

PROJECT MANUAL / SPECIFICATIONS

Sioux Falls VA Medical Center
2501 W. 22nd Street
Sioux Falls, SD 57105

Project # 438-18-102
Renovate Tower of Building 1
CLH Project Number 2018-20

Part 1

Divisions 00 thru 14

Bid Documents
May 30, 2019

CLH

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 VHA MASTER SPECIFICATIONS**

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12-01-18
Renovate Tower of Building 1
VAMC, Sioux Falls, SD
VA Project #438-18-102

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SECTION 00 01 15
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the contract.

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E601	ELECTRICAL SCHEDULES

- - - END - - -

**REPORT OF GEOTECHNICAL EXPLORATION
SIOUX FALLS VA MEDICAL CENTER ELEVATOR ADDITION
2501 WEST 22ND STREET
SIOUX FALLS, SOUTH DAKOTA
JANUARY 21, 2019
TD2 FILE NO. 1792-108**

**REPORT OF GEOTECHNICAL EXPLORATION
 SIOUX FALLS VA MEDICAL CENTER ELEVATOR ADDITION
 2501 WEST 22ND STREET
 SIOUX FALLS, SOUTH DAKOTA
 JANUARY 21, 2019
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EXECUTIVE SUMMARY

The site is the existing Veteran's Administration Medical Center, with a legal description of W ½ SE ¼ 19-191-49 and Block 1 to Block 8 Smith's, A.L. 1st to City of Sioux Falls and located at 2501 West 22nd Street in Sioux Falls, South Dakota. The existing stand-alone building will have two new elevator additions constructed to service the existing facility. The elevators are expected to service the basement and top three floors of the facility. The western most addition will contain one elevator, and the east addition will contain two elevators.

To investigate the site soil conditions, two (2) soil borings were advanced. Soils encountered included loess overlying glacial till. The soils anticipated to be encountered at bearing level include the loess. The loess is expected to be suitable for support of the structure using shallow and continuous foundation elements and mat foundations for elevator pits. No soil improvement is expected to be necessary for the site.

Free water was encountered during and after the drilling operations in borings B-1 and B-2. The expected depth to free water is below the depth of anticipated shallow utility and foundation excavation; therefore, free ground water is not expected to impact the proposed construction.

The building addition footprints are expected to need minor fills (defined as <4') and cuts of up to 15 feet to create a level building pad at the basement level. For the purpose of the settlement analysis, foundation loads of up to 8 kips per foot for continuous wall loads were expected for the new additions. Settlements under building addition foundations are expected to be within the tolerable range for the building construction.

Floor slab and pavement subgrades should be prepared such that a subgrade of structural fill is used to support the slab or pavement. Some overexcavation may be necessary to compact the full depth of the required subgrade in cut areas. As very moist to wet soils are expected in the basement floor slab area, consideration of a granular subgrade should be made.

This executive summary is not intended to relate all geotechnical findings and conclusions provided in this report. The entire report should be read and consulted by the project design professionals for application to the project as described herein.

**REPORT OF GEOTECHNICAL EXPLORATION
SIOUX FALLS VA MEDICAL CENTER ELEVATOR ADDITION
2501 WEST 22ND STREET
SIOUX FALLS, SOUTH DAKOTA
JANUARY 21, 2019
TD2 FILE NO. 1792-108**

1.0 INTRODUCTION

This Report summarizes subsoil exploration work, laboratory findings, and geotechnical engineering conclusions and recommendations by Thompson, Dreessen & Dorner, Inc. (TD2) for the above-referenced project. This work was based on our written agreement with Ms. Kris Gillen and Ms. Rebecca Block of Calvin L. Hinz Architecture as the project architects. This investigation was made to evaluate geotechnical properties of the soil at the proposed elevator addition sites. The Report presents the results of the boring and testing program and discusses special precautions for the design and construction of the project as it relates to geotechnical issues.

2.0 PROJECT DESCRIPTION

The site is the existing Veteran's Administration Medical Center, with a legal description of W ½ SE ¼ 19-191-49 and Block 1 to Block 8 Smith's, A.L. 1st to City of Sioux Falls and located at 2501 West 22nd Street in Sioux Falls, South Dakota. The existing stand-alone building will have two new elevator additions constructed to service the existing facility. The elevators are expected to service the basement and top three floors of the facility. The western most addition will contain one elevator and the east addition will contain two elevators.

3.0 EXPLORATION RESULTS

3.1. Field Work

Two test borings, numbered B-1 and B-2, were advanced at the site to discover soil conditions. Boring B-1 was advanced in the east addition footprint and boring B-2 was advanced in the west addition footprint. The boring locations are shown on the Boring Location Plan included in the Appendix of this Report. Borings B-1 and B-2 were advanced to a depth of 30 feet below ground surface. The borings were made with continuous flight augers and required no drill hole stabilization techniques, such as hollow stem augers or drilling fluid.

Samples were recovered every 2.5 feet of boring in the first 10 feet and every 5 feet thereafter. Field boring logs were prepared as drilling progressed. More details of the field work can be found in Section 6.1 of this Report.

3.2.Laboratory Test Program

Selected samples were tested in the laboratory to define pertinent geotechnical properties necessary for the analysis. Laboratory tests included moisture content, density determination, unconfined compressive strength, and visual classification of the soil. A complete table of laboratory test results is included in the Appendix. Each test was performed in general conformance with current ASTM procedures. More details of the laboratory testing program can be found in Section 6.2 of this Report.

Based on the results of the testing program, the field boring logs were reviewed and supplemented as presented in the Appendix. These final logs represent our interpretation of the in-place soil conditions.

3.3.Site Conditions

This site lies within the Coteau Des Prairies of eastern South Dakota. Most of the soils in Minnehaha County formed in glacial material derived from pre-glacial formations of granite, limestone, quartzite, sandstone, and shale. The glacier ground up and mixed these materials as it transported them. When the glacier melted, the glacial material was redeposited. Some deposits consist of unsorted materials, or glacial till. Other material was sorted either by water or by wind and water after it was deposited. The typical soil profile in this region consists of various ages of loess materials overlying glacial deposits. The loess materials are derived from wind borne sediments, and are generally silt sized particles that are cemented together with clays and various calcium based compounds. The loess deposits generally overly and conform to the eroded loamy glacial till surface. The loamy glacial till is a mixture of clay, silt, sand, and gravel that contains few to many cobblestones and boulders. The borings at the site encountered loess overlying glacial till.

The USDA Web Soil Survey maps the near surface soils at the site as Nora-Crofton complex, 6 to 9 percent slopes (NcC). This mapping indicates that the near surface soils formed in loessial materials.

The current site is generally grass covered. A review of historical aerial photographs shows that a previous addition was made to the building in between 2007 and 2010.

For the proposed additions, minor fills (defined as <4') are expected to be needed to create a level building pad. Significant cuts are expected to be needed to get down to the basement level for construction.

3.4.Subsurface Conditions

The subsurface conditions encountered in the borings have been used to infer the general soil conditions at the site. We assume the soil conditions between borings are fairly represented by the borings. However, variations between borings may become apparent during construction. During construction, if conditions are encountered other than that described below and as shown on the boring logs, it is important that we be informed to evaluate the exposed conditions with respect to their effect on our recommendations.

The following is a brief review of the various layers of soil encountered in the borings. All depths given are relative to the ground surface at the time of drilling. The Appendix contains the detailed boring logs. The ground surface at the site was generally covered with lawn grass followed by topsoil. The topsoil thickness was observed to be about 4 to 6 inches in thickness.

Loess was encountered underlying the topsoil in borings B-1 and B-2. The loess was described as light brown to brown to grayish brown, moist to very moist, and firm to stiff. Visual classification of this material type generally suggested Lean Clay (CL) according to the Unified Soil Classification System (USCS). Laboratory analysis of the recovered alluvial samples yielded moisture contents from 16.7% to 31.0%, dry unit weights from 84.2 to 94.1 pounds per cubic foot, and unconfined compressive strengths from 0.25 to 0.98 tons per square foot.

Glacial till was encountered underlying the loess in borings B-1, and B-2. The till was described as light brown to brown to orangish brown, moist to very moist, and stiff to hard. Visual classification of this material type generally suggested Fat Clay (CH) according to the USCS. Laboratory analysis of the recovered alluvial samples yielded moisture contents from 19.7% to 28.1%, dry unit weights from 99.7 to 111.2 pcf, and unconfined compressive strengths from 0.65 to 3.26 tsf.

3.5.Groundwater Data

Free ground water was encountered during and after the drilling operations in borings B-1, and B-2. Free water was measured at 24.0 feet below ground surface in boring B-1 and 27.0 feet bgs in boring B-2 during drilling operations. The borings were left open after drilling operations and extended water levels were measured prior to abandoning the borings. After drilling operations, water was measured at 29.0 feet bgs in boring B-1 and 26.0 feet bgs in boring B-2. Water levels were measured in the open, uncased bore holes at the time noted on the boring logs.

It should be noted that groundwater levels may fluctuate seasonally and yearly from the readings noted on the boring logs. Factors affecting groundwater levels can include precipitation, flow direction, nearby pumping, and temperature changes. The expected depth to free water is not expected to be encountered in the vast majority of on-site excavations and should not impact the proposed construction.

4.0 ENGINEERING RECOMMENDATIONS

4.1. Discussion

The following analyses, conclusions, and recommendations are based on our field investigation, laboratory test results, engineering analysis, and experience. The engineering recommendations made in this Report are based on our understanding of the project as discussed in the preceding paragraphs. The following sections provide a brief discussion of the geotechnical aspects of the site, followed by project specific recommendations and conclusions.

4.2. Site Preparation

Prior to on-site earthwork, topsoil, including the root crown and other trees, shrubs, organic materials and debris should be stripped, cleared, and grubbed from the building addition footprints. The upper most soil crust along with the root crown should be removed prior to grading operations. The strippings can be stockpiled for placement in green spaces following construction or can be removed completely from the site. We recommend that the upper 3" to 5" of topsoil be removed with the grass stubble and root crown. A greater excavation depth may be required below any trees or shrubs. Removal of trees and shrubs should include the removal of the root ball. The geotechnical engineer should be consulted during stripping and reserves the right to adjust the depth of stripping based on observations at the time of construction.

Some of the ground surface at the site is covered by sidewalk pavements. Demolition of all portions of the sidewalk that will not be reused by the new construction will be necessary prior to construction. Additionally, any site service utilities that will not be reused by the proposed construction should be properly abandoned and removed.

Minor cuts and fills, (defined as <4'), are expected to be needed to create level building pads for the additions. Therefore, the settlement under the completed structures is expected to be due to the new construction itself and not a new fill load. No construction delay or surcharge is anticipated to be needed to allow settlement to occur under minor fills. Additional settlement discussion is found in Section 4.7 of this Report. All site fill should be considered Structural Fill and compacted to the requirements in Section 4.3 of this report.

Shallow foundations for building walls and mat foundations for elevator pits are suitable for support of the proposed structures when bearing on the encountered loess at the site. No surcharge of the existing site is necessary to pre-compress the site soils. The encountered loess materials do not indicate properties of a collapse susceptible soil but they do indicate properties of a swell-susceptible material; however, no soil improvement methods to remediate collapsible or swelling soils are necessary. Subgrades for floor slabs and pavements must be prepared to support the slab or pavement. Recommendations for shallow foundations are provided in Section 4.6, Foundation Analysis, of this Report.

The new floor slab is anticipated to carry moderate to heavy loads in the building area. A compacted structural fill subgrade should be prepared to support the floor slab. This is needed in cut or fill areas. Some overexcavation may be needed to properly prepare a compacted subgrade in cut areas. Subgrade compaction requirements for the floor slab are provided in Section 4.8 of this Report.

4.3. Earthwork

The on-site excavations are expected to encounter clayey materials above optimum moisture content. It is expected that the vast majority of on-site excavation will encounter materials suitable for re-use as structural fill or backfill following conditioning, drying and processing. For the purposes of estimating earthwork quantities, 1 cubic yard of compacted structural fill can be expected to require 1.35 cubic yards of on-site excavation. On-site processing of borrow materials should include the breaking up of chunks or clods in excess of 1 ½ inches. Foreign debris was not encountered in the borings, so separation of debris is not expected to be needed for on-site borrow. Drying or blending will be required to facilitate compaction moisture recommendations of the on-site clay to the requirements for structural fill or backfill.

If the contractor does not have adequate space, time, or weather conditions, for processing and conditioning on-site soils, the use of imported backfill may become necessary. Imported fill may be required for use as backfill or as a blending material or replacement material. Imported fill should exhibit a liquid limit less than 43 and a plasticity index less than 23, be free of organics, debris, particles larger than 1½" and other deleterious materials. The addition of fly ash, lime, or cement to the on-site soil as a drying or improvement agent is permitted under the direction of the engineer.

All fill should be placed in thin, horizontal lifts, and moisture conditioned prior to compaction. Loose lift thickness should be adjusted, depending on the contractor's construction equipment but should generally not exceed 8 inches. Fill placed to create an embankment slope should be compacted in horizontal layers, with compactive effort extending to the slope face. In many cases, overbuilding the slope may be needed to facilitate slope face compaction prior to cutting to the required shape. When fill is placed adjacent to an existing embankment slope, the existing slope should be stepped or benched to allow the placement of horizontal layers to eliminate a shear plane. Steps or benches should be no greater than 4 feet in height.

Compaction of all fill placed is necessary to minimize post-construction compression (settlements) of the fill. Compaction requirements for cohesive fills and non-cohesive fills should be referenced to the ASTM D1557 (Modified Proctor) test method.

Structural fill should be compacted to an in-place dry unit weight at least 90 percent of the maximum dry unit weight at a water content at the time of compaction to within -1 and +5 percent of the optimum water content.

Backfill for shallow utilities and immediately behind below grade walls should be compacted to an in-place dry unit weight at least 85 percent of the maximum dry unit weight at a water content at the time of compaction to within -2 and +5 percent of the optimum water content. Backfill placed with a zone of subgrade preparation should be compacted to the requirements of the subgrade for the full depth of the backfill.

The soils found at this site are typical of the area. Past experience indicates that corrosion potential of buried metallic pipes in these soils is moderate; therefore, it is recommended that polyethylene wrap is provided for ductile iron piping. Sulfate corrosion potential of Portland cement is minimal, and Type I Portland cement is suitable for use. All concrete used for this project should be air-entrained to reduce damage from frost action.

4.4. Excavations

Vertical cuts and excavations may stand for short periods of time, but should not be considered stable in any case. All excavations should be sloped back, shored, benched, or shielded for protection of workers. All workers should use adequate safety precautions. Trenching and excavation activities should conform to federal and local regulations as a minimum.

The soils encountered in the test borings generally classify as Type B soils according to OSHA's Construction Standards for Excavations. In general, the maximum allowable slope for shallow excavations in a Type B soil is 1H:1V, although other provisions and restrictions may apply. If different soil types are encountered, the maximum allowable slope may be different. All excavation work should be completed in accordance with OSHA standards. Where safe back-slopes cannot be provided, bracing or shoring designed by competent professionals should be installed.

Surface water seepage may cause excavations to be less stable. Therefore, the amount of open trenches exposed should be kept to a minimum. Backfill should be placed as soon as possible after structural strength requirements are met after installation. Parallel excavations should be avoided because an unstable column of soil can form between the excavations, especially the excavations that are close and if one of the excavations is back filled before the other.

Groundwater seepage into open shallow excavations is not a concern based on the observed water levels in the borings. All excavations may encounter very moist to wet soils which will be easily disturbed during construction. Care should be exercised to minimize disturbance of exposed very moist or wet soils. Deep excavations may encounter free ground water. Deep excavations may require additional bedding to properly support piping. Deep excavations that encounter free water may utilize shallow pumping from localized sumps in the excavation.

4.5. Seismic Conditions

Seismic design conditions for this project should utilize a Site Class of "D" according to 2012 International Building Code. The IBC Site Class determination is based on the top 100 feet of soil and rock profile. Although the borings performed at the site are much shallower than 100', generalized information of the site subsurface conditions suggest this Site Class. The structural engineer should perform the seismic design, using the recommended Site Class.

4.6. Foundation Analysis

In light of the subsurface conditions revealed by the boring and testing program, this site appears suitable for use of a shallow spread foundation system. The selection of an allowable soil bearing pressure for shallow foundation elements must fulfill two requirements. First, the load must be sufficiently less than the ultimate bearing capacity of the foundation to insure stability. Second, the differential settlement must not exceed an amount which will produce adverse behavior of the superstructure.

In order to meet the previous criteria, we have explored both the bearing capacity and the load settlement characteristics of the site soils. The bearing capacity is based on a factor of safety of 3 against the full dead load plus normal live load. The allowable bearing pressure is expressed in terms of the net pressure transferred to the soil.

A net allowable soil bearing pressure of 1,500 pounds per square foot may be used to size both continuous wall footings and combined mat foundations in areas where the existing loess soils are at bearing level. Exterior footings and footings in unheated areas should be founded at a minimum depth of 3.5 feet below surrounding grade to provide frost protection. Isolated interior footings in heated areas may be founded such that the floor slab subgrade preparation does not disturb bearing soils. All footings should be reinforced with steel reinforcement. Structural stoops should be provided at all entrances.

Because of the clayey nature of the encountered soils, it is expected that shallow foundations may be trench formed. This type of footing has the advantage of quicker construction, it eliminates the need to backfill the foundation, and it distributes stresses much more evenly to the soil. Trench formed footing excavations should be made with a smooth edge bucket excavator to reduce bearing surface disturbance. Care should be exercised to avoid overexcavating below the grade required by the plans. It is not recommended that fill be placed at the base of footing excavations to replace accidental overexcavation.

Trenched "grade beam" type footings are acceptable for exterior walls. Trenched "grade beam" footings should be reinforced with top and bottom reinforcement, be designed to be capable of spanning 10 feet under applied loads and have a minimum width of 16 inches where supporting load bearing walls. For this purpose, a "grade beam" footing is defined as any footing with a thickness at least two times its width. If foundation trenches become unstable or present seepage water, TD2 should be contact to evaluate the encountered conditions with respect to these provided recommendations.

Lateral loads acting against the footings can be resisted by friction against the footing bearing surface using normal dead loads and an allowable friction coefficient of 0.20. Alternatively, lateral resistance can be developed by assigning an allowable adhesion of 250 psf to the net contact area. Additional lateral resistance can be developed by assigning an allowable passive resistance to the portions of the footings or grade beams more than 1.0 foot below the slab. The allowable passive resistance can be approximated by an equivalent fluid weight of 150 pcf. Passive resistance should only be used with trench footings or formed footings that have been backfilled to the requirements of structural fill.

4.7. Below Grade Walls

The basement and elevator pit walls will be subjected to unbalanced lateral soil loads. The lateral pressures acting against the basement walls are a function of the properties of the natural soil and the backfill, backfill placement procedures, drainage, and wall movements. The encountered soil properties and the estimated properties of the compacted fill on-site were used to determine the lateral pressure properties of the site soils. The design lateral pressures presented in this report are consistent with backfill compacted using light equipment. Some compaction procedures and equipment can generate significantly higher lateral pressures, which should be recognized by the contractor.

Below grade walls can be designed using the equivalent fluid pressure method. The drained at-rest equivalent fluid pressure should be used as 55 pounds per cubic foot. The drained active equivalent fluid pressure should be used as 45 pcf. Surcharge loads should be transformed to an equivalent height of soil weighing 110 pcf to determine the lateral earth pressure on the wall.

The lateral pressure recommended for design of the below grade walls is based on the assumption that hydrostatic pressures do not act in conjunction with soil loads. Installation of a foundation drain is appropriate to relieve hydrostatic pressure from the basement wall and to reduce the potential for water entry into the building. An exterior perimeter drain system should be provided to prevent hydrostatic pressure from acting on the wall. This is especially true for basement walls with more than about 5 feet of retained soil. The drain system should be routed to the storm sewer system in a manner to prevent backup during full flow events in the sewer or should be directed to a sump for discharge.

Backfill should be properly compacted to reduce future subsidence, and proper surface drainage should be provided to reduce the amount of moisture infiltration into the backfill. The contractor should evaluate the backfill procedure to determine if temporary supports are needed. Sand backfill is not recommended, except as required around the perimeter drain system. The top 12" of wall backfill on an exterior wall side and in landscaped areas should consist of low plastic silty clay suitable to promote vegetative cover.

4.8. Settlement Analysis

The site fill is anticipated to be minor to create level building pads. For the purpose of our settlement analysis it was presumed that new foundation loads of up to 8 kips per foot for continuous wall loads are expected for the new building additions. A maximum total settlement of 1 inch and a differential settlement of ½ to ¾ inch are generally considered acceptable for this type of construction and were used in our analysis.

Based on the analysis of footings bearing on existing site soils and the influence of minor fills (<4'), total settlements are expected to be less than 1 inch at the building foundations for the additions. Differential settlements are expected to be less than ¾ inch across 30 feet. Additional analysis may be necessary if more significant loads are expected.

The encountered soil properties exhibit a low to moderate swell potential. Swell occurs with increasing moisture content and can be followed by shrinkage with decreasing moisture content. Differential settlements are associated with swell and shrinkage. The low potential for swell should not be a factor for foundation construction. However, effective compaction of subgrades supporting slab-on-grade floors will be necessary.

In any case, care should be exercised during construction so as not to leave foundation trenches open for more time than necessary. If foundation excavations become saturated due to precipitation, or dry out excessively, the excavation should be evaluated by the geotechnical engineer prior to use to determine suitability and corrective action.

The soils at the site are frost susceptible. As such, foundations in unheated areas should be founded at a frost free depth. Structural stoops should be provided at all entrances. The effective drainage of surface features and reduction of infiltration of water adjacent to pavements and structure foundations can aid in reducing frost heave.

Reliably predicted settlement estimates cannot be made for extraneous causes of settlement such as poor backfill or fill compaction, saturating of subsoils through excessive irrigation, precipitation, or broken piping. Therefore, this report provides recommendations for the proper compaction of fill and backfill and surface drainage to reduce potential extraneous settlement.

4.9. Floor Slab Subgrades

The Site Preparation Section of this report recommended that the floor slab subgrade should be composed of structural fill. To provide uniform support for floor slabs, the subgrade should be composed of 12 inches of structural fill. The structural fill requirements of the subgrade may include moisture contents from 0 to +5 of optimum. Some overexcavation may be necessary to compact the full depth of the required subgrade in cut area.

The compaction for the subgrade is expected to occur early in the construction process. The completed subgrade is expected to be subjected to disturbances from under slab utility construction, precipitation, construction traffic, or freezing conditions prior to slab pavement placement. Therefore, the subgrade should be reworked and compacted immediately prior to concrete placement. The disturbances should be repaired by scarification and recompaction. Extensive disturbances should be repaired by overexcavation and recompaction.

Provided the above subgrade compaction requirements are followed and applied, a subgrade modulus of 110 pounds per cubic inch can be used for design of the floor slab.

A granular base course may be used under the slab; and may be beneficial in light of the very moist to wet soils expected at the subgrade. If a granular base course is used beneath the floor slab, this layer should be at least 6 inches thick, free-draining, well-graded, and compacted by vibration prior to pouring the floor slab. The use of fine sand or mason's sand is discouraged from use as a leveling course as it is extremely difficult to maintain a compacted state in the sand under typical construction traffic.

A vapor retarder/barrier should be used if floor coverings could be damaged by moisture vapor intrusion through the floor slab. If a vapor retarder/barrier is used it should be in accordance with ASTM E1745. The vapor barrier should be placed above the granular cushion and beneath the concrete slab. The vapor barrier should be at least 15 mil in thickness. The use of a vapor barrier will affect the curing of the slab, and as such, proper finishing, jointing, and curing techniques should be implemented, as well as implementing an appropriate water-cement ratio. Moisture vapor emission rate (MEVR) testing is recommended to be performed prior to installation of moisture sensitive coverings.

Significant floor loads are not anticipated for use in the structure so a significant amount of structural reinforcement is not expected to be needed. A specific floor slab thickness and reinforcing design should be prepared by a structural engineer.

The slab should be designed with consideration to isolation joints at columns, expansion joints at exterior walls, and construction and control joints as needed. A moveable joint should be provided between the floor slab and structural members to accommodate some differential movement. All control joints should be made to a depth of $\frac{1}{4}$ of the slab thickness as a minimum, unless special provisions for a joint-less floor are included in the design. Expansion joints should be made full depth and be sealed with a flexible sealant and re-sealed periodically as needed.

4.10. Surface Drainage and Landscaping

The success of the shallow foundation system and slab on grade floor system is contingent upon keeping the subgrade soils at more or less constant moisture content, and by not allowing surface drainage a path to the subsurface. Positive surface drainage away from the structure must be maintained at all times. Typical sources of water that could cause water content gains in the subgrade soils include infiltration of surface water, irrigation water, and utility line leaks. Utilities within the building footprint should be verified as leak-tight prior to service.

The final grade of the foundation backfill and any overlying pavements should have a positive slope away from foundation walls on all sides. A minimum slope of 1 inch per foot for the first 5 to 10 feet is recommended. However, the slope may be decreased if the ground surface adjacent to foundations is covered with concrete slabs or asphalt pavements. Pavements and exterior slabs that abut structures should be carefully sealed against moisture intrusion at the joint. Exterior pavement and slabs should be sloped to promote drainage. A minimum slope of 2 percent is recommended for other landscaped areas of the site.

No final graded slopes should be made steeper than 3H:1V due to erosion and maintainability concerns. If steeper slopes are proposed, additional slope stability analyses and design measures will be required. Redistribution of topsoil and final seeding are recommended for all exposed surfaces. Erosion protection and controls should be installed for all exposed slopes of 5H:1V or steeper.

Landscaped areas should be designed and built such that irrigation and other surface water will be collected and carried away from foundation elements. Irrigation within ten feet of the foundation should be carefully controlled and minimized. All downspouts and faucets should discharge onto splash blocks that extend at least 3 feet from the building line or beyond adjacent landscaping areas. Splash blocks should slope away from the foundation walls.

The roof drains should be directed to exterior daylight outlets, exterior storm sewer system or to interior sumps for subsequent pump discharge. Exterior daylight outlets should be discharged onto splash blocks or pavements that are not as susceptible as soil to erosion. Connections to the storm sewer system should be made such that at full flow conditions, backup into the drain system does not occur.

During construction, temporary grades should be established to prevent runoff from entering excavations. Backfill should be placed as soon as possible after structural strength requirements are met and installation is complete. The length of open trench should be minimized to reduce potential runoff from entering the trench.

5.0 PLAN REVIEW AND CONSTRUCTION OBSERVATION

Since a project of this nature requires many soil-related judgments and decisions, we recommend that TD2 be retained as part of the construction team. The geotechnical engineer should be provided the opportunity for general review of the final design and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications.

Implementation of the site preparation and design recommendations presented in this report requires evaluation of the soil conditions encountered during construction. Therefore, we recommend that the geotechnical engineer be retained to inspect all fill placement and footing trench excavations. We also recommend that a limited number of compaction tests be performed to document the degree of compaction obtained in backfill and structural fill.

6.0 EXPLORATION PROCEDURES

6.1. Soil Sampling

The test borings were made with a CME 45-B drill rig equipped with 4" continuous flight augers to advance the borings. Relatively undisturbed samples of cohesive soils were obtained with thin-walled tube samplers in accordance with ASTM D1587. Cohesionless soils were sampled using a split barrel sampler while performing the Standard Penetration Test (SPT) in conformance with ASTM D1586. As the samples were obtained in the field, they were visually and manually classified by the drill crew chief in general accordance with ASTM D2488. Logs of the borings indicating the depth and identification of the various strata, water level information, and pertinent information regarding the method of maintaining and advancing the drill holes are included in the Appendix.

Recovered samples of cohesive material were tested in the field using a hand penetrometer to estimate the unconfined compressive strength and to aid in describing the consistency of the recovered sample. The field boring logs were supplemented with the laboratory test results for the preparation of the final boring logs. The final boring logs present the interpreted soil profile at each boring location.

6.2. Laboratory Testing

Recovered samples were extruded in the field, sealed in plastic, labeled, and protected for transportation to the laboratory for further testing and verification of field classification according to ASTM D4220. A chart illustrating the soil classification procedure is included in the Appendix. Select samples were evaluated in the laboratory and summarized on a Summary of Soil Testing Results report included in the appendix. Laboratory tests included moisture content (ASTM D2216), density determination (ASTM D2937), unconfined compressive strength (ASTM D2166), and classification by Unified Soil Classification System (ASTM D2487). All tests were conducted in substantial conformance with ASTM requirements. Laboratory results are reported on the Summary of Soils Tests Results report included in the Appendix.

7.0 STANDARD OF CARE

This Report was prepared under the supervision of a professional registered engineer. This Report has been prepared for the exclusive use of our client and their agents for application to the proposed project as described. The recommendations contained in this Report represent our professional opinions. These opinions were arrived at in accordance with currently accepted engineering procedures at this time and location. Other than this, no warranty, either expressed or implied, is intended. Additive conclusions or recommendations made from these data by others are their responsibility.

In the event that any changes in the nature, design, or location of the structure are planned, the conclusions and recommendations contained in this Report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing. Because of special mechanical or structural details, it is sometimes necessary to deviate from our recommendations. These problems can usually be reconciled by a brief conference between us and the designing architects and engineers.

If any soil conditions become notably different, during construction, from those described here, TD2 should be notified immediately. This geotechnical engineering report does not relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site or in the subsurface. If potential hazardous materials are believed to exist at the site, a geo-environmental investigation should be performed.

Respectfully submitted,
THOMPSON, DREESSEN & DORNER, INC.

Prepared by,

Reviewed by,

Alexandra Berney, E.I.
Engineer Intern

Kurtis L. Rohn, P.E.
Geotechnical Engineer

KLR/tjp

Enclosures

APPENDIX

W. 22nd Street

S. Garfield Avenue

B-2

B-1



Job Number: 1792-108
thompson, dreessen & dorner, inc.
10836 Old Mill Rd
Omaha, NE 68154
p.402.330.8860 www.td2co.com

Date: 1-9-19
Drawn By: ARB
Reviewed By: KLR
Revision Date: ..

Sioux Falls VA Medical Center Elevator Addition
2501 W. 22nd Street, Sioux Falls, South Dakota

Boring Location Plan



THOMPSON, DRESSEN & DORNER, INC.
CONSULTING ENGINEERS & LAND SURVEYORS

GEOTECHNICAL ENGINEERING DIVISION

PROJECT: Sioux Falls VA Medical Center Elevator Additions

LOCATION: 2501 W 22nd Street, Sioux Falls, South Dakota

CLIENT: Calvin L. Hinz Architecture

JOB No. : 1792-108

DATE: 1/4/19

BORING LOG

BORING No. : B-1

WEATHER CONDITIONS		BORING LOCATION		SURFACE ELEV.	ELEVATION DATUM	DRILLER	LOGGER
Sunny 36°		See Boring Location Plan				T. Eggert	A. Cannia
GROUNDWATER LEVEL OBSERVATIONS				TYPE OF SURFACE		SRT. HAMMER	DRILL RIG
WHILE DRILLING	END OF DRILLING	24 HOURS AFTER DRILLING	HOURS	Grass		NA	CME-45
24.0	29.0	HBED		4" Continuous Flight Augers		Fish	30.0 feet

SAMPLE DATA				DESCRIPTION OF SOIL					LABORATORY RESULTS					
DEPTH FT.	SAMPLE No. & Type	Penetrometer Strength (tsf)	% REC.	COLOR	MOIST	CONS	USCS	GEOLOGICAL DESCRIPTION	GRAPHICAL LOG	MC (%)	DRY DENSITY (pcf)	C _u (psi)	SOIL CLASS	DEPTH FT.
5	U-1	1.5	100	Dk Br Light Brown	Moist Moist	Firm Firm	CL CL	4" Topsoil Loess, Lean Clay, Low Plasticity, Layered, Silty, Rust Stains, Calcium Deposits		19.2	94.1	0.98		
	U-2	1.5	100					Root Holes, Root Hairs		18.1	85.0	0.51		5
10	U-3	2.0	100	Brown				Very Silty		22.4	85.5	0.89		
	U-4	1.5	100							23.2	87.0	0.55		10
15	U-5	1.5	100	Grayish Brown	Very Moist					27.2	93.5	0.75		15
20	U-6	1.5	100							31.0	93.3	0.53		20
25	U-7	3.0	100	Light Brown	Moist	Stiff	CH	Glacial Till, Fat Clay, High Plasticity, Loamy, Large Calcium Nodules, Silt, Rust Stains, Blocky		20.3	111.2	1.17		25
30	U-8	4.25	100	Orangish Brown		Hard		Gravel Pieces		19.7	111.2	3.26		30

Bottom of Boring @ 30'



THOMPSON, DREESSEN & DORNER, INC.
CONSULTING ENGINEERS & LAND SURVEYORS

GEOTECHNICAL ENGINEERING DIVISION

PROJECT: Sioux Falls VA Medical Center Elevator Additions

LOCATION: 2501 W 22nd Street, Sioux Falls, South Dakota

CLIENT: Calvin L. Hinz Architecture

JOB No. : 1792-108

DATE: 1/4/19

BORING LOG

BORING No. : B-2

WEATHER CONDITIONS			BORING LOCATION			SURFACE ELEV.		ELEVATION DATUM		DRILLER		LOGGER	
Sunny 35°			See Boring Location Plan							T. Eggert		A. Cannia	
GROUNDWATER LEVEL OBSERVATIONS				TYPE OF SURFACE				SPT-HAMMER		DRILL RIG			
				Grass				NA		CME-45			
WHILE DRILLING	END OF DRILLING	24 HOURS AFTER DRILLING	HOURS		DRILLING METHOD				BIT USED		TOTAL DEPTH		
27.0	26.0	HBED			4" Continuous Flight Augers				Fish		30.0 feet		

SAMPLE DATA				DESCRIPTION OF SOIL					LABORATORY RESULTS					
DEPTH FT.	SAMPLE No. & Type	Penetrometer Strength (tsf)	% REC.	COLOR	MOIST	CONS	USCS	GEOLOGICAL DESCRIPTION	GRAPHICAL LOG	MC (%)	DRY DENSITY (pcf)	q _{tip}	SOIL CLASS	DEPTH FT.
5	U-1	1.0	100	Dk Br	Moist	Firm	CL	6" Topsoil		16.7	84.5	0.25		
				Brown	Moist	Firm	CL	Loess, Lean Clay, Low Plasticity, Root Holes, Root Hairs, Calcium Deposits						
10	U-2	1.5	100	Light Brown				Rust Stains		18.8	85.3			
								Silty						
15	U-3	1.5	100					Gray Mottles		19.3	84.2	0.35		
20	U-4	1.5	100							21.2	85.5	0.56		
25	U-5	1.5	100		Very Moist				24.3	87.1	0.69			
30	U-6	2.25	100	Grayish Brown		Stiff		Rust Lined Root Holes	29.7	93.0	0.46			
30	U-7	2.0	100			Firm			30.6	92.8	0.75			
30	U-8	2.5	100	Brown	Very Moist	Stiff	CH	Glacial Till, Fat Clay, High Plasticity, Loamy, Calcium Deposits, Rust Stains	28.1	99.7	0.65		30	

Bottom of Boring @ 30'

SOIL BORING LOGS

Water Level Observations: Water level observations were made under the conditions noted in the open, uncased bore holes. Fluctuations in the water levels may occur with time, precipitation, and other factors.

Samples: Samples types are identified by letter and by consecutive number within a boring:

- U Thin-walled tube sample 3-inch diameter, unless otherwise noted.
- S Split spoon sample, 2-inch OD unless otherwise noted.
- A Auger disturbed sample obtained from auger cuttings.
- CC Continuous core sample from Macro Core® sampler.

N-Blows per Foot: Resistance as measured while performing the Standard Penetration Test. The number indicates blows for the last 12 inches of penetration of the split spoon sampler. Multiple numbers indicate blows per 6 inches of penetration or blows per length driven.

Penetrometer Strength: The hand penetrometer resistance in tons per square foot determined in the field for the recovered sample.

Recovery: Recovery is shown as a ratio of inches of sample recovered to inches of sample attempted.

Physical Description: The description includes; color, moisture condition, consistency, and Unified Soil Classification System description. The USCS description is either interpreted or determined as noted. Includes other pertinent comments from field observations.

Geologic Description: A brief geologic interpretation and observations of the recovered samples and/or exposed cuttings.

Graphical Log: The symbols suggest the observed variations in the geologic formations or soils layers showing similar attributes. The soil boring log Geologic Description contains detailed descriptions. A symbol legend follows the soil boring logs.

Laboratory Results: Brief summary of selected laboratory results. A separate Summary of Soil Testing Results provides more complete information.

Limitations: The profiles indicated on the logs are an idealized description of the subsurface soil materials based on the observations of the recovered samples. The boundary lines shown represent approximate boundaries between material types and the actual changes may be gradual.

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

(Based on Unified Soil Classification System) ASTM: D 2487

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification		
				Group Symbol	Group Name ^B	
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels	Clean Gravels	Less than 5% fines	Cu ≥ 4 and 1 ≤ Cc < 3 ^F	GW	Well-graded gravel ^I
	More than 50% of coarse fraction retained on No. 4 sieve	Gravels with Fines	More than 12% fines ^C	Cu < 4 and/or 1 > Cc > 3 ^F	GP	Poorly graded gravel ^I
				Fines classify as ML or MH	GM	Silty gravel ^{I, G, H}
				Fines classify as CL or CH	GC	Clayey gravel ^{F, G, H}
Sands	50% or more of coarse fraction passes No. 4 sieve	Clean Sands	Less than 5% fines	Cu ≥ 6 and 1 < Cc < 3 ^F	SW	Well-graded sand
				Cu < 6 and/or 1 > Cc > 3 ^F	SP	Poorly graded sand ^I
				Fines classify as ML or MH	SM	Silty sand ^{I, G, H}
				Fines classify as CL or CH	SC	Clayey sand ^{I, G, H}
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silt and Clays Liquid limit less than 50	Inorganic	Liquid limit -- oven dried	PI ≥ 7 and plots on or above "A" line	CL	Lean clay ^{K, L, M}
				PI < 4 or plots below "A" line	ML	Silt ^{N, L, M}
				Liquid limit -- not dried < 0.75	OL	Organic clay ^{K, L, M, U}
				Liquid limit -- not dried < 0.75	OH	Organic silt ^{N, L, M, U}
	Silt and Clays Liquid limit 50 or more	Inorganic	Liquid limit -- oven dried	PI plots on or above "A" line	CH	Fat clay ^{K, L, M}
				PI plots below "A" line	MH	Elastic silt ^{N, L, M}
				Liquid limit -- oven dried < 0.75	OH	Organic clay ^{K, L, M, P}
				Liquid limit -- not dried < 0.75	OL	Organic silt ^{N, L, M, U}
Highly organic soils	Primarily organic matter, dark in color, and organic odor			PT	Peat	

^A Based on the material passing the 3-in. (75-mm) sieve.

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to the group name.

^C Gravels with 5 to 12% fines require dual symbols:

GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

^D Sands with 5 to 12% fines require dual symbols:

SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

^E $Cu = D_{60}/D_{10}$ $Cc = D_{10} \times D_{90} / (D_{50})^2$

^F If soil contains > 15% sand, add "with sand" to group name

^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^H If fines are organic, add "with organic fines" to group name.

^I If soil contains > 15% gravel, add "with gravel" to group name

^J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel", whichever is predominant.

^L If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.

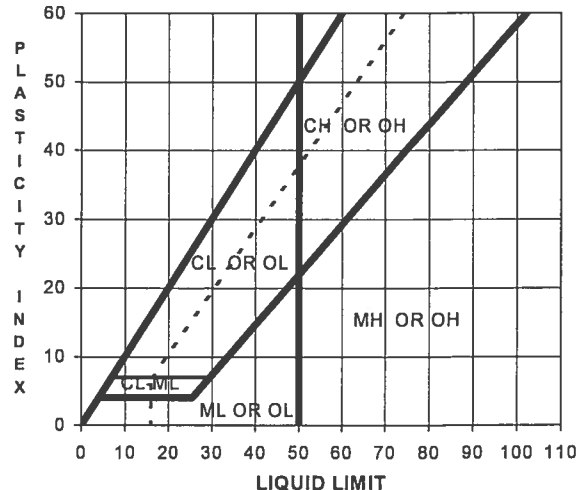
^M If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

^N PI ≥ 4 and plots on or above "A" line.

^O PI < 4 or plots below "A" line.

^P PI plots on or above "A" line.

^U PI plots below "A" line.





THOMPSON, DREESSEN & DORNER, INC.
 CONSULTING ENGINEERS & LAND SURVEYORS
GEOTECHNICAL ENGINEERING DIVISION

SUMMARY OF SOIL TEST RESULTS

PROJECT: Sioux Falls VA Medical Center Elevator Additions TD2 JOB NO: 1792-108
 CLIENT: Calvin L. Hinz Architecture DATE: 01/09/19

LOCATION: 2501 W 22nd Street
 Sioux Falls, South Dakota

BORING No.	SAMPLE NO.	SAMPLE DEPTH (ft.)	SAMPLE DIAM. (in.)	SAMPLE LENGTH (in.)	MOISTURE CONTENT (%)		DENSITY WET (pcf)	DENSITY DRY (pcf)	VOID RATIO (e)	SAT. (%)	UNCONFINED COMPRESSION (ksf)		SOIL CLASSIFICATION			REMARKS
					WET (%)	DRY (%)					qu	SI STRAIN (%)	ATTERBERG LIMITS		GROUP SYMBOL	
												LL	PL	PI		
B-1	U-1	1-2.5	2.86	5.89	19.2	112.2	94.1	0.776	66	0.98	2.3					
	U-2	3.5-5	2.82	5.48	18.1	100.3	85.0	0.968	50	0.51	1.6					
	U-3	7-8.5	2.84	5.67	22.4	104.7	85.5	0.955	63	0.89	1.7					
	U-4	8.5-10	2.85	5.35	23.2	107.2	87.0	0.923	67	0.55	2.1					
	U-5	13.5-15	2.84	5.83	27.2	119.0	93.5	0.789	93	0.75	1.5					
	U-6	18.5-20	2.83	5.84	31.0	122.2	93.3	0.793	100	0.53	2.1					
	U-7	23.5-25	2.79	5.92	20.3	133.9	111.2	0.503	100	1.17	12.2					
	U-8	28.5-30	2.86	5.92	19.7	133.1	111.2	0.504	100	3.26	6.3					
B-2	U-1	1-2.5	2.82	5.74	16.7	98.6	84.5	0.979	46	0.25	1.8					
	U-2	3.5-5	2.83	2.38	18.8	101.4	85.3	0.960	53	0.35	1.0					
	U-3	7-8.5	2.81	5.81	19.3	100.4	84.2	0.987	53	0.56	1.9					
	U-4	8.5-10	2.85	5.62	21.2	103.6	85.5	0.955	59	0.69	0.9					
	U-5	13.5-15	2.83	5.63	24.3	108.2	87.1	0.921	71	0.46	0.9					
	U-6	18.5-20	2.84	5.70	29.7	120.7	93.0	0.798	100	0.75	1.6					
	U-7	23.5-25	2.86	5.79	30.6	121.2	92.8	0.803	100	0.65	2.0					
	U-8	28.5-30	2.82	5.63	28.1	127.7	99.7	0.678	100							

SECTION 01 00 00
GENERAL REQUIREMENTS

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SECTION 01 00 00
GENERAL REQUIREMENTS

1.1 SAFETY REQUIREMENTS

Refer to section 01 35 26, SAFETY REQUIREMENTS for safety and infection control requirements.

1.2 GENERAL INTENTION

- A. Contractor shall completely prepare site for building operations, including demolition and removal of existing structures, and furnish labor and materials and perform work for VA Project #438-18-102, Renovate Tower of Building 1, VAMC Sioux Falls, South Dakota, as required by drawings and specifications.
- B. Visits to the site by Bidders may be made only by appointment with the Medical Center Engineering Officer.
- C. Offices of Calvin L. Hinz Architects (CLH Architects), as Architect-Engineers, will render certain technical services during construction. Such services shall be considered as advisory to the Government and shall not be construed as expressing or implying a contractual act of the Government without affirmations by Contracting Officer or his duly authorized representative.
- D. Before placement and installation of work subject to tests by testing laboratory retained by Department of Veterans Affairs, the Contractor shall notify the Contracting Officers Representative (COR) in sufficient time to enable testing laboratory personnel to be present at the site in time for proper taking and testing of specimens and field inspection. Such prior notice shall be not less than three work days unless otherwise designated by the COR .
- E. All employees of general contractor and subcontractors shall comply with VA security management program and obtain permission of the VA police, be identified by project and employer, and restricted from unauthorized access.

F. Any reference throughout this Project Manual / Specifications document to the VA "Resident Engineer", "Project Engineer", or "COR" shall be considered synonymous with the VA "Contracting Officers Representative" and used interchangeably.

G. History / Existing Conditions:

1. Building 1 on the VA Medical Center - Sioux Falls campus is a sprawling English Gothic building in "Danville cloister brick in various shades, laid up in Flemish bond and trimmed with Bedford Stone" (Source: <http://www.lostcolleges.com/columbus-college>). The building was originally built as the main building of Columbus College, a men's Catholic boarding college. The college closed in 1929 and the Army bought the college in 1943 for an emergency hospital. In 1949 Building 1 came into use as the Royal C. Johnson Veterans Memorial Hospital.
2. Building 1 is connected via a single-story corridor extending from the original main entrance to the main hospital building. Building 1 contains a variety of administrative departments, outpatient clinics, and an inpatient mental health unit located on the second floor. The building is predominately a three story with basement structure with one story and five story portions. The windows were replaced in some of the building in different phases and are slightly variable in shade of color.
3. The five-story tower portion of the Building 1 tower was renovated in 1974 and contains a mixture of original walls, walls constructed in the 1974 renovation, and some demountable wall systems. The areas on each floor are planned to be demolished back to the structure and rebuilt new.
4. There are two stair structures that serve the five-story tower portion of the Building 1 tower. The western stair only served the three lower floors originally. The stair was extended to serve all five floors in the 1974 project. The stairs are serviceable as existing but require some minor adjustments to meet code and are to be modified to facilitate the proposed new

elevator. There are no elevators that currently serve the five-story tower.

5. The original back entrance to the facility, facing northwest, was modified at some point to add an elevator onto the structure, serving the basement through third floors. This covered up the historic original entrance to the facility with a monolithic brick masonry shaft enclosure. Upon the demolition of this existing elevator shaftway, the architectural character of this historic original entrance will be restored and enhanced as indicated in the Constructing Drawings.

1.3 STATEMENT OF BID ITEM(S)

A. ITEM I, (Base Bid) VA Project #438-18-102, Renovate Tower of Building 1, VAMC Sioux Falls, South Dakota: Work includes all labor, material, equipment and supervision to perform general new construction, selective demolition, interior fit-up, structural, civil, mechanical, plumbing, and electrical work, and any other necessary work as described in the Construction Documents. All work, including final cleanup and completion of any punch list items, shall be performed within _____ (____) calendar days after date of receipt of Notice to Proceed.

1. The Project Scope includes, but is not limited to, the following:

ARCHITECTURAL / GENERAL:

- A. Construct (3) new elevators at two locations (two at current Main Elevator location, and one at five-story tower location) of the VA Sioux Falls Medical Center Building 1.
- B. Demolish and remove the existing Main Elevator Tower upon completion and full operation of new Main Elevator Tower construction.
- C. Completely renovate / repurpose the five-story tower portion of the VA Sioux Falls Medical Center Building 1.
- D. Replace the membrane roofing and flashing at the low-slope roof area, and repair the flashing as required at the slate

roof area, at the five-story tower portion of the VA Sioux Falls Medical Center Building 1.

- E. Repair / tuckpoint existing masonry mortar and replace flashing where required and/or as indicated on the Construction Drawings at the five-story tower portion of the VA Sioux Falls Medical Center Building 1.
 - a. The five-story tower portion of Building 1 has some problems with water infiltration. The infiltration is occurring along the perimeter of the building, where the water is appearing to infiltrate at the flashing and drip into the brick cavity. The water then exits the brick cavity into the building above the stone lintels above windows that provide a termination point of the brick cavity. Replacement of the flashing is included in this Work to correct this water infiltration issue.
- F. Asbestos abatement and lead paint removal as indicated in the Construction Drawings at the five-story tower portion of the VA Sioux Falls Medical Center Building 1.
- G. Window replacement where indicated in the Construction Drawings at the five-story tower portion of the VA Sioux Falls Medical Center Building 1; and new windows at the new elevator tower construction.

SITE/CIVIL:

- H. Demolish, excavate, relocate utilities, replace sidewalks and regrade all areas of new elevator construction as indicated in the Construction Drawings.

STRUCTURAL:

- I. New elevator towers are to be constructed of reinforced CMU masonry, with face brick to match existing, as indicated in the Construction Drawings. The foundations are shallow footings on drilled steel helical piles.

FIRE SUPPRESSION:

- J. The existing fire suppression system will be modified to accommodate the new elevators and the renovation area of the VA-Sioux Falls Building 1 Tower. New sprinkler heads will be installed throughout the area of work.

PLUMBING:

- K. The existing plumbing system in Building 1 Tower will be removed as needed for the area of renovation. New piping, plumbing fixtures and associated components will be added and connected into the existing plumbing piping systems. New plumbing will be installed for the new elevators per governing codes.

HVAC:

- L. The existing HVAC system serving VA-Sioux Falls Building 1 Tower will be removed as needed for the renovation. All equipment and associated controls and accessories will be removed. Piping will be removed back to the mains and capped. Various HVAC systems will be considered for the new room layouts of the space as well as consideration of the existing building constraints. Cooling and ventilation equipment will be installed for the new elevators/elevator equipment rooms per governing codes.

POWER:

- M. The electrical system serving the renovation areas will be upgraded to support the revised loads. The electrical distribution system will be upgraded as required to support the new elevators. The requirements for and availability of emergency power for the elevators has yet to be determined.

LIGHTING:

- N. Lighting for the renovation will be energy efficient LED luminaires. Emergency and exit lighting will be LED and connected to the emergency power system at the building.

FIRE ALARM:

- O. The existing fire alarm system will be modified and/or expanded as required for the renovation and to support elevator functions.

TELECOMMUNICATIONS:

- P. Telecommunications systems will consist of a Category 6 system with cables routed to the existing IT room. Each telecommunications outlet will consist of four (4) data jacks.

ACCESS CONTROL:

- Q. Access control where indicated is an extension of the existing access control system.

- B. **BIDDING ALTERNATES (DEDUCT)** include the following:

ALTERNATE NO.1 (Deduct): Delete all Window Coverings for Tower Renovation: WC-1 Solar Shades and WC-2 Lightproof Shades

ALTERNATE NO.2 (Deduct): Delete all exterior windows scheduled for replacement for the Tower Renovation.

1.4 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR

- A. Drawings and contract documents may be obtained from the website where the solicitation is posted. Additional copies will be at Contractor's expense.

1.5 CONSTRUCTION SECURITY REQUIREMENTS

- A. Security Plan:

1. The security plan defines both physical and administrative security procedures that will remain effective for the entire duration of the project.

2. The General Contractor is responsible for assuring that all sub-contractors working on the project and their employees also comply with these regulations.

B. Security Procedures:

1. General Contractor's employees shall not enter the project site without appropriate badge. They may also be subject to inspection of their personal effects when entering or leaving the project site.
2. Before starting work the General Contractor shall give one week's notice to the Contracting Officer so that security escort arrangements can be provided for the employees. This notice is separate from any notices required for utility shutdown described later in this section.
3. No photography of VA premises is allowed without written permission of the Contracting Officer.
4. VA reserves the right to close down or shut down the project site and order General Contractor's employees off the premises in the event of a national emergency. The General Contractor may return to the site only with the written approval of the Contracting Officer.

C. Not Used

D. Key Control:

1. The General Contractor shall provide duplicate keys and lock combinations to the Contracting officers representative (COR) for the purpose of security inspections of every area of project including tool boxes and parked machines and take any emergency action.
2. The General Contractor shall turn over all permanent lock cylinders to the VA locksmith for permanent installation. See Section 08 71 00, DOOR HARDWARE and coordinate.

E. Document Control:

1. Before starting any work, the General Contractor/Sub Contractors shall submit an electronic security memorandum describing the

approach to following goals and maintaining confidentiality of "sensitive information".

2. The General Contractor is responsible for safekeeping of all drawings, project manual and other project information. This information shall be shared only with those with a specific need to accomplish the project.
3. Certain documents, sketches, videos or photographs and drawings may be marked "Law Enforcement Sensitive" or "Sensitive Unclassified". Secure such information in separate containers and limit the access to only those who will need it for the project. Return the information to the Contracting Officer upon request.
4. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.
5. All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
6. Notify Contracting Officer and Site Security Officer immediately when there is a loss or compromise of "sensitive information".
7. All electronic information shall be stored in specified location following VA standards and procedures using an Engineering Document Management Software (EDMS).
 - a. Security, access and maintenance of all project drawings, both scanned and electronic shall be performed and tracked through the EDMS system.
 - b. "Sensitive information" including drawings and other documents may be attached to e-mail provided all VA encryption procedures are followed.

F. Motor Vehicle Restrictions

1. Vehicle authorization request shall be required for any vehicle entering the site and such request shall be submitted 24 hours

before the date and time of access. Access shall be restricted to picking up and dropping off materials and supplies.

2. A limited number of (2 to 5) permits shall be issued for General Contractor and its employees for parking in designated areas only.

1.6 OPERATIONS AND STORAGE AREAS

- A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer's Representative. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.
 - B. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.
 - C. The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.
- (FAR 52.236-10)**
- D. Working space and space available for storing materials shall be as determined by the COR .

- E. Workers are subject to rules of Medical Center applicable to their conduct.
- F. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others. Use of equipment and tools that transmit vibrations and noises through the building structure, are not permitted in buildings that are occupied, during construction, jointly by patients or medical personnel, and Contractor's personnel, except as permitted by COR where required by limited working space.
1. Do not store materials and equipment in other than assigned areas.
 2. Schedule delivery of materials and equipment to immediate construction working areas within buildings in use by Department of Veterans Affairs in quantities sufficient for not more than two work days. Provide unobstructed access to Medical Center areas required to remain in operation.
 3. Not Used.
- F. Utilities Services: Where necessary to cut existing pipes, electrical wires, conduits, cables, etc., of utility services, or of fire protection systems or communications systems (except telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by COR . All such actions shall be coordinated with the COR or Utility Company involved:
1. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction project, for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.

G. Phasing:

Refer to the Phasing Plan(s) in the Construction Drawings and as follows:

The Medical Center must maintain its operation 24 hours a day 7 days a week. Therefore, any interruption in service must be scheduled and coordinated with the COR to ensure that no lapses in operation occur. It is the CONTRACTOR'S responsibility to develop a work plan and schedule detailing, at a minimum, the procedures to be employed, the equipment and materials to be used, the interim life safety measure to be used during the work, and a schedule defining the duration of the work with milestone subtasks. The work to be outlined shall include, but not be limited to:

To ensure such executions, Contractor shall furnish the COR with a schedule of approximate dates on which the Contractor intends to accomplish work in each specific area of site, building or portion thereof. In addition, Contractor shall notify the COR two weeks in advance of the proposed date of starting work in each specific area of site, building or portion thereof. Arrange such dates to ensure accomplishment of this work in successive phases mutually agreeable to COR.

- H. Building No.1 will be occupied during performance of work; but immediate areas of alterations will be vacated.
 - 1. Contractor shall take all measures and provide all material necessary for protecting existing equipment and property in affected areas of construction against dust and debris, so that equipment and affected areas to be used in the Medical Centers operations will not be hindered. Contractor shall permit access to Department of Veterans Affairs personnel and patients through other construction areas which serve as routes of access to such affected areas and equipment. These routes whether access or egress shall be isolated from the construction area by temporary partitions and have walking surfaces, lighting etc to facilitate patient and staff access. Coordinate alteration work in areas occupied by Department of Veterans Affairs so that Medical Center operations will continue during the construction period.

2. Immediate areas of alterations not mentioned in preceding Subparagraph 1 will be temporarily vacated while alterations are performed.
- I. Construction Fence: Before construction operations begin, Contractor shall provide a chain link construction fence, 2.1m (seven feet) minimum height, around the construction area(s) indicated on the drawings. Provide gates as required for access with necessary hardware, including hasps and padlocks. Fasten fence fabric to terminal posts with tension bands and to line posts and top and bottom rails with tie wires spaced at maximum 375mm (15 inches). Bottom of fences shall extend to 25mm (one inch) above grade. Remove the fence when directed by COR .
 - J. When a building and/or construction site is turned over to Contractor, Contractor shall accept entire responsibility including upkeep and maintenance therefore:
 1. Contractor shall maintain a minimum temperature of 18.3 degrees C (65 degrees F) at all times, except as otherwise specified.
 2. Contractor shall maintain in operating condition existing fire protection and alarm equipment. In connection with fire alarm equipment, Contractor shall make arrangements for pre-inspection of site with Fire Department or Company (Department of Veterans Affairs or municipal) whichever will be required to respond to an alarm from Contractor's employee or watchman.
 - K. Utilities Services: Maintain existing utility services for Medical Center at all times. Provide temporary facilities, labor, materials, equipment, connections, and utilities to assure uninterrupted services. Where necessary to cut existing water, steam, gases, sewer or air pipes, or conduits, wires, cables, etc. of utility services or of fire protection systems and communications systems (including telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by COR .

1. No utility service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of Resident Engineer COR . Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished, work on any energized circuits or equipment shall not commence without a detailed work plan, the Medical Center Director's prior knowledge and written approval. Refer to specification Sections 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, 27 05 11 REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS and 28 05 00, COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY for additional requirements.
2. Contractor shall submit a request to interrupt any such services to COR , in writing, 7 days in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.
3. Contractor will be advised (in writing) of approval of request, or of which other date and/or time such interruption will cause least inconvenience to operations of Medical Center . Interruption time approved by Medical Center may occur at other than Contractor's normal working hours.
4. Major interruptions of any system must be requested, in writing, at least 15 calendar days prior to the desired time and shall be performed as directed by the COR .
5. In case of a contract construction emergency, service will be interrupted on approval of COR . Such approval will be confirmed in writing as soon as practical.
6. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction project, for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.

- L. Abandoned Lines: All service lines such as wires, cables, conduits, ducts, pipes and the like, and their hangers or supports, which are to be abandoned but are not required to be entirely removed, shall be sealed, capped or plugged at the main, branch or panel they originate from. The lines shall not be capped in finished areas, but shall be removed and sealed, capped or plugged in ceilings, within furred spaces, in unfinished areas, or within walls or partitions; so that they are completely behind the finished surfaces.
1. Coordinate all abandoned conduit locations with the COR where to be removed or remaining in place. Conduit remaining in place shall be labeled as "abandoned". All other abandoned conduit shall be removed in its entirety.
- M. To minimize interference of construction activities with flow of Medical Center traffic, comply with the following:
1. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction equipment and vehicles. Wherever excavation for new utility lines cross existing roads, at least one lane must be open to traffic at all times with approval.
 2. Method and scheduling of required cutting, altering and removal of existing roads, walks and entrances must be approved by the COR .
- N. Coordinate the work for this contract with other construction operations as directed by COR . This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.

1.7 ALTERATIONS

- A. Survey: Before any work is started, the Contractor shall make a thorough survey with the COR and a representative of VA Supply Service, of buildings in which alterations occur and areas which are anticipated routes of access, and furnish a report, signed by all

three, to the Contracting Officer. This report shall list by rooms and spaces:

1. Existing condition and types of resilient flooring, doors, windows, walls and other surfaces not required to be altered throughout affected areas of buildings.
 2. Existence and conditions of items such as plumbing fixtures and accessories, electrical fixtures, equipment, venetian blinds, shades, etc., required by drawings to be either reused or relocated, or both.
 3. Shall note any discrepancies between drawings and existing conditions at site.
 4. Shall designate areas for working space, materials storage and routes of access to areas within buildings where alterations occur and which have been agreed upon by Contractor and COR .
- B. Any items required by drawings to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of COR and/or Supply Representative , to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor with new items in accordance with specifications which will be furnished by Government. Provided the contract work is changed by reason of this subparagraph B, the contract will be modified accordingly, under provisions of clause entitled "DIFFERING SITE CONDITIONS" (FAR 52.236-2) and "CHANGES" (FAR 52.243-4 and VAAR 852.236-88).
- C. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and COR together shall make a thorough re-survey of the areas of buildings involved. They shall furnish a report on conditions then existing, of resilient flooring, doors, windows, walls and other surfaces as compared with conditions of same as noted in first condition survey report:
1. Re-survey report shall also list any damage caused by Contractor to such flooring and other surfaces, despite protection measures; and,

will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workers in executing work of this contract.

D. Protection: Provide the following protective measures:

1. Wherever existing roof surfaces are disturbed they shall be protected against water infiltration. In case of leaks, they shall be repaired immediately upon discovery.
2. Temporary protection against damage for portions of existing structures and grounds where work is to be done, materials handled and equipment moved and/or relocated.
3. Protection of interior of existing structures at all times, from damage, dust and weather inclemency. Wherever work is performed, floor surfaces that are to remain in place shall be adequately protected prior to starting work, and this protection shall be maintained intact until all work in the area is completed.

E. Any new installation of ductwork, piping, conduit, cabling or any other utility system shall be installed so as not to restrict access to existing infrastructural utility ductwork, piping, conduit, cabling or any other utility systems. Coordinate new installations of utility systems with COR prior to installation.

1. All new installations of utility systems such as piping, conduit, cabling shall be consistent with the color-coding of the existing infrastructural utility systems. See Mechanical / Electrical Specification Sections and coordinate with COR.

1.8 DISPOSAL AND RETENTION

A. Materials and equipment accruing from work removed and from demolition of buildings or structures, or parts thereof, shall be disposed of as follows:

1. Reserved items which are to remain property of the Government are identified by attached tags or noted on drawings or in specifications as items to be stored. Items that remain property of

the Government shall be removed or dislodged from present locations in such a manner as to prevent damage which would be detrimental to re-installation and reuse. Store such items where directed by COR .

2. Items not reserved shall become property of the Contractor and be removed by Contractor from Medical Center .
3. Items of portable equipment and furnishings located in rooms and spaces in which work is to be done under this contract shall remain the property of the Government. When rooms and spaces are vacated by the Department of Veterans Affairs during the alteration period, such items which are NOT required by drawings and specifications to be either relocated or reused will be removed by the Government in advance of work to avoid interfering with Contractor's operation.
4. PCB Transformers and Capacitors : The Contractor shall be responsible for disposal of the Polychlorinated Biphenyl (PCB) transformers and capacitors . The transformers and capacitors shall be taken out of service and handled in accordance with the procedures of the Environmental Protection Agency (EPA) and the Department of Transportation (DOT) as outlined in Code of Federal Regulation (CFR), Titled 40 and 49 respectively. The EPA's Toxic Substance Control Act (TSCA) Compliance Program Policy Nos. 6-PCB-6 and 6-PCB-7 also apply. Upon removal of PCB transformers and capacitors for disposal, the "originator" copy of the Uniform Hazardous Waste Manifest (EPA Form 8700-22), along with the Uniform Hazardous Waste Manifest Continuation Sheet (EPA Form 8700-22A) shall be returned to the Contracting Officer who will annotate the contract file and transmit the Manifest to the Medical Center's Chief.
 - a. Copies of the following listed CFR titles may be obtained from the Government Printing Office:

40 CFR 261Identification and Listing of Hazardous Waste

- 40 CFR 262Standards Applicable to Generators of Hazardous Waste
- 40 CFR 263Standards Applicable to Transporters of Hazardous Waste
- 40 CFR 761PCB Manufacturing, Processing, Distribution in Commerce, and use Prohibitions
- 49 CFR 172Hazardous Material tables and Hazardous Material Communications Regulations
- 49 CFR 173Shippers - General Requirements for Shipments and Packaging
- 49 CFR 173Subpart A General
- 49 CFR 173Subpart B Preparation of Hazardous Material for Transportation
- 49 CFR 173Subpart J Other Regulated Material; Definitions and Preparation
- TSCACompliance Program Policy Nos. 6-PCB-6 and 6-PCB-7

1.9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS

- A. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workers, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.
- B. The Contractor shall protect from damage all existing improvements and utilities at or near the work site and on adjacent property of a third

party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

(FAR 52.236-9)

- C. Refer to Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS, for additional requirements on protecting vegetation, soils and the environment. Refer to Articles, "Alterations", "Restoration", and "Operations and Storage Areas" for additional instructions concerning repair of damage to structures and site improvements.
- D. Not Used.

1.10 RESTORATION

- A. Remove, cut, alter, replace, patch and repair existing work as necessary to install new work. Except as otherwise shown or specified, do not cut, alter or remove any structural work, and do not disturb any ducts, plumbing, steam, gas, or electric work without approval of the COR . Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the COR before it is disturbed. Materials and workmanship used in restoring work, shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.
- B. Upon completion of contract, deliver work complete and undamaged. Existing work (walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, walks, etc.) disturbed or removed as a result of performing required new work, shall be patched, repaired, reinstalled, or replaced with new work, and refinished and left in as good condition as existed before commencing work.

- C. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workers to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone) which are not scheduled for discontinuance or abandonment.
- D. Expense of repairs to such utilities and systems not shown on drawings or locations of which are unknown will be covered by adjustment to contract time and price in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88) and "DIFFERING SITE CONDITIONS" (FAR 52.236-2).

1.11 PHYSICAL DATA

- A. Data and information furnished or referred to below is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

- 1. The indications of physical conditions on the drawings and in the specifications are the result of site investigations by TD2 Engineering & Surveying, 10836 Old Mill Road, Omaha, NE 68154.

(FAR 52.236-4)

- B. Subsurface conditions have been developed by core borings and test pits. Logs of subsurface exploration are shown diagrammatically on drawings.
- C. A copy of the soil report will be made available for inspection by bidders upon request to the Engineering Officer at the VA Medical Center, Sioux Falls, South Dakota and shall be considered part of the contract documents.
- D. Government does not guarantee that other materials will not be encountered nor that proportions, conditions or character of several materials will not vary from those indicated by explorations. Bidders are expected to examine site of work and logs of borings; and, after investigation, decide for themselves character of materials and make

their bids accordingly. Upon proper application to Department of Veterans Affairs, bidders will be permitted to make subsurface explorations of their own at site.

1.12 PROFESSIONAL SURVEYING SERVICES

A registered professional land surveyor or registered civil engineer whose services are retained and paid for by the Contractor shall perform services specified herein and in other specification sections. The Contractor shall certify that the land surveyor or civil engineer is not one who is a regular employee of the Contractor, and that the land surveyor or civil engineer has no financial interest in this contract.

1.13 LAYOUT OF WORK

- A. The Contractor shall lay out the work from Government established base lines and bench marks, indicated on the drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at Contractor's own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer until authorized to remove them. If such marks are destroyed by the Contractor or through Contractor's negligence before their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.

(FAR 52.236-17)

- B. Establish and plainly mark center lines for each building and corner of column lines and/or addition to each existing building, and such other lines and grades that are reasonably necessary to properly assure that location, orientation, and elevations established for each such structure and/or addition, are in accordance with lines and elevations shown on contract drawings.

- C. Following completion of general mass excavation and before any other permanent work is performed, establish and plainly mark (through use of appropriate batter boards or other means) sufficient additional survey control points or system of points as may be necessary to assure proper alignment, orientation, and grade of all major features of work. Survey shall include, but not be limited to, location of lines and grades of footings, exterior walls, center lines of columns in both directions, major utilities and elevations of floor slabs:
1. Such additional survey control points or system of points thus established shall be checked and certified by a registered land surveyor or registered civil engineer. Furnish such certification to the COR before any work (such as footings, floor slabs, columns, walls, utilities and other major controlling features) is placed.
- D. During progress of work, and particularly as work progresses from floor to floor, Contractor shall have line grades and plumbness of all major form work checked and certified by a registered land surveyor or registered civil engineer as meeting requirements of contract drawings. Furnish such certification to the COR before any major items of concrete work are placed. In addition, Contractor shall also furnish to the COR certificates from a registered land surveyor or registered civil engineer that the following work is complete in every respect as required by contract drawings.
1. Lines of each building and/or addition.
 2. Elevations of bottoms of footings and tops of floors of each building and/or addition.
 3. Lines and elevations of sewers and of all outside distribution systems.
 5. Lines of elevations of all swales and interment areas.
- E. Whenever changes from contract drawings are made in line or grading requiring certificates, record such changes on a reproducible drawing bearing the registered land surveyor or registered civil engineer seal, and forward these drawings upon completion of work to COR .

E*. Upon completion of the work, the Contractor shall furnish the COR one electronic copy and reproducible drawings at the scale of the contract drawings, showing the finished grade on the grid developed for constructing the work. These drawings shall bear the seal of the registered land surveyor or registered civil engineer.

F. The Contractor shall perform the surveying and layout work of this and other articles and specifications in accordance with the provisions of Article "Professional Surveying Services".

1.14 AS-BUILT DRAWINGS

A. The contractor shall maintain two full size sets of as-built drawings which will be kept current during construction of the project, to include all contract changes, modifications and clarifications.

B. All variations shall be shown in the same general detail as used in the contract drawings. To ensure compliance, as-built drawings shall be made available for the COR review, as often as requested.

C. Contractor shall deliver two approved completed sets of as-built drawings in the electronic version (scanned PDF) to the COR within 15 calendar days after each completed phase and after the acceptance of the project by the COR.

D. Paragraphs A, B, & C shall also apply to all shop drawings.

1.15 WARRANTY MANAGEMENT

A. Warranty Management Plan: Develop a warranty management plan which contains information relevant to FAR 52.246-21 Warranty of Construction in at least 30 days before the planned pre-warranty conference, submit four sets of the warranty management plan. Include within the warranty management plan all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan must be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesman, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below must include due date and whether item has been submitted or was approved.

Warranty information made available during the construction phase must be submitted to the Contracting Officer for approval prior to each monthly invoice for payment. Assemble approved information in a binder and turn over to the Government upon acceptance of the work. The construction warranty period will begin on the date of the project acceptance and continue for the product warranty period. A joint 4 month and 9 month warranty inspection will be conducted, measured from time of acceptance, by the Contactor and the Contracting Officer. Include in the warranty management plan, but not limited to, the following:

1. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the company of the Contractor, subcontractors, manufacturers or suppliers involved.
2. Furnish with each warranty the name, address and telephone number of each of the guarantor's representatives nearest project location.
3. Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers and for all commissioned systems such as fire protection and alarm systems, sprinkler systems and lightning protection systems, etc.
4. A list for each warranted equipment item, feature of construction or system indicating:
 - a. Name of item.
 - b. Model and serial numbers.
 - c. Location where installed.
 - d. Name and phone numbers of manufacturers and suppliers.
 - e. Name and phone numbers of manufacturers or suppliers.
 - f. Names, addresses and phone numbers of sources of spare parts.

- g. Warranties and terms of warranty. Include one-year overall warranty of construction, including the starting date of warranty of construction. Items which have extended warranties must be indicated with separate warranty expiration dates.
 - h. Starting point and duration of warranty period.
 - i. Summary of maintenance procedures required to continue the warranty in force.
 - j. Cross-reference to specific pertinent Operation and Maintenance manuals.
 - k. Organizations, names and phone numbers of persons to call for warranty service.
 - l. Typical response time and repair time expected for various warranted equipment.
5. The plans for attendance at the 4 and 9-month post construction warranty inspections conducted by the government.
6. Procedure and status of tagging of all equipment covered by extended warranties.
7. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- B. Performance Bond: The Performance Bond must remain effective throughout the construction period
- 1. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Contracting Officer will have the work performed by others, and after completion of the work, will charge the remaining construction warranty funds of expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.
 - 2. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the

contractor's expenses, the Contracting Officer will have the right to recoup expenses from the bonding company.

3. Following oral or written notification of required construction warranty repair work, the Contractor shall respond in a timely manner. Written verification will follow oral instructions. Failure to respond will be cause for the Contracting Officer to proceed against the Contractor.

C. Pre-Warranty Conference: Prior to contract completion, and at a time designated by the Contracting Officer's Representative, the Contractor shall meet with the Contracting Officer's Representative to develop a mutual understanding with respect to the requirements of this section. Communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty will be established/ reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warranted construction, be continuously available and be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in conjunction with other portions of this provision.

D. Contractor's Response to Construction Warranty Service Requirements:

Following oral or written notification by the Contracting Officer, the Contractor shall respond to construction warranty service requirements in accordance with the "Construction Warranty Service Priority List" and the three categories of priorities listed below. Submit a report on any warranty item that has been repaired during the warranty period. Include within the report the cause of the problem, date reported, corrective action taken, and when the repair was completed. If the

Contractor does not perform the construction warranty within the timeframe specified, the Government will perform the work and back charge the construction warranty payment item established.

1. First Priority Code 1. Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.
 2. Second Priority Code 2. Perform onsite inspection to evaluate situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.
 3. Third Priority Code 3. All other work to be initiated within 3 work days and work continuously to completion or relief.
 4. Not Used
- E. Warranty Tags: At the time of installation, tag each warranted item with a durable, oil and water-resistant tag approved by the Contracting Officer. Attach each tag with a copper wire and spray with a silicone waterproof coating. Also submit two record copies of the warranty tags showing the layout and design. The date of acceptance and the QC signature must remain blank until the project is accepted for beneficial occupancy. Show the following information on the tag.

Type of product/material	
Model number	
Serial number	
Contract number	
Warranty period from/to	
Inspector's signature	
Construction Contractor	
Address	
Telephone number	
Warranty contact	
Address	
Telephone number	
Warranty response time priority code	

1.16 USE OF ROADWAYS

- A. For hauling, use only established public roads and roads on Medical Center property and, when authorized by the COR , such temporary roads which are necessary in the performance of contract work.
 Temporary roads shall be constructed and restoration performed by the Contractor at Contractor's expense. When necessary to cross curbing, sidewalks, or similar construction, they must be protected by well-constructed bridges.

- B. When new permanent roads are to be a part of this contract, Contractor may construct them immediately for use to facilitate building operations. These roads may be used by all who have business thereon within zone of building operations.

- C. When certain buildings (or parts of certain buildings) are required to be completed in advance of general date of completion, all roads

leading thereto must be completed and available for use at time set for completion of such buildings or parts thereof.

1.17 NOT USED

1.18 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Use of new installed mechanical and electrical equipment to provide heat, ventilation, plumbing, light and power will be permitted subject to written approval and compliance with the following provisions:
1. Permission to use each unit or system must be given by COR in writing. If the equipment is not installed and maintained in accordance with the written agreement and following provisions, the COR will withdraw permission for use of the equipment.
 2. Electrical installations used by the equipment shall be completed in accordance with the drawings and specifications to prevent damage to the equipment and the electrical systems, i.e. transformers, relays, circuit breakers, fuses, conductors, motor controllers and their overload elements shall be properly sized, coordinated and adjusted. Installation of temporary electrical equipment or devices shall be in accordance with NFPA 70, National Electrical Code, (2014 Edition), Article 590, *Temporary Installations*. Voltage supplied to each item of equipment shall be verified to be correct and it shall be determined that motors are not overloaded. The electrical equipment shall be thoroughly cleaned before using it and again immediately before final inspection including vacuum cleaning and wiping clean interior and exterior surfaces.
 3. Units shall be properly lubricated, balanced, and aligned. Vibrations must be eliminated.
 4. Automatic temperature control systems for preheat coils shall function properly and all safety controls shall function to prevent coil freeze-up damage.
 5. The air filtering system utilized shall be that which is designed for the system when complete, and all filter elements shall be

replaced at completion of construction and prior to testing and balancing of system.

6. All components of heat production and distribution system, metering equipment, condensate returns, and other auxiliary facilities used in temporary service shall be cleaned prior to use; maintained to prevent corrosion internally and externally during use; and cleaned, maintained and inspected prior to acceptance by the Government. Boilers, pumps, feedwater heaters and auxiliary equipment must be operated as a complete system and be fully maintained by operating personnel. Boiler water must be given complete and continuous chemical treatment.

- B. Prior to final inspection, the equipment or parts used which show wear and tear beyond normal, shall be replaced with identical replacements, at no additional cost to the Government.
- C. This paragraph shall not reduce the requirements of the mechanical and electrical specifications sections.
- D. Any damage to the equipment or excessive wear due to prolonged use will be repaired replaced by the contractor at the contractor's expense.

1.19 TEMPORARY USE OF EXISTING ELEVATORS

- A. Contractor will not be allowed the use of existing elevators. Outside type hoist shall be used by Contractor for transporting materials and equipment.

1.20 TEMPORARY USE OF NEW ELEVATORS

- A. The Contractor and his personnel shall be permitted use of new elevator(s) subject to the following provisions:
 - 1. Contractor shall make arrangements with the COR for use of elevator(s). Contractor may obtain elevator(s) for exclusive use.
 - 2. Prior to the use of elevator(s), the Contractor shall have the elevator(s) inspected and accepted by an ASME accredited, certified elevator safety inspector. The acceptance report shall be submitted to the COR .

3. Submit to the COR the schedule and procedures for maintaining equipment. Indicate the day or days of the week and total hours required for maintenance. A report shall be submitted to the COR monthly indicating the type of maintenance conducted, hours used, and any repairs made to the elevator(s).
4. The Contractor shall be responsible for enforcing the maintenance procedures as per VA and manufacturers recommendations and requirements.
5. During temporary use of elevator(s) all repairs, equipment replacement and cost of maintenance shall be the responsibility of the Contractor.
6. Personnel for operating elevator(s) shall not be provided by the Department of Veterans Affairs.
7. Contractor shall cover and provide maximum protection of the entire elevator(s) installation.
8. The Contractor shall arrange for the elevator company to perform operation of the elevator(s) so that an ASME accredited, certified elevator safety inspector can evaluate the equipment. The Contractor shall be responsible for any costs of the elevator company.
9. All elevator(s) parts worn or damaged during temporary use shall be removed and replaced with new parts at the contractors expense. This shall be determined by an ASME accredited certified elevator safety inspector after temporary use and before acceptance by the Government. Submit report to the COR for approval.
10. Elevator shall be tested as required by the testing section of the elevator(s) specifications before acceptance by the Department of Veterans Affairs. The Contractor shall be responsible for all cost associated with testing and inspection.

1.21 TEMPORARY TOILETS

- A. Provide where directed, (for use of all Contractor's workers) ample temporary sanitary toilet accommodations with suitable sewer and water

connections; or, when approved by COR , provide suitable dry closets where directed. Keep such places clean and free from flies, and all connections and appliances connected therewith are to be removed prior to completion of contract, and premises left perfectly clean.

1.22 AVAILABILITY AND USE OF UTILITY SERVICES

- A. The Government shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. The amount to be paid by the Contractor for chargeable electrical services shall be the prevailing rates charged to the Government. The Contractor shall carefully conserve any utilities furnished without charge.
- B. The Contractor, at Contractor's expense and in a workmanlike manner, in compliance with code and as satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of electricity used for the purpose of determining charges. Before final acceptance of the work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia and repair restore the infrastructure as required.
- C. Contractor shall install meters at Contractor's expense and furnish the Medical Center a monthly record of the Contractor's usage of electricity as hereinafter specified.
- D. Heat: Furnish temporary heat necessary to prevent injury to work and materials through dampness and cold. Use of open salamanders or any temporary heating devices which may be fire hazards or may smoke and damage finished work, will not be permitted. Maintain minimum temperatures as specified for various materials:
 - 1. Obtain heat by connecting to Medical Center heating distribution system.
 - a. Steam is available at no cost to Contractor.

E. Electricity (for Construction and Testing): Furnish all temporary electric services.

1. Obtain electricity by connecting to the Medical Center electrical distribution system. The Contractor shall meter and pay for electricity required for electric cranes and hoisting devices, electrical welding devices and any electrical heating devices providing temporary heat. Electricity for all other uses is available at no cost to the Contractor.

F. Water (for Construction and Testing): Furnish temporary water service.

1. Obtain water by connecting to the Medical Center water distribution system. Provide reduced pressure backflow preventer at each connection as per code. Water is available at no cost to the Contractor.
2. Maintain connections, pipe, fittings and fixtures and conserve water-use so none is wasted. Failure to stop leakage or other wastes will be cause for revocation (at COR discretion) of use of water from Medical Center's system.

G. Fuel: Natural and LP gas and burner fuel oil required for boiler cleaning, normal initial boiler-burner setup and adjusting, and for performing the specified boiler tests will be furnished by the Government. Fuel required for prolonged boiler-burner setup, adjustments, or modifications due to improper design or operation of boiler, burner, or control devices shall be furnished and paid by the Contractor at Contractor's expense.

1.23 NEW TELEPHONE EQUIPMENT

The contractor shall coordinate with the work of installation of telephone equipment by others. This work shall be completed before the building is turned over to VA.

1.24 TESTS

- A. As per specification section 23 05 93 the contractor shall provide a written testing and commissioning plan complete with component level, equipment level, sub-system level and system level breakdowns. The plan will provide a schedule and a written sequence of what will be tested, how and what the expected outcome will be. This document will be submitted for approval prior to commencing work. The contractor shall document the results of the approved plan and submit for approval with the as built documentation.
- B. Pre-test mechanical and electrical equipment and systems and make corrections required for proper operation of such systems before requesting final tests. Final test will not be conducted unless pre-tested.
- C. Conduct final tests required in various sections of specifications in presence of an authorized representative of the Contracting Officer. Contractor shall furnish all labor, materials, equipment, instruments, and forms, to conduct and record such tests.
- D. Mechanical and electrical systems shall be balanced, controlled and coordinated. A system is defined as the entire system which must be coordinated to work together during normal operation to produce results for which the system is designed. For example, air conditioning supply air is only one part of entire system which provides comfort conditions for a building. Other related components are return air, exhaust air, steam, chilled water, refrigerant, hot water, controls and electricity, etc. Another example of a system which involves several components of different disciplines is a boiler installation. Efficient and acceptable boiler operation depends upon the coordination and proper operation of fuel, combustion air, controls, steam, feedwater, condensate and other related components.
- E. All related components as defined above shall be functioning when any system component is tested. Tests shall be completed within a reasonable period of time during which operating and environmental

conditions remain reasonably constant and are typical of the design conditions.

- F. Individual test result of any component, where required, will only be accepted when submitted with the test results of related components and of the entire system.

1.25 INSTRUCTIONS

- A. Contractor shall furnish Maintenance and Operating manuals (hard copies and electronic) and verbal instructions when required by the various sections of the specifications and as hereinafter specified.
- B. Manuals: Maintenance and operating manuals and one compact disc (four hard copies and one electronic copy each) for each separate piece of equipment shall be delivered to the COR coincidental with the delivery of the equipment to the job site. Manuals shall be complete, detailed guides for the maintenance and operation of equipment. They shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and sub-assembly components. Manuals shall include an index covering all component parts clearly cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" views showing and identifying each separate item. Emphasis shall be placed on the use of special tools and instruments. The function of each piece of equipment, component, accessory and control shall be clearly and thoroughly explained. All necessary precautions for the operation of the equipment and the reason for each precaution shall be clearly set forth. Manuals must reference the exact model, style and size of the piece of equipment and system being furnished. Manuals referencing equipment similar to but of a different model, style, and size than that furnished will not be accepted.
- C. Instructions: Contractor shall provide qualified, factory-trained manufacturers' representatives to give detailed training to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be at

the job site. These requirements are more specifically detailed in the various technical sections. Instructions for different items of equipment that are component parts of a complete system, shall be given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All instruction periods shall be at such times as scheduled by the COR and shall be considered concluded only when the COR is satisfied in regard to complete and thorough coverage. The contractor shall submit a course outline with associated material to the COR for review and approval prior to scheduling training to ensure the subject matter covers the expectations of the VA and the contractual requirements. The Department of Veterans Affairs reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the COR , does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

1.26 GOVERNMENT-FURNISHED PROPERTY

- A. The Government shall deliver to the Contractor, the Government-furnished property shown on the Schedule and/or drawings .
- B. Equipment furnished by Government to be installed by Contractor will be furnished to Contractor at the Medical Center .
- C. Storage space for equipment will be provided by the Government and the Contractor shall be prepared to unload and store such equipment therein upon its receipt at the Medical Center.
- D. Notify Contracting Officer in writing, 60 days in advance, of date on which Contractor will be prepared to receive equipment furnished by Government. Arrangements will then be made by the Government for delivery of equipment.
 - 1. Immediately upon delivery of equipment, Contractor shall arrange for a joint inspection thereof with a representative of the Government. At such time the Contractor shall acknowledge receipt of equipment described, make notations, and immediately furnish the Government

representative with a written statement as to its condition or shortages.

2. Contractor thereafter is responsible for such equipment until such time as acceptance of contract work is made by the Government.

E. Equipment furnished by the Government will be delivered in a partially assembled (knock down) condition in accordance with existing standard commercial practices, complete with all fittings, fastenings, and appliances necessary for connections to respective services installed under contract. All fittings and appliances (i.e., couplings, ells, tees, nipples, piping, conduits, cables, and the like) necessary to make the connection between the Government furnished equipment item and the utility stub-up shall be furnished and installed by the contractor at no additional cost to the Government.

F. Completely assemble and install the Government furnished equipment in place ready for proper operation in accordance with specifications and drawings.

G. Furnish supervision of installation of equipment at construction site by qualified factory trained technicians regularly employed by the equipment manufacturer.

1.27 NOT USED

1.28 NOT USED

1.29 CONSTRUCTION SIGN

A. Provide a Construction Sign where directed by the COR . All wood members shall be of framing lumber. Cover sign frame with 0.7 mm (24 gage) galvanized sheet steel nailed securely around edges and on all bearings. Provide three 100 by 100 mm (4 inch by 4 inch) posts (or equivalent round posts) set 1200 mm (four feet) into ground. Set bottom of sign level at 900 mm (three feet) above ground and secure to posts with through bolts. Make posts full height of sign. Brace posts with 50 x 100 mm (two by four inch) material as directed.

- B. Paint all surfaces of sign and posts two coats of white gloss paint. Border and letters shall be of black gloss paint, except project title which shall be blue gloss paint.
- C. Maintain sign and remove it when directed by the COR.
- D. Detail Drawing of construction sign showing required legend and other characteristics of sign is shown on the drawings.

1.30 SAFETY SIGN

- A. Provide a Safety Sign where directed by COR . Face of sign shall be 19 mm (3/4 inch) thick exterior grade plywood. Provide two 100 mm by 100 mm (four by four inch) posts extending full height of sign and 900 mm (three feet) into ground. Set bottom of sign level at 1200 mm (four feet) above ground.
- B. Paint all surfaces of Safety Sign and posts with one prime coat and two coats of white gloss paint. Letters and design shall be painted with gloss paint of colors noted.
- C. Maintain sign and remove it when directed by COR .
- D. Standard Detail Drawing Number SD10000-02 (Found on VA TIL) of safety sign showing required legend and other characteristics of sign is made a part of this specification.
- E. Post the number of accident free days on a daily basis.

Estimated Cost		No. of Photographs
Up to	\$250,000	50 to 100
" "	\$500,000	100 to 150
" "	\$1,000,000	150 to 200
" "	\$2,000,000	200 to 250
" "	\$5,000,000	250 to 300
" "	\$10,000,000	300 to 400

More than	\$10,000,000	400 to 500
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1.31 NOT USED

1.32 FINAL ELEVATION DIGITAL IMAGES

- A. A minimum of four (4) images of each elevation shall be taken with a minimum 6 MP camera, by a professional photographer with different settings to allow the COR to select the image to be printed. All images are provided to the RE on a CD.
- B. Photographs shall be taken upon completion, including landscaping. They shall be taken on a clear sunny day to obtain sufficient detail to show depth and to provide clear, sharp pictures. Pictures shall be 400 mm x 500 mm (16 by 20 inches), printed on regular weight paper, matte finish archival grade photographic paper and produced by a RA4 process from the digital image with a minimum 300 PPI. Identifying data shall be carried on label affixed to back of photograph without damage to photograph and shall be similar to that provided for final construction photographs.
- C. Furnish six (6) 400 mm x 500 mm (16 by 20 inch) color prints of the following buildings constructed under this project (elevations as selected by the RE from the images taken above). Photographs shall be artistically composed showing full front elevations. All images shall become property of the Government. Each of the selected six prints shall be place in a frame with a minimum of 2 inches of appropriate matting as a border. Provide a selection of a minimum of 3 different frames from which the SRE will select one style to frame all six prints. Photographs with frames shall be delivered to the COR in boxes suitable for shipping.

1. Hospital Building No. ____.

1.33 HISTORIC PRESERVATION

Where the Contractor or any of the Contractor's employees, prior to, or during the construction work, are advised of or discover any possible archeological, historical and/or cultural resources, the Contractor

shall immediately notify the COR verbally, and then with a written follow up.

1.34 NOT USED

- - - E N D - - -

SECTION 01 32 16.15
PROJECT SCHEDULES
(SMALL PROJECTS - DESIGN/BID/BUILD)

PART 1- GENERAL

1.1 DESCRIPTION:

- A. The Contractor shall develop a Critical Path Method (CPM) plan and schedule demonstrating fulfillment of the contract requirements (Project Schedule), and shall keep the Project Schedule up-to-date in accordance with the requirements of this section and shall utilize the plan for scheduling, coordinating and monitoring work under this contract (including all activities of subcontractors, equipment vendors and suppliers). Conventional Critical Path Method (CPM) technique shall be utilized to satisfy both time and cost applications.

1.2 CONTRACTOR'S REPRESENTATIVE:

- A. The Contractor shall designate an authorized representative responsible for the Project Schedule including preparation, review and progress reporting with and to the Contracting Officer's Representative (COTR).
- B. The Contractor's representative shall have direct project control and complete authority to act on behalf of the Contractor in fulfilling the requirements of this specification section.
- C. The Contractor's representative shall have the option of developing the project schedule within their organization or to engage the services of an outside consultant. If an outside scheduling consultant is utilized, Section 1.3 of this specification will apply.

1.3 CONTRACTOR'S CONSULTANT:

- A. The Contractor shall submit a qualification proposal to the COTR, within 10 days of bid acceptance. The qualification proposal shall include:
1. The name and address of the proposed consultant.
 2. Information to show that the proposed consultant has the qualifications to meet the requirements specified in the preceding paragraph.
 3. A representative sample of prior construction projects, which the proposed consultant has performed complete project scheduling

services. These representative samples shall be of similar size and scope.

- B. The Contracting Officer has the right to approve or disapprove the proposed consultant, and will notify the Contractor of the VA decision within seven calendar days from receipt of the qualification proposal. In case of disapproval, the Contractor shall resubmit another consultant within 10 calendar days for renewed consideration. The Contractor shall have their scheduling consultant approved prior to submitting any schedule for approval.

1.4 COMPUTER PRODUCED SCHEDULES

- A. The contractor shall provide monthly, to the Department of Veterans Affairs (VA), all computer-produced time/cost schedules and reports generated from monthly project updates. This monthly computer service will include: three copies of up to five different reports (inclusive of all pages) available within the user defined reports of the scheduling software approved by the Contracting Officer; a hard copy listing of all project schedule changes, and associated data, made at the update and an electronic file of this data; and the resulting monthly updated schedule in PDM format. These must be submitted with and substantively support the contractor's monthly payment request and the signed look ahead report. The COTR shall identify the five different report formats that the contractor shall provide.
- B. The contractor shall be responsible for the correctness and timeliness of the computer-produced reports. The Contractor shall also responsible for the accurate and timely submittal of the updated project schedule and all CPM data necessary to produce the computer reports and payment request that is specified.
- C. The VA will report errors in computer-produced reports to the Contractor's representative within ten calendar days from receipt of reports. The Contractor shall reprocess the computer-produced reports and associated diskette(s), when requested by the Contracting Officer's representative, to correct errors which affect the payment and schedule for the project.

1.5 THE COMPLETE PROJECT SCHEDULE SUBMITTAL

A. Within 45 calendar days after receipt of Notice to Proceed, the Contractor shall submit for the Contracting Officer's review; three blue line copies of the interim schedule on sheets of paper 765 x 1070 mm (30 x 42 inches) and an electronic file in the previously approved CPM schedule program. The submittal shall also include three copies of a computer-produced activity/event ID schedule showing project duration; phase completion dates; and other data, including event cost. Each activity/event on the computer-produced schedule shall contain as a minimum, but not limited to, activity/event ID, activity/event description, duration, budget amount, early start date, early finish date, late start date, late finish date and total float. Work activity/event relationships shall be restricted to finish-to-start or start-to-start without lead or lag constraints. Activity/event date constraints, not required by the contract, will not be accepted unless submitted to and approved by the Contracting Officer. The contractor shall make a separate written detailed request to the Contracting Officer identifying these date constraints and secure the Contracting Officer's written approval before incorporating them into the network diagram. The Contracting Officer's separate approval of the Project Schedule shall not excuse the contractor of this requirement. Logic events (non-work) will be permitted where necessary to reflect proper logic among work events, but must have zero duration. The complete working schedule shall reflect the Contractor's approach to scheduling the complete project. **The final Project Schedule in its original form shall contain no contract changes or delays which may have been incurred during the final network diagram development period and shall reflect the entire contract duration as defined in the bid documents.** These changes/delays shall be entered at the first update after the final Project Schedule has been approved. The Contractor should provide their requests for time and supporting time extension analysis for contract time as a result of contract changes/delays, after this update, and in accordance with Article, ADJUSTMENT OF CONTRACT COMPLETION.

- D. Within 30 calendar days after receipt of the complete project interim Project Schedule and the complete final Project Schedule, the Contracting Officer or his representative, will do one or both of the following:
1. Notify the Contractor concerning his actions, opinions, and objections.
 2. A meeting with the Contractor at or near the job site for joint review, correction or adjustment of the proposed plan will be scheduled if required. Within 14 calendar days after the joint review, the Contractor shall revise and shall submit three blue line copies of the revised Project Schedule, three copies of the revised computer-produced activity/event ID schedule and a revised electronic file as specified by the Contracting Officer. The revised submission will be reviewed by the Contracting Officer and, if found to be as previously agreed upon, will be approved.
- E. The approved baseline schedule and the computer-produced schedule(s) generated there from shall constitute the approved baseline schedule until subsequently revised in accordance with the requirements of this section.
- F. Not Used.

1.6 WORK ACTIVITY/EVENT COST DATA

- A. The Contractor shall cost load all work activities/events except procurement activities. The cumulative amount of all cost loaded work activities/events (including alternates) shall equal the total contract price. Prorate overhead, profit and general conditions on all work activities/events for the entire project length. The contractor shall generate from this information cash flow curves indicating graphically the total percentage of work activity/event dollar value scheduled to be in place on early finish, late finish. These cash flow curves will be used by the Contracting Officer to assist him in determining approval or disapproval of the cost loading. Negative work activity/event cost data will not be acceptable, except on VA issued contract changes.
- B. The Contractor shall cost load work activities/events for guarantee period services, test, balance and adjust various systems in accordance

with the provisions in Article, FAR 52.232 - 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.236 - 83 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS).

- C. In accordance with FAR 52.236 - 1 (PERFORMANCE OF WORK BY THE CONTRACTOR) and VAAR 852.236 - 72 (PERFORMANCE OF WORK BY THE CONTRACTOR), the Contractor shall submit, simultaneously with the cost per work activity/event of the construction schedule required by this Section, a responsibility code for all activities/events of the project for which the Contractor's forces will perform the work.
- D. The Contractor shall cost load work activities/events for all BID ITEMS including ASBESTOS ABATEMENT. The sum of each BID ITEM work shall equal the value of the bid item in the Contractors' bid.

1.7 PROJECT SCHEDULE REQUIREMENTS

- A. Show on the project schedule the sequence of work activities/events required for complete performance of all items of work. The Contractor Shall:
 - 1. Show activities/events as:
 - a. Contractor's time required for submittal of shop drawings, templates, fabrication, delivery and similar pre-construction work.
 - b. Contracting Officer's and Architect-Engineer's review and approval of shop drawings, equipment schedules, samples, template, or similar items.
 - c. Interruption of VA Facilities utilities, delivery of Government furnished equipment, and rough-in drawings, project phasing and any other specification requirements.
 - d. Test, balance and adjust various systems and pieces of equipment, maintenance and operation manuals, instructions and preventive maintenance tasks.
 - e. VA inspection and acceptance activity/event with a minimum duration of five work days at the end of each phase and immediately preceding any VA move activity/event required by the contract phasing for that phase.
 - 2. Show not only the activities/events for actual construction work for each trade category of the project, but also trade relationships to

- indicate the movement of trades from one area, floor, or building, to another area, floor, or building, for at least five trades who are performing major work under this contract.
3. Break up the work into activities/events of a duration no longer than 20 work days each or one reporting period, except as to non-construction activities/events (i.e., procurement of materials, delivery of equipment, concrete and asphalt curing) and any other activities/events for which the COTR may approve the showing of a longer duration. The duration for VA approval of any required submittal, shop drawing, or other submittals will not be less than 20 work days.
 4. Describe work activities/events clearly, so the work is readily identifiable for assessment of completion. Activities/events labeled "start," "continue," or "completion," are not specific and will not be allowed. Lead and lag time activities will not be acceptable.
 5. The schedule shall be generally numbered in such a way to reflect either discipline, phase or location of the work.
- B. The Contractor shall submit the following supporting data in addition to the project schedule:
1. The appropriate project calendar including working days and holidays.
 2. The planned number of shifts per day.
 3. The number of hours per shift.
- Failure of the Contractor to include this data shall delay the review of the submittal until the Contracting Officer is in receipt of the missing data.
- C. To the extent that the Project Schedule or any revised Project Schedule shows anything not jointly agreed upon, it shall not be deemed to have been approved by the COTR. Failure to include any element of work required for the performance of this contract shall not excuse the Contractor from completing all work required within any applicable completion date of each phase regardless of the COTR's approval of the Project Schedule.
- D. Compact Disk Requirements and CPM Activity/Event Record Specifications: Submit to the VA an electronic file(s) containing one file of the data

required to produce a schedule, reflecting all the activities/events of the complete project schedule being submitted.

1.8 PAYMENT TO THE CONTRACTOR:

- A. Monthly, the contractor shall submit an application and certificate for payment using VA Form 10-6001a reflecting updated schedule activities and cost data in accordance with the provisions of the following Article, PAYMENT AND PROGRESS REPORTING, as the basis upon which progress payments will be made pursuant to Article, FAR 52.232 - 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.236 - 83 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS). The Contractor shall be entitled to a monthly progress payment upon approval of estimates as determined from the currently approved updated project schedule. Monthly payment requests shall include: a listing of all agreed upon project schedule changes and associated data; and an electronic file (s) of the resulting monthly updated schedule.
- B. Approval of the Contractor's monthly Application for Payment shall be contingent, among other factors, on the submittal of a satisfactory monthly update of the project schedule.

1.9 PAYMENT AND PROGRESS REPORTING

- A. Monthly schedule update meetings will be held on dates mutually agreed to by the COTR and the Contractor. Contractor and their CPM consultant (if applicable) shall attend all monthly schedule update meetings. The Contractor shall accurately update the Project Schedule and all other data required and provide this information to the COTR three work days in advance of the schedule update meeting. Job progress will be reviewed to verify:
 - 1. Actual start and/or finish dates for updated/completed activities/events.
 - 2. Remaining duration for each activity/event started, or scheduled to start, but not completed.
 - 3. Logic, time and cost data for change orders, and supplemental agreements that are to be incorporated into the Project Schedule.
 - 4. Changes in activity/event sequence and/or duration which have been made, pursuant to the provisions of following Article, ADJUSTMENT OF CONTRACT COMPLETION.

5. Completion percentage for all completed and partially completed activities/events.
 6. Logic and duration revisions required by this section of the specifications.
 7. Activity/event duration and percent complete shall be updated independently.
- B. After completion of the joint review, the contractor shall generate an updated computer-produced calendar-dated schedule and supply the Contracting Officer's representative with reports in accordance with the Article, COMPUTER PRODUCED SCHEDULES, specified.
- C. After completing the monthly schedule update, the contractor's representative or scheduling consultant shall rerun all current period contract change(s) against the prior approved monthly project schedule. The analysis shall only include original workday durations and schedule logic agreed upon by the contractor and resident engineer for the contract change(s). When there is a disagreement on logic and/or durations, the Contractor shall use the schedule logic and/or durations provided and approved by the resident engineer. After each rerun update, the resulting electronic project schedule data file shall be appropriately identified and submitted to the VA in accordance to the requirements listed in articles 1.4 and 1.7. This electronic submission is separate from the regular monthly project schedule update requirements and shall be submitted to the resident engineer within fourteen (14) calendar days of completing the regular schedule update. **Before inserting the contract changes durations, care must be taken to ensure that only the original durations will be used for the analysis, not the reported durations after progress. In addition, once the final network diagram is approved, the contractor must recreate all manual progress payment updates on this approved network diagram and associated reruns for contract changes in each of these update periods as outlined above for regular update periods. This will require detailed record keeping for each of the manual progress payment updates.**
- D. Following approval of the CPM schedule, the VA, the General Contractor, its approved CPM Consultant, RE office representatives, and all

subcontractors needed, as determined by the SRE, shall meet to discuss the monthly updated schedule. The main emphasis shall be to address work activities to avoid slippage of project schedule and to identify any necessary actions required to maintain project schedule during the reporting period. The Government representatives and the Contractor should conclude the meeting with a clear understanding of those work and administrative actions necessary to maintain project schedule status during the reporting period. This schedule coordination meeting will occur after each monthly project schedule update meeting utilizing the resulting schedule reports from that schedule update. If the project is behind schedule, discussions should include ways to prevent further slippage as well as ways to improve the project schedule status, when appropriate.

1.10 RESPONSIBILITY FOR COMPLETION

- A. If it becomes apparent from the current revised monthly progress schedule that phasing or contract completion dates will not be met, the Contractor shall execute some or all of the following remedial actions:
 - 1. Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of work.
 - 2. Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the backlog of work.
 - 3. Reschedule the work in conformance with the specification requirements.
- B. Prior to proceeding with any of the above actions, the Contractor shall notify and obtain approval from the COTR for the proposed schedule changes. If such actions are approved, the representative schedule revisions shall be incorporated by the Contractor into the Project Schedule before the next update, at no additional cost to the Government.

1.11 CHANGES TO THE SCHEDULE

- A. Within 30 calendar days after VA acceptance and approval of any updated project schedule, the Contractor shall submit a revised electronic file (s) and a list of any activity/event changes including predecessors and successors for any of the following reasons:

1. Delay in completion of any activity/event or group of activities/events, which may be involved with contract changes, strikes, unusual weather, and other delays will not relieve the Contractor from the requirements specified unless the conditions are shown on the CPM as the direct cause for delaying the project beyond the acceptable limits.
 2. Delays in submittals, or deliveries, or work stoppage are encountered which make rescheduling of the work necessary.
 3. The schedule does not represent the actual prosecution and progress of the project.
 4. When there is, or has been, a substantial revision to the activity/event costs regardless of the cause for these revisions.
- B. CPM revisions made under this paragraph which affect the previously approved computer-produced schedules for Government furnished equipment, vacating of areas by the VA Facility, contract phase(s) and sub phase(s), utilities furnished by the Government to the Contractor, or any other previously contracted item, shall be furnished in writing to the Contracting Officer for approval.
- C. Contracting Officer's approval for the revised project schedule and all relevant data is contingent upon compliance with all other paragraphs of this section and any other previous agreements by the Contracting Officer or the VA representative.
- D. The cost of revisions to the project schedule resulting from contract changes will be included in the proposal for changes in work as specified in FAR 52.243 - 4 (Changes) and VAAR 852.236 - 88 (Changes - Supplemental), and will be based on the complexity of the revision or contract change, man hours expended in analyzing the change, and the total cost of the change.
- E. The cost of revisions to the Project Schedule not resulting from contract changes is the responsibility of the Contractor.

1.12 ADJUSTMENT OF CONTRACT COMPLETION

- A. The contract completion time will be adjusted only for causes specified in this contract. Request for an extension of the contract completion date by the Contractor shall be supported with a justification, CPM data and supporting evidence as the COTR may deem necessary for

determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof based on revised activity/event logic, durations (in work days) and costs is obligatory to any approvals. The schedule must clearly display that the Contractor has used, in full, all the float time available for the work involved in this request. The Contracting Officer's determination as to the total number of days of contract extension will be based upon the current computer-produced calendar-dated schedule for the time period in question and all other relevant information.

- B. Actual delays in activities/events which, according to the computer-produced calendar-dated schedule, do not affect the extended and predicted contract completion dates shown by the critical path in the network, will not be the basis for a change to the contract completion date. The Contracting Officer will within a reasonable time after receipt of such justification and supporting evidence, review the facts and advise the Contractor in writing of the Contracting Officer's decision.
- C. The Contractor shall submit each request for a change in the contract completion date to the Contracting Officer in accordance with the provisions specified under FAR 52.243 - 4 (Changes) and VAAR 852.236 - 88 (Changes - Supplemental). The Contractor shall include, as a part of each change order proposal, a sketch showing all CPM logic revisions, duration (in work days) changes, and cost changes, for work in question and its relationship to other activities on the approved network diagram.
- D. All delays due to non-work activities/events such as RFI's, WEATHER, STRIKES, and similar non-work activities/events shall be analyzed on a month by month basis.

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02-01-15
Renovate Tower of Building 1
VAMC, Sioux Falls, SD
VA Project #438-18-102

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SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This specification defines the general requirements and procedures for submittals. A submittal is information submitted for VA review to establish compliance with the contract documents.
- B. Detailed submittal requirements are found in the technical sections of the contract specifications. The Contracting Officer's Representative may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective technical specifications at no additional cost to the government.
- C. VA approval of a submittal does not relieve the Contractor of the responsibility for any error which may exist. The Contractor is responsible for fully complying with all contract requirements and the satisfactory construction of all work, including the need to check, confirm, and coordinate the work of all subcontractors for the project. Non-compliant material incorporated in the work will be removed and replaced at the Contractor's expense.

1.2 DEFINITIONS

- A. Preconstruction Submittals: Submittals which are required prior to issuing contract notice to proceed or starting construction. For example, Certificates of insurance; Surety bonds; Site-specific safety plan; Construction progress schedule; Schedule of values; Submittal register; List of proposed subcontractors.
- B. Shop Drawings: Drawings, diagrams, and schedules specifically prepared to illustrate some portion of the work. Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be integrated and coordinated.
- C. Product Data: Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions, and brochures, which describe and illustrate size, physical appearance, and other characteristics of materials, systems, or equipment for some portion of the work. Samples of warranty language when the contract requires extended product warranties.

- D. Samples: Physical examples of materials, equipment, or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged. Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project. Field samples and mock-ups constructed to establish standards by which the ensuing work can be judged.
- E. Design Data: Calculations, mix designs, analyses, or other data pertaining to a part of work.
- F. Test Reports: Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work. Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.
- G. Certificates: Document required of Contractor, or of a manufacturer, supplier, installer, or subcontractor through Contractor. The purpose is to document procedures, acceptability of methods, or personnel qualifications for a portion of the work.
- H. Manufacturer's Instructions: Pre-printed material describing installation of a product, system, or material, including special notices and MSDS concerning impedances, hazards, and safety precautions.
- I. Manufacturer's Field Reports: Documentation of the testing and verification actions taken by manufacturer's representative at the job site on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must indicate whether the material, product, or system has passed or failed the test.
- J. Operation and Maintenance Data: Manufacturer data that is required to operate, maintain, troubleshoot, and repair equipment, including manufacturer's help, parts list, and product line documentation. This data shall be incorporated in an operations and maintenance manual.
- K. Closeout Submittals: Documentation necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a phase of construction on a multi-phase contract.

1.3 SUBMITTAL REGISTER

- A. The submittal register will list items of equipment and materials for which submittals are required by the specifications. This list may not be all inclusive and additional submittals may be required by the specifications. The Contractor is not relieved from supplying submittals required by the contract documents but which have been omitted from the submittal register.
- B. The submittal register will serve as a scheduling document for submittals and will be used to control submittal actions throughout the contract period.
- C. The VA will provide the initial submittal register in electronic format. Thereafter, the Contractor shall track all submittals by maintaining a complete list, including completion of all data columns, including dates on which submittals are received and returned by the VA.
- D. The Contractor shall update the submittal register as submittal actions occur and maintain the submittal register at the project site until final acceptance of all work by Contracting Officer's Representative.
- E. The Contractor shall submit formal monthly updates to the submittal register in electronic format. Each monthly update shall document actual submission and approval dates for each submittal.

1.4 SUBMITTAL SCHEDULING

- A. Submittals are to be scheduled, submitted, reviewed, and approved prior to the acquisition of the material or equipment.
- B. Coordinate scheduling, sequencing, preparing, and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow time for potential resubmittal.
- C. No delay costs or time extensions will be allowed for time lost in late submittals or resubmittals.
- D. All submittals are required to be approved prior to the start of the specified work activity.

1.5 SUBMITTAL PREPARATION

- A. Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.

- B. Collect required data for each specific material, product, unit of work, or system into a single submittal. Prominently mark choices, options, and portions applicable to the submittal. Partial submittals will not be accepted for expedition of construction effort. Submittal will be returned without review if incomplete.
- C. If available product data is incomplete, provide Contractor-prepared documentation to supplement product data and satisfy submittal requirements.
- D. All irrelevant or unnecessary data shall be removed from the submittal to facilitate accuracy and timely processing. Submittals that contain the excessive amount of irrelevant or unnecessary data will be returned with review.
- E. Provide a transmittal form for each submittal with the following information:
 - 1. Project title, location and number.
 - 2. Construction contract number.
 - 3. Date of the drawings and revisions.
 - 4. Name, address, and telephone number of subcontractor, supplier, manufacturer, and any other subcontractor associated with the submittal.
 - 5. List paragraph number of the specification section and sheet number of the contract drawings by which the submittal is required.
 - 6. When a resubmission, add alphabetic suffix on submittal description. For example, submittal 18 would become 18A, to indicate resubmission.
 - 7. Product identification and location in project.
- F. The Contractor is responsible for reviewing and certifying that all submittals are in compliance with contract requirements before submitting for VA review. Proposed deviations from the contract requirements are to be clearly identified. All deviations submitted must include a side by side comparison of item being proposed against item specified. Failure to point out deviations will result in the VA requiring removal and replacement of such work at the Contractor's expense.
- G. Stamp, sign, and date each submittal transmittal form indicating action taken.

H. Stamp used by the Contractor on the submittal transmittal form to certify that the submittal meets contract requirements is to be similar to the following:

CONTRACTOR
(Firm Name)
_____ Approved
_____ Approved with corrections as noted on submittal data and/or attached sheets(s)
SIGNATURE: _____
TITLE: _____
DATE: _____

1.6 SUBMITTAL FORMAT AND TRANSMISSION

- A. Provide submittals in electronic format, with the exception of material samples. Use PDF as the electronic format, unless otherwise specified or directed by the Contracting Officer's Representative.
- B. Compile the electronic submittal file as a single, complete document. Name the electronic submittal file specifically according to its contents.
- C. Electronic files must be of sufficient quality that all information is legible. Generate PDF files from original documents so that the text included in the PDF file is both searchable and can be copied. If documents are scanned, Optical Character Resolution (OCR) routines are required.

- D. Not Used.
- E. Provide electronic documents through an electronic FTP file sharing system. Confirm that the electronic FTP file sharing system can be accessed from the VA computer network. The Contractor is responsible for setting up, providing, and maintaining the electronic FTP file sharing system for the construction contract period of performance.
- F. Not Used.
- G. Submittals will be reviewed for compliance with contract requirements by Architect-Engineer, and action thereon will be taken by Project Manager on behalf of the Contracting Officer's Representative.
- H. Shop drawing and product data submittals shall be transmitted to Architect in electronic (PDF) format using Submittal Exchange, a website service designed specifically for transmitting submittals between construction team members.
 - 1. Submittal Preparation - Contractor may use any or all of the following options:
 - a. Subcontractors and Suppliers provide electronic (PDF) submittals to Contractor via the Submittal Exchange website.
 - b. Subcontractors and Suppliers provide paper submittals to General Contractor who electronically scans and converts to PDF format.
 - c. Subcontractors and Suppliers provide paper submittals to Scanning Service which electronically scans and converts to PDF format.
 - 2. Contractor shall review and apply electronic stamp or signature certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions and coordination of information with other parts of the work.
 - 3. Contractor shall transmit each submittal to Architect using the Submittal Exchange website, www.submittalexchange.com. Contractor shall set up and pay for www.submittalexchange.com.
 - 4. Architect/Engineer review comments will be made available on the Submittal Exchange website for downloading. Contractor will receive email notice of completed review by Architect/Engineer and approval by Project Manager.

5. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the Contractor.
- I. Schedules called for in specifications and shown on shop drawings shall be submitted for use and information of Department of Veterans Affairs and Architect Engineer. However, the Contractor shall assume responsibility for coordinating and verifying schedules. The Contracting Officer and Architect/Engineer assumes no responsibility for checking schedules or layout drawings for exact sizes, exact numbers and detailed positioning of items.
- J. Submittals must be submitted by Contractor only. Contracting Officer's Representative, Architect and Engineers assume no responsibility for checking quantities or exact numbers included in such submittals.
1. The electronic submittal process is not intended for color samples, color charts, or physical material samples. Submit physical samples required by mail or delivery in quadruplicate. Each physical submittal should be accompanied/ recorded with a digital submittal through Submittal Exchange, noting a physical item was submitted for review, a list of physical items submitted, and representation as best possible of items submitted (electric format of color charts and photos or images of color samples or material samples). Accompanying digital submittal should contain all pertinent product literature. Physical submittals should only be accompanied by Contractor's transmittal letter. Both physical and digital transmittal letter should be the same.
2. Both digital and physical submittals will receive consideration only when covered by a transmittal letter signed or stamped by Contractor. Letter shall contain the list of items, name of Medical Center, name of Contractor, contract number, applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item), manufacturer and brand, ASTM or Federal Specification Number (if any) and such additional information as may be required by specifications for particular item being furnished. In addition, catalogs shall be marked to indicate specific items submitted for approval.
- a. A copy of the letter must be attached to each submittal either physical or digital.

- b. Each sample, certificate, manufacturers' literature and data shall be labeled to indicate the name and location of the Medical Center, name of Contractor, manufacturer, brand, contract number and ASTM or Federal Specification Number as applicable and location(s) on project.
 - c. Required certificates shall be signed by an authorized representative of manufacturer or supplier of material, and by Contractor.
3. If submittal samples have been disapproved, resubmit new samples as soon as possible after notification of disapproval. Such new samples shall be marked "Resubmitted Sample" in addition to containing other previously specified information required on label and in transmittal letter. Resubmittals should include all previously approved material.
4. Approved samples will be kept on file by the Project Manager at the site until completion of contract. Where noted in technical sections of specifications, approved samples in good condition may be used in their proper locations in contract work. At completion of contract, samples that are not approved will be returned to Contractor only upon request and at Contractor's expense. Such request should be made prior to completion of the contract. Disapproved samples that are not requested for return by Contractor will be discarded after completion of contract.
5. Submittal drawings (shop, erection or setting drawings) and schedules, required for work of various trades, shall be checked before submission by technically qualified employees of Contractor for accuracy, completeness and compliance with contract requirements. These drawings and schedules shall be stamped and signed by Contractor certifying to such check.
- a. For each drawing required, submit legible electronic reproducible (PDF).
 - b. Electronic reproducible (PDF) shall be full size.
 - c. Each drawing shall have marked thereon, proper descriptive title, including Medical Center location, project number, manufacturer's number, reference to contract drawing number, detail Section Number, and Specification Section Number.

- d. A space 120 mm by 125 mm (4 3/4 by 5 inches) shall be reserved on each drawing to accommodate approval or disapproval stamp.
 - e. Submit drawings, electronically via Submittal Exchange.
 - f. When work is directly related and involves more than one trade, shop drawings shall be submitted to Architect Engineer under one cover.
6. General Contractor shall include the full cost of Submittal Exchange project subscription in their proposal and shall be included in the Contract Amount.
7. Contractor shall have or obtain required hardware and software:
- a. Internet Service and Equipment Requirements:
 - i. Email address and Internet access at Contractor's main office.
 - ii. Adobe Acrobat (www.adobe.com), Bluebeam PDF Revu (www.bluebeam.com), or other similar PDF review software for applying electronic stamps and comments.

1.7 SAMPLES

- A. Submit two sets of physical samples showing range of variation, for each required item.
- B. Where samples are specified for selection of color, finish, pattern, or texture, submit the full set of available choices for the material or product specified.
- C. When color, texture, or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.
- D. Before submitting samples, the Contractor is to ensure that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.
- E. The VA reserves the right to disapprove any material or equipment which previously has proven unsatisfactory in service.
- F. Physical samples supplied maybe requested back for use in the project after reviewed and approved.

1.8 OPERATION AND MAINTENANCE DATA

- A. Submit data specified for a given item within 30 calendar days after the item is delivered to the contract site.
- B. In the event the Contractor fails to deliver O&M Data within the time limits specified, the Contracting Officer may withhold from progress payments 50 percent of the price of the item with which such O&M Data are applicable.

1.9 TEST REPORTS

SRE may require specific test after work has been installed or completed which could require contractor to repair test area at no additional cost to contract.

1.10 VA REVIEW OF SUBMITTALS AND RFIS

- A. The VA will review all submittals for compliance with the technical requirements of the contract documents. The Architect-Engineer for this project will assist the VA in reviewing all submittals and determining contractual compliance. Review will be only for conformance with the applicable codes, standards and contract requirements.
- B. Period of review for submittals begins when the VA COR receives submittal from the Contractor.
- C. Period of review for each resubmittal is the same as for initial submittal.
- D. VA review period is 15 working days for submittals.
- E. VA review period is 10 working days for RFIs.
- F. The VA will return submittals to the Contractor with the following notations:
 - 1. "Approved": authorizes the Contractor to proceed with the work covered.
 - 2. "Approved as noted": authorizes the Contractor to proceed with the work covered provided the Contractor incorporates the noted comments and makes the noted corrections.
 - 3. "Disapproved, revise and resubmit": indicates noncompliance with the contract requirements or that submittal is incomplete. Resubmit with appropriate changes and corrections. No work shall proceed for this item until resubmittal is approved.
 - 4. "Not reviewed": indicates submittal does not have evidence of being reviewed and approved by Contractor or is not complete. A submittal

marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals after taking appropriate action.

1.11 APPROVED SUBMITTALS

- A. The VA approval of submittals is not to be construed as a complete check, and indicates only that the general method of construction, materials, detailing, and other information are satisfactory.
- B. VA approval of a submittal does not relieve the Contractor of the responsibility for any error which may exist. The Contractor is responsible for fully complying with all contract requirements and the satisfactory construction of all work, including the need to check, confirm, and coordinate the work of all subcontractors for the project. Non-compliant material incorporated in the work will be removed and replaced at the Contractor's expense.
- C. After submittals have been approved, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.
- D. Retain a copy of all approved submittals at project site, including approved samples.

1.12 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

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**SECTION 01 42 19
REFERENCE STANDARDS**

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies the availability and source of references and standards specified in the project manual under paragraphs APPLICABLE PUBLICATIONS and/or shown on the drawings.

1.2 AVAILABILITY OF SPECIFICATIONS LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS FPMR PART 101-29 (FAR 52.211-1) (AUG 1998)

- A. The GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, FPMR Part 101-29 and copies of specifications, standards, and commercial item descriptions cited in the solicitation may be obtained for a fee by submitting a request to - GSA Federal Supply Service, Specifications Section, Suite 8100, 470 East L'Enfant Plaza, SW, Washington, DC 20407, Telephone (202) 619-8925, Facsimile (202) 619-8978.
- B. If the General Services Administration, Department of Agriculture, or Department of Veterans Affairs issued this solicitation, a single copy of specifications, standards, and commercial item descriptions cited in this solicitation may be obtained free of charge by submitting a request to the addressee in paragraph (a) of this provision. Additional copies will be issued for a fee.

1.3 AVAILABILITY FOR EXAMINATION OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-4) (JUN 1988)

The specifications and standards cited in this solicitation can be examined at the following location:

DEPARTMENT OF VETERANS AFFAIRS
Office of Construction & Facilities Management
Facilities Quality Service (00CFM1A)
425 Eye Street N.W, (sixth floor)
Washington, DC 20001

Telephone Numbers: (202) 632-5249 or (202) 632-5178
Between 9:00 AM - 3:00 PM

1.4 AVAILABILITY OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-3) (JUN 1988)

The specifications cited in this solicitation may be obtained from the associations or organizations listed below.

AA Aluminum Association Inc.
<http://www.aluminum.org>

AABC Associated Air Balance Council
<http://www.aabchg.com>

AAMA American Architectural Manufacturer's Association
<http://www.aamanet.org>

AAN American Nursery and Landscape Association
<http://www.anla.org>

AASHTO American Association of State Highway and Transportation
Officials
<http://www.aashto.org>

AATCC American Association of Textile Chemists and Colorists
<http://www.aatcc.org>

ACGIH American Conference of Governmental Industrial Hygienists
<http://www.acgih.org>

ACI American Concrete Institute
<http://www.aci-int.net>

ACPA American Concrete Pipe Association
<http://www.concrete-pipe.org>

ACPPA American Concrete Pressure Pipe Association
<http://www.acppa.org>

ADC Air Diffusion Council
<http://flexibleduct.org>

AGA American Gas Association
<http://www.aga.org>

AGC Associated General Contractors of America
<http://www.agc.org>

AGMA American Gear Manufacturers Association, Inc.
<http://www.agma.org>

AHAM Association of Home Appliance Manufacturers
<http://www.aham.org>

AIA American Institute of Architects
<http://www.aia.org>

AISC American Institute of Steel Construction
<http://www.aisc.org>

AISI American Iron and Steel Institute
<http://www.steel.org>

AITC American Institute of Timber Construction
<http://www.aitc-glulam.org>

AMCA Air Movement and Control Association, Inc.
<http://www.amca.org>

ANLA American Nursery & Landscape Association
<http://www.anla.org>

ANSI American National Standards Institute, Inc.
<http://www.ansi.org>

APA The Engineered Wood Association
<http://www.apawood.org>

ARI Air-Conditioning and Refrigeration Institute
<http://www.ari.org>

ASAE American Society of Agricultural Engineers
<http://www.asae.org>

ASCE American Society of Civil Engineers
<http://www.asce.org>

ASHRAE American Society of Heating, Refrigerating, and
Air-Conditioning Engineers
<http://www.ashrae.org>

ASME American Society of Mechanical Engineers
<http://www.asme.org>

ASSE American Society of Sanitary Engineering
<http://www.asse-plumbing.org>

ASTM American Society for Testing and Materials
<http://www.astm.org>

AWI Architectural Woodwork Institute
<http://www.awinet.org>

AWS American Welding Society
<http://www.aws.org>

AWWA American Water Works Association
<http://www.awwa.org>

BHMA Builders Hardware Manufacturers Association
<http://www.buildershardware.com>

BIA Brick Institute of America
<http://www.bia.org>

CAGI Compressed Air and Gas Institute
<http://www.cagi.org>

CGA Compressed Gas Association, Inc.
<http://www.cganet.com>

CI The Chlorine Institute, Inc.
<http://www.chlorineinstitute.org>

CISCA Ceilings and Interior Systems Construction Association
<http://www.cisca.org>

CISPI Cast Iron Soil Pipe Institute
<http://www.cispi.org>

CLFMI Chain Link Fence Manufacturers Institute
<http://www.chainlinkinfo.org>

CPMB Concrete Plant Manufacturers Bureau
<http://www.cpm.org>

CRA California Redwood Association
<http://www.calredwood.org>

CRSI Concrete Reinforcing Steel Institute
<http://www.crsi.org>

CTI Cooling Technology Institute
<http://www.cti.org>

DHI Door and Hardware Institute
<http://www.dhi.org>

EGSA Electrical Generating Systems Association
<http://www.egsa.org>

EEI Edison Electric Institute
<http://www.eei.org>

EPA Environmental Protection Agency
<http://www.epa.gov>

ETL ETL Testing Laboratories, Inc.
<http://www.etl.com>

FAA Federal Aviation Administration
<http://www.faa.gov>

FCC Federal Communications Commission
<http://www.fcc.gov>

FPS The Forest Products Society
<http://www.forestprod.org>

GANNA Glass Association of North America
<http://www.cssinfo.com/info/gana.html/>

FM Factory Mutual Insurance
<http://www.fmglobal.com>

GA Gypsum Association
<http://www.gypsum.org>

GSA General Services Administration
<http://www.gsa.gov>

HI Hydraulic Institute
<http://www.pumps.org>

HPVA Hardwood Plywood & Veneer Association
<http://www.hpva.org>

ICBO International Conference of Building Officials
<http://www.icbo.org>

ICEA Insulated Cable Engineers Association Inc.
<http://www.icea.net>

\ICAC Institute of Clean Air Companies
<http://www.icac.com>

IEEE Institute of Electrical and Electronics Engineers
<http://www.ieee.org/>

IMSA International Municipal Signal Association
<http://www.imsasafety.org>

IPCEA Insulated Power Cable Engineers Association

NBMA Metal Buildings Manufacturers Association
<http://www.mbma.com>

MSS Manufacturers Standardization Society of the Valve and Fittings
Industry Inc.
<http://www.mss-hq.com>

NAAMM National Association of Architectural Metal Manufacturers
<http://www.naamm.org>

NAPHCC Plumbing-Heating-Cooling Contractors Association
<http://www.phccweb.org.org>

NBS National Bureau of Standards
See - NIST

NBBPVI National Board of Boiler and Pressure Vessel Inspectors
<http://www.nationboard.org>

NEC National Electric Code
See - NFPA National Fire Protection Association

NEMA National Electrical Manufacturers Association
<http://www.nema.org>

NFPA National Fire Protection Association
<http://www.nfpa.org>

NHLA National Hardwood Lumber Association
<http://www.natlhardwood.org>

NIH National Institute of Health
<http://www.nih.gov>

NIST National Institute of Standards and Technology
<http://www.nist.gov>

NLMA Northeastern Lumber Manufacturers Association, Inc.
<http://www.nelma.org>

NPA National Particleboard Association
18928 Premiere Court
Gaithersburg, MD 20879
(301) 670-0604

NSF National Sanitation Foundation
<http://www.nsf.org>

NWDA Window and Door Manufacturers Association
<http://www.nwwda.org>

OSHA Occupational Safety and Health Administration
Department of Labor
<http://www.osha.gov>

PCA Portland Cement Association
<http://www.portcement.org>

PCI Precast Prestressed Concrete Institute
<http://www.pci.org>

PPI The Plastic Pipe Institute
<http://www.plasticpipe.org>

PEI Porcelain Enamel Institute, Inc.
<http://www.porcelainenamel.com>

PTI Post-Tensioning Institute
<http://www.post-tensioning.org>

RFCI The Resilient Floor Covering Institute
<http://www.rfci.com>

RIS Redwood Inspection Service
See - CRA

RMA Rubber Manufacturers Association, Inc.
<http://www.rma.org>

SCMA Southern Cypress Manufacturers Association
<http://www.cypressinfo.org>

SDI Steel Door Institute
<http://www.steeldoor.org>

SOI Secretary of the Interior
http://www.cr.nps.gov/local-law/arch_stnds_8_2.htm

IGMA Insulating Glass Manufacturers Alliance
<http://www.igmaonline.org>

SJI Steel Joist Institute
<http://www.steeljoist.org>

SMACNA Sheet Metal and Air-Conditioning Contractors
National Association, Inc.
<http://www.smacna.org>

SSPC The Society for Protective Coatings
<http://www.sspc.org>

STI Steel Tank Institute
<http://www.steeltank.com>

SWI Steel Window Institute
<http://www.steelwindows.com>

TCA Tile Council of America, Inc.
<http://www.tileusa.com>

TEMA Tubular Exchange Manufacturers Association
<http://www.tema.org>

TPI Truss Plate Institute, Inc.
583 D'Onofrio Drive; Suite 200
Madison, WI 53719
(608) 833-5900

UBC The Uniform Building Code
See ICBO

UL Underwriters' Laboratories Incorporated
<http://www.ul.com>

ULC Underwriters' Laboratories of Canada
<http://www.ulc.ca>

WCLIB West Coast Lumber Inspection Bureau
6980 SW Varns Road, P.O. Box 23145

Portland, OR 97223
(503) 639-0651

WRCLA Western Red Cedar Lumber Association
P.O. Box 120786
New Brighton, MN 55112
(612) 633-4334

WWPA Western Wood Products Association
<http://www.wwpa.org>

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SECTION 01 45 00
QUALITY CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies requirements for Contractor Quality Control (CQC) for Design-Bid-Build (DBB) construction projects.

1.2 APPLICABLE PUBLICATIONS

- A. The publication listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
- B. ASTM International (ASTM)
 - 1. ASTM D3740 - (2012a) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
 - 2. ASTM E29 - (2014a) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.3 SUBMITTALS

Government approval is required for all submittals. CQC inspection reports shall be submitted under this Specification section and follow the [Applicable CQC Control Phase (Preparatory, Initial, or Follow-Up)]: [Applicable Specification section] naming convention.

- 1. Preconstruction Submittals
 - a. Interim CQC Plan
 - b. CQC Plan
 - c. Additional Requirements for Design Quality Control (DQC) Plan
- 2. Design Data
 - a. Discipline-Specific Checklists
 - b. Design Quality Control
- 3. Test Reports
 - a. Verification Statement

PART 2 PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

Establish and maintain an effective quality control (QC) system that complies with the FAR Clause 52.246.12 titled "Inspection of Construction". QC consists of plans, procedures, and organization necessary to produce an end product which complies with the Contract requirements. The QC system covers all design and construction operations, both onsite and offsite, and be keyed to the proposed design and construction sequence. The project superintendent will be held responsible for the quality of work and is subject to removal by the Contracting Office or Authorized designee for non-compliance with the quality requirements specified in the Contract. In this context the highest level manager responsible for the overall construction activities at the site, including quality and production is the project superintendent. The project superintendent maintains a physical presence at the site at all times and is responsible for all construction and related activities at the site, except as otherwise acceptable to the Contracting Officer.

3.2 CQC PLAN:

- A. Submit no later than 15days after receipt of Notice to Proceed (NTP) the CQC Plan proposed to implement the requirements of the FAR Clause 52.246.12 titled "Inspection of Construction". The Government will consider an Interim CQC Plan for the first to match timeline established immediately above days of operation, which must be accepted within 10, business days of NTP. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an Interim plan applicable to the particular feature of work to be started. Work outside of the accepted Interim CQC Plan will not be permitted to begin until acceptance of a CQC Plan or another Interim CQC Plan containing the additional work scope is accepted.
- B. Content of the CQC Plan: Include, as a minimum, the following to cover all design and construction operations, both onsite and offsite, including work by subcontractors, designers of record consultants,

architects/engineers (A/E), fabricators, suppliers, and purchasing agents:

1. A description of the QC organization, including a chart showing lines of authority and acknowledgement that the CQC staff will implement the three phase control system for all aspects of the work specified. Include a CQC System Manager that reports to the project superintendent.
2. The name, qualifications (in resume format) duties, responsibilities, and authorities of each person assigned a CQC function.
3. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the Contract. Letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities will to the Contracting Officer or Authorized designee. be issued by the CQC System Manager. Furnish copies of these letters
4. Procedures for scheduling, reviewing, certifying, and managing submittals including those of subcontractors, designers of record, consultants, A/E's offsite fabricators, suppliers and purchasing agents. These procedures must be in accordance with Section 01 33 23 Shop Drawings, Product Data, and Samples.
5. Control, verification, and acceptance of testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities approved by the Contracting Officer or Authorized designee are required to be used)
6. Procedures for tracking Preparatory, Initial, and Follow-Up control phases and control, verification, and acceptance tests including documentation.
7. Procedures for tracking design and construction deficiencies from identification through acceptable corrective action. Establish verification procedures that identified deficiencies have been corrected.

8. Reporting procedures, including proposed reporting formats.
 9. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks has separate control requirements, and is identified by different trades or disciplines, or it is work by the same trade in a different environment. Although each section of specifications can generally be considered as a definable feature of work, there are frequently more than one definable feature under a particular section. This list will be agreed upon during the Coordination meeting.
 10. Coordinate schedule work with Special Inspections required by Section 01 45 35 Special Inspections, the Statement of Special Inspections and Schedule of Special Inspections. Where the applicable Code issue by the International Code Council (ICC) calls for inspections by the Building Official, the Contractor must include the inspections in the CQC Plan and must perform the inspections required by the applicable ICC. The Contractor must perform these inspections using independent qualified inspectors. Include the Special Inspection Plan requirements in the CQC Plan.
- C. Additional Requirements for Design Quality Control (DQC) Plan: The following additional requirements apply to the DQC Plan for DB projects only and not DBB projects:
1. Submit and maintain a DQC Plan as an effective QC program which assures that all services required by this contract are performed and provided in a manner that meets professional architectural and engineering quality standards. As a minimum, all documents must be technically reviewed by competent, independent reviewers identified in the DQC Plan. The same element that produced the product may not perform the independent technical review (ITR). Correct errors and deficiencies in the design documents prior to submitting them to the Government.
 2. Include the design schedule in the master project schedule, showing the sequence of events involved in carrying out the project design tasks within the specific Contract period. This should be at a detailed level of scheduling sufficient to identify all major design tasks, including those that control the flow of work. Include review and correction periods associated with each item. This should be a forward planning as well as a project monitoring tool. The schedule

reflects calendar days and not dates for each activity. If the schedule is changed, submit a revised schedule reflecting the change within 7 calendar days. Include in the DQC Plan the discipline-specific checklists to be used during the design and quality control of each submittal. Submit at each design phase as part of the project documentation these completed discipline-specific checklists.

3. Implement the DQC Plan by a DQC Manager who has the responsibility of being cognizant of and assuring that all documents on the project have been coordinated. This individual must be a person who has verifiable engineering or architectural design experience and is a Professional Engineer or Registered Architect within the state of Construction location. Notify the Contracting Officer or Authorized designee, in writing, of the name of the individual, and the name of an alternate person assigned to the position.

D. Acceptance of Plan: Acceptance of the Contractor's plan is required prior to the start of design and construction. Acceptance is conditional and will be predicated on satisfactory performance during the design and construction. The Government reserves the right to require the Contractor to make changes in the CQC Plan and operations including removal of personnel as necessary, to obtain the quality specified.

E. Notification of Changes: After acceptance of the CQC Plan, notify the Contracting Officer or Authorized designee in writing of any proposed change. Proposed changes are subject to acceptance by the Government prior to implementation by the Contractor.

3.3 COORDINATION MEETING:

After the Preconstruction Conference Post-award Conference before start of design or construction, and prior to acceptance by the Government of the CQC Plan, meet with the Contracting Officer or Authorized designee to discuss the Contractor's quality control system. Submit the CQC Plan a minimum of 5 business days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details must be developed, including the forms for recording the CC operations, design activities (if applicable), control activities, testing,

administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting will be prepared by the Government, signed by both the Contractor and Contracting Officer or Authorized designee and will become a part of the contract file. There can be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings or address deficiencies in the CQC system or procedures which can require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION:

- A. Personnel Requirements: The requirements for the CQC organization are a Safety and Health Manager, CQC System Manager, a Design Quality Manager (if applicable), and sufficient number of additional qualified personnel to ensure safety and Contract compliance. The Safety and Health Manager shall satisfy the requirements of Specification 01 35 26 Safety Requirements and reports directly to a senior project (or corporate) official independent from the CQC System Manager. The Safety and Health Manager will also serve as a member of the CQC Staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff maintains a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure Contract compliance. The CQC staff will be subject to acceptance by the Contracting Officer or Authorized designee. Provide adequate office space, filing systems, and other resources as necessary to maintain an effective and fully functional CQC organization. Promptly complete and furnish all letters, material submittals, shop drawings submittals, schedules and all other project documentation to the CQC organization. The CQC organization is responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Government.
- B. CQC System Manager: Identify as CQC System Manager an individual within the onsite work organization that is responsible for overall management of CQC and has the authority to act in all CQC matters for the

Contractor. The CQC system Manager is required to be a graduate engineer, graduate architect, or a graduate of construction management, with a minimum of PM or SRE to determine qualifications based on project complexity at construction review , 10 years construction experience on construction similar to the scope of this Contract. This CQC System manager is on the site at all times during construction and is employed by the General Contractor. The CQC System Manger is assigned as CQC System Manager but has duties as project superintendent in addition to quality control. Identify in the plan an alternate to serve in the event of the CDQC System Manager's absence. The requirements for the alternate are the same as the CQC System Manager.

C. CQC Personnel: In addition to CQC personnel specified elsewhere in the contract, provide as part of the CQC organization specialized personnel to assist in the CQC System Manager for the following areas, as applicable: electrical, mechanical, civil, structural, environmental, architectural, materials technician submittals clerk, Commissioning Agent/LEED specialist, and low voltage systems. These individuals or specified technical companies are directly employed by the General Contractor and cannot be employed by a supplier or subcontractor on this project and have the necessary education or experience in accordance with the Experience Matrix listed herein. These individuals can perform other duties but need to be allowed sufficient time to perform the specialized personnel's assigned quality controls duties as described in the CQC Plan. A single person can cover more than one area provided that the single person is qualified to perform QC activities in each designated and that workload allows.

EXPERIENCE MATRIX

Area	Qualifications
Civil	Graduate Civil Engineer or Construction Manager with 2 years experience in the type of work being performed on this project or technician with 5 years related experience.

Area	Qualifications
Mechanical	Graduate Mechanical Engineer with 2 years experience or construction professional with 5 years of experience supervising mechanical features of work in the field with a construction company.
Electrical	Graduate Electrical Engineer with 2 years related experience or construction professional with 5 years of experience supervising electrical features of work in the field with a construction company.
Structural	Graduate Civil Engineer (with Structural Track or Focus), Structural Engineer, or Construction Manager with 2 years experience or construction professional with 5 years experience supervising structural features of work in the field with a construction company.
Architectural	Graduate Architect with 2 years experience or construction professional with 5 years of related experience.
Environmental	Graduate Environmental Engineer with 3 years experience.
Submittals	Submittal Clerk with 1 year experience.
Concrete, Pavement, and Soils	Materials Technician with 2 years experience for the appropriate area.
Testing, Adjusting, and Balancing (TAB)	Specialist must be a member of AABC or an experienced technician of the firm certified by the NEBB.
Design Quality Control Manager	Registered Architect or Professional Engineer

D. **Additional Requirements:** In addition to the above experience and education requirements, the CQC System Manager and Alternate CQC System Manager are required to have completed the Construction Quality Management (CQM) for Construction course. If the CQC System Manager does not have a current specification, obtain the CQM for Contractors course identification within 90 days of award. This course is periodically offered by the Naval Facilities Engineering Command and

the Army Corps of Engineers. Contact the Contracting Officer or Authorized designee for information on the next scheduled class.

- E. Organizational Changes: Maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer or Authorized designee for acceptance.

3.5 SUBMITTALS AND DELIVERABLES: Submittals have to comply with the requirements in Section 01 33 23 Shop Drawings, Product Data, and Samples. The CQC organization is responsible for certifying that all submittals and deliverables are in compliance with the contract requirements. When Section 01 91 00 General Commissioning Requirements is included in the contract, the submittals required by the section have to be coordinated with the Section 01 33 23 Shop Drawings, Product Data, and Samples to ensure adequate time is allowed for each type of submittal required.

3.6 CONTROL:

- A. CQC is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control are required to be conducted by the CQC System Manager for each definable feature of the construction work as follows:
 - 1. Preparatory Phase: This phase is performed prior to beginning work on each definable feature of work after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase includes:
 - a. A review of each paragraph of applicable specifications, references codes, and standards. Make available during the preparatory inspection a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field. Maintain and make available in the field for use by Government personnel until final acceptance of the work.
 - b. Review of the Contract drawings.
 - c. Check to assure that all materials and equipment have been tested, submitted, and approved.

- d. Review of provisions that have been made to provide required control inspection and testing.
 - e. Review Special Inspections required by Section 01 45 35 Special Inspections, that Statement of Special Inspections and the Schedule of Specials Inspections.
 - f. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the Contract.
 - g. Examination of required materials, equipment, and sample work to assure that they are on hand conform to approved shop drawings or submitted data, and are properly stored.
 - h. Review of the appropriate Activity Hazard Analysis (AHA) to assure safety requirements are met.
 - i. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards - contract defined or industry standard if not contract defined - for that feature of work.
 - j. Check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
 - k. Discussion of the initial control phase.
 - l. The Government needs to be notified at least 48 hours or 2 business days in advance of beginning the Preparatory control phase. Include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. Document the results of the Preparatory phase actions by separate minutes prepared by the CQC System Manager and attach to the daily CQC report. Instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.
- B. Initial Phase: This phase is accomplished at the beginning of a definable feature of work. Accomplish the following:
- 1. Check work to ensure that it is in full compliance with contract requirements. Review minutes of the Preparatory meeting.

2. Verify adequacy of controls to ensure full contract compliance.
Verify the required control inspection and testing is in compliance with the contract.
 3. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
 4. Resolve all differences.
 5. Check safety to include compliance with an upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
 6. The Government needs to be notified at least 48 hours or 2 business days in advance of beginning the initial phase for definable features of work. Prepare separate minutes of this phase by the CQC System Manager and attach to the daily CQC report. Indicate the exact location of initial phase for definable feature of work for future reference and comparison with Follow-Up phases.
 7. The initial phase for each definable feature of work is repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.
 8. Coordinate scheduled work with Special Inspections required by Section 01 45 35 Special Inspections, the Statement of Special Inspections, and the Schedule of Special Inspections.
- C. Follow-Up Phase: Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements until the completion of the particular feature of work. Record the checks in the CQC documentation. Conduct final Follow-Up checks and correct all deficiencies prior to the start of additional features of work which may be affected by the deficient work. Do not build upon nor conceal non-conforming work. Coordinate scheduled work with Special Inspections required by Section 01 45 35 Special Inspections, the Statement of Special Inspections, and the Schedule of Special Inspections
- D. Additional Preparatory and Initial Phases on the same definable features of work if: the quality ongoing work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.7 TESTS

- A. Testing Procedure: Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and acceptance test when specified. Procure the services of a Department of Veteran Affairs approved testing laboratory or establish an approved testing laboratory at the project site. Perform the following activities and record and provide the following data:
1. Verify that testing procedures comply with contract requirements.
 2. Verify that facilities and testing equipment are available and comply with testing standards.
 3. Check test instrument calibration data against certified standards.
 4. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
 5. Record results of all tests taken, both passing and failing on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the unique sequential control number identifying the test. If approved by the Contracting Officer or Authorized designee, actual test reports are submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer or Authorized designee. Failure to submit timely test reports as stated results in nonpayment for related work performed and disapproval of the test facility for this Contract.
- B. Testing Laboratories: All testing laboratories must be validated through the procedures contained in Specification section 01 45 29 Testing Laboratory Services.
1. Capability Check: The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt and steel is required to meet criteria detailed in ASTM D3740 and ASTM E329.

2. Capability Recheck: If the selected laboratory fails the capability check, the Contractor will be assessed a charge equal to value of recheck to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the Contract amount due the Contractor.

C. Onsite Laboratory: The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.8 COMPLETION INSPECTION

A. Punch-Out Inspection: Conduct an inspection of the work by the CQC system Manager near the end of the work, or any increment of the work established by a time stated FAR 52.211-10 - Commencement, Prosecution, and Completion of Work, or by the specifications. Prepare and include in the CQC documentation a punch list of items which do not conform to the approved drawings and specifications. Include within the list of deficiencies the estimated date by which the deficiencies will be corrected. Make a second inspection the CQC System Manager or staff to ascertain that all deficiencies have been corrected. Once this is accomplished, notify the Government that the facility is ready for the Government Pre-Final Inspection.

52.211-10 -- Commencement, Prosecution, and Completion of Work.

As prescribed in [11.404\(b\)](#), insert the following clause in solicitations and contracts when a fixed-price construction contract is contemplated. The clause may be changed to accommodate the issuance of orders under indefinite-delivery contracts for construction.

Commencement, Prosecution, and Completion of Work (Apr 1984)

The Contractor shall be required to:

- (a) commence work under this contract within _____ // *Contracting Officer insert number*// calendar days after the date the Contractor receives the notice to proceed,
- (b) prosecute the work diligently, and
- (c) complete the entire work ready for use not later than _____.* The time stated for completion shall include final cleanup of the premises.

(End of Clause)

* The Contracting Officer shall specify either a number of days after the date the contractor receives the notice to proceed, or a calendar date.

Alternate I (Apr 1984). If the completion date is expressed as a specific calendar date, computed on the basis of the contractor receiving the notice to proceed by a certain day, add the following paragraph to the basic clause:

The completion date is based on the assumption that the successful offeror will receive the notice to proceed by _____ // *Contracting Officer insert date* //. The completion date will be extended by the number of calendar days after the above date that the Contractor receives the notice to proceed, except to the extent that the delay in issuance of the notice to proceed results from the failure of the Contractor to execute the contract and give the required performance and payment bonds within the time specified in the offer.

- B. Pre-Final Inspection: The Government will perform the Pre-Final Inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. Ensure that all items on this list have been corrected before notifying the Government, so that a Final Acceptance Inspection with the customer can be scheduled. Correct any items noted on the Pre-Final Inspection in a timely manner. These inspections and any deficiency corrections required by this paragraph need to be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate construction completion dates.
- C. Final Acceptance Inspection: The Contractor's QC Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Authorized designee is required to be in attendance at the Final Acceptance Inspection. Additional Government personnel can also be in attendance. The Final Acceptance Inspection will be formally scheduled by the Contracting Officer's or Authorized designee based upon results of the Pre-Final Inspection. Notify the Contracting Officer through the Resident Engineer office at least 14 days prior to the Final Acceptance Inspection and include the Contractor's assurance that all specific items previously identified at the Contractor as being unacceptable, along with all remaining work

performed under the contract, will be complete and acceptable by the date schedule for the Final Acceptance Inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with FAR Clause 52.246-12 titled "Inspection of Construction".

3.9 DOCUMENTATION

- A. Quality Control Activities: Maintain current records providing factual evidence that required QC activities and tests have been performed. Include in these records the work of subcontractors and suppliers on an acceptable form that includes, as a minimum, the following information:
1. The name and area of responsibility of the Contractor/Subcontractor
 2. Operating plant/equipment with hours worked, idle, or down for repair.
 3. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
 4. Test and control activities performed with results and references to specification/drawing requirements. Identify the Control Phase (Preparatory, Initial, and/or Follow-Up). List deficiencies noted, along with corrective action.
 5. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specification/drawing requirements.
 6. Submittals and deliverables reviewed, with Contract reference, by whom, and action taken.
 7. Offsite surveillance activities, including actions taken.
 8. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
 9. Instructions given/received and conflicts in plans and specifications.
 10. Provide documentation of design quality control activities. For independent design reviews, provide, as a minimum, identification of the Independent Technical Reviewer (ITR) team, the ITR review comments, responses, and the record of resolution of the comments.

B. **Verification Statement:** Indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. Cover both conforming and deficient features and include a statement that equipment and materials incorporated in the work and workmanship comply with the Contract. Furnish the original and one copy of these records in report form to the Government daily with 1 week after the date covered by the report, except that reports need not be submitted for day son which no work is performed. As a minimum, prepare and submit on report for every 7 days of no work and on the last day of a no work period. All calendar days need to be accounted for throughout the life of the contract. The first report following a day of no work will be for that day only. Reports need to be signed and dated by the CQC System Manager. Include copies of test reports and copies of reports prepared by all subordinate QC personnel within the CQC System Manager Report.

3.10 **SAMPLE FORMS**



014500 Referenced Example Form Templa

3.11 **NOTIFICATION OF NONCOMPLIANCE:** The Contracting Officer or Authorized designee will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor should take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site will be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer can issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders will be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

--- End of Section ---

SECTION 01 45 29
TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies materials testing activities and inspection services required during project construction to be provided by a Testing Laboratory retained by the Department of Veterans Affairs.

1.2 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. American Association of State Highway and Transportation Officials (AASHTO):
 - T27-11Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates
 - T96-02 (R2006)Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
 - T99-10Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.) Drop
 - T104-99 (R2007)Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
 - T180-10Standard Method of Test for Moisture-Density Relations of Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop
 - T191-02 (R2006)Standard Method of Test for Density of Soil In-Place by the Sand-Cone Method
 - T310-13Standard Method of Test for In-place Density and Moisture Content of Soil and Soil-aggregate by Nuclear Methods (Shallow Depth)
- C. American Concrete Institute (ACI):
 - 506.4R-94 (R2004)Guide for the Evaluation of Shotcrete

D. American Society for Testing and Materials (ASTM):

- A370-12Standard Test Methods and Definitions for
Mechanical Testing of Steel Products
- A416/A416M-10Standard Specification for Steel Strand,
Uncoated Seven-Wire for Prestressed Concrete
- C31/C31M-10Standard Practice for Making and Curing
Concrete Test Specimens in the Field
- C33/C33M-11aStandard Specification for Concrete Aggregates
- C39/C39M-12Standard Test Method for Compressive Strength
of Cylindrical Concrete Specimens
- C109/C109M-11bStandard Test Method for Compressive Strength
of Hydraulic Cement Mortars
- C136-06Standard Test Method for Sieve Analysis of Fine
and Coarse Aggregates
- C138/C138M-10bStandard Test Method for Density (Unit Weight),
Yield, and Air Content (Gravimetric) of
Concrete
- C140-12Standard Test Methods for Sampling and Testing
Concrete Masonry Units and Related Units
- C143/C143M-10aStandard Test Method for Slump of Hydraulic
Cement Concrete
- C172/C172M-10Standard Practice for Sampling Freshly Mixed
Concrete
- C173/C173M-10bStandard Test Method for Air Content of freshly
Mixed Concrete by the Volumetric Method
- C330/C330M-09Standard Specification for Lightweight
Aggregates for Structural Concrete
- C567/C567M-11Standard Test Method for Density Structural
Lightweight Concrete
- C780-11Standard Test Method for Pre-construction and
Construction Evaluation of Mortars for Plain
and Reinforced Unit Masonry
- C1019-11Standard Test Method for Sampling and Testing
Grout
- C1064/C1064M-11Standard Test Method for Temperature of Freshly
Mixed Portland Cement Concrete

- C1077-11cStandard Practice for Agencies Testing Concrete
and Concrete Aggregates for Use in Construction
and Criteria for Testing Agency Evaluation
- C1314-11aStandard Test Method for Compressive Strength
of Masonry Prisms
- D422-63 (2007)Standard Test Method for Particle-Size Analysis
of Soils
- D698-07e1Standard Test Methods for Laboratory Compaction
Characteristics of Soil Using Standard Effort
- D1140-00 (2006)Standard Test Methods for Amount of Material in
Soils Finer than No. 200 Sieve
- D1143/D1143M-07e1Standard Test Methods for Deep Foundations
Under Static Axial Compressive Load
- D1188-07e1Standard Test Method for Bulk Specific Gravity
and Density of Compacted Bituminous Mixtures
Using Coated Samples
- D1556-07Standard Test Method for Density and Unit
Weight of Soil in Place by the Sand-Cone Method
- D1557-09Standard Test Methods for Laboratory Compaction
Characteristics of Soil Using Modified Effort
(56,000ft lbf/ft³ (2,700 KNm/m³))
- D2166-06Standard Test Method for Unconfined Compressive
Strength of Cohesive Soil
- D2167-08)Standard Test Method for Density and Unit
Weight of Soil in Place by the Rubber Balloon
Method
- D2216-10Standard Test Methods for Laboratory
Determination of Water (Moisture) Content of
Soil and Rock by Mass
- D2974-07aStandard Test Methods for Moisture, Ash, and
Organic Matter of Peat and Other Organic Soils
- D3666-11Standard Specification for Minimum Requirements
for Agencies Testing and Inspecting Road and
Paving Materials
- D3740-11Standard Practice for Minimum Requirements for
Agencies Engaged in Testing and/or Inspection

- of Soil and Rock as used in Engineering Design
and Construction
- D6938-10Standard Test Method for In-Place Density and
Water Content of Soil and Soil-Aggregate by
Nuclear Methods (Shallow Depth)
- E94-04 (2010)Standard Guide for Radiographic Examination
- E164-08Standard Practice for Contact Ultrasonic
Testing of Weldments
- E329-11cStandard Specification for Agencies Engaged in
Construction Inspection, Testing, or Special
Inspection
- E543-09Standard Specification for Agencies Performing
Non-Destructive Testing
- E605-93 (R2011)Standard Test Methods for Thickness and Density
of Sprayed Fire Resistive Material (SFRM)
Applied to Structural Members
- E709-08Standard Guide for Magnetic Particle
Examination
- E1155-96 (R2008)Determining FF Floor Flatness and FL Floor
Levelness Numbers
- F3125/F3125M-15Standard Specification for High Strength
Structural Bolts, Steel and Alloy Steel, Heat
Treated, 120 ksi (830 MPa) and 150 ksi (1040
MPa) Minimum Tensile Strength, Inch and Metric
Dimensions

E. American Welding Society (AWS):

- D1.D1.1M-10Structural Welding Code-Steel

1.3 REQUIREMENTS:

- A. Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (i.e.; E329, C1077, D3666, D3740, A880, E543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific

laboratory performing the actual testing, not just the "Corporate Office."

- B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by Contracting Officers Representative . When it appears materials furnished, or work performed by Contractor fail to meet construction contract requirements, Testing Laboratory shall direct attention of Contracting Officers Representative to such failure.
- C. Written Reports: Testing laboratory shall submit test reports to Contracting Officers Representative , Contractor, unless other arrangements are agreed to in writing by the Contracting Officers Representative . Submit reports of tests that fail to meet construction contract requirements on colored paper.
- D. Verbal Reports: Give verbal notification to Contracting Officers Representative immediately of any irregularity.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EARTHWORK:

- A. General: The Testing Laboratory shall provide qualified personnel, materials, equipment, and transportation as required to perform the services identified/required herein, within the agreed to schedule and/or time frame. The work to be performed shall be as identified herein and shall include but not be limited to the following:
 - 1. Observe fill and subgrades during proof-rolling to evaluate suitability of surface material to receive fill or base course. Provide recommendations to the Resident Engineer regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to Contracting Officers Representative extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.
 - 2. Not Used.
 - 3. Not Used.
- B. Testing Compaction:

1. Determine maximum density and optimum moisture content for each type of fill, backfill and subgrade material used, in compliance with ASTM D1557.
2. Make field density tests in accordance with the primary testing method following ASTM D6938 wherever possible. Field density tests utilizing ASTM D1556 shall be utilized on a case by case basis only if there are problems with the validity of the results from the primary method due to specific site field conditions. Should the testing laboratory propose these alternative methods, they should provide satisfactory explanation to the Contracting Officers Representative before the tests are conducted.
 - a. Building Slab Subgrade: At least one test of subgrade for every 185 m² (2000 square feet) of building slab, but in no case fewer than three tests. In each compacted fill layer, perform one test for every 185 m² (2000 square feet) of overlaying building slab, but in no case fewer than three tests.
 - b. Foundation Wall Backfill: One test per 30 m (100 feet) of each layer of compacted fill but in no case fewer than two tests.
 - c. Pavement Subgrade: One test for each 335 m² (400 square yards), but in no case fewer than two tests.
 - d. Curb, Gutter, and Sidewalk: One test for each 90 m (300 feet), but in no case fewer than two tests.
 - e. Trenches: One test at maximum 30 m (100 foot) intervals per 1200 mm (4 foot) of vertical lift and at changes in required density, but in no case fewer than two tests.
 - f. Footing Subgrade: At least one test for each layer of soil on which footings will be placed. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested subgrade when acceptable to Resident Engineer. In each compacted fill layer below wall footings, perform one field density test for every 30 m (100 feet) of wall. Verify subgrade is level, all loose or disturbed soils have been removed, and correlate actual soil conditions observed with those indicated by test borings.
- C. Fill and Backfill Material Gradation: One test per 100yardsstockpiled or in-place source material. Gradation of fill and backfill material

shall be determined in accordance with ASTM C136, ASTM D422 or ASTM D1140.

- D. Testing for Footing Bearing Capacity: Evaluate if suitable bearing capacity material is encountered in footing subgrade.
- E. Testing Materials: Test suitability of on-site and off-site borrow as directed by Contracting Officers Representative.

3.2 FOUNDATION PILES:

- A. Witness load test procedure for conformance with ASTM D1143 and interpret test data to verify geotechnical recommendations for pile capacity. Submit load test report in accordance with ASTM D1143.
- B. Review Contractor's equipment, methods, and procedures prior to starting any work on site. Provide continuous inspection of pile installation. Maintain a record of all pertinent phases of operation for submittal to Resident Engineer.
- C. Helical Piles: Test pile applications for conformance with specified strength requirements. Not less than six tests shall be made for each day of drilling / casting, evenly distributed among each footing site.
- D. Not Used
- E. Not Used

3.3 NOT USED

3.4 LANDSCAPING:

- A. Test topsoil for organic materials, pH, phosphate, potash content, and gradation of particles.
 - 1. Test for organic material by using ASTM D2974.
 - 2. Determine percent of silt, sand, clay, and foreign materials such as rock, roots, and vegetation.
- B. Submit laboratory test report of topsoil to Contracting Officers Representative.

3.5 NOT USED.

3.6 SITE WORK CONCRETE:

Test site work concrete including materials for concrete as required in Article CONCRETE of this section.

3.7 NOT USED.

3.8 CONCRETE:

- A. Batch Plant Inspection and Materials Testing:
 - 1. Perform continuous batch plant inspection until concrete quality is established to satisfaction of Resident Engineer with concurrence of

- Contracting Officer and perform periodic inspections thereafter as determined by Contracting Officers Representative.
2. Periodically inspect and test batch proportioning equipment for accuracy and report deficiencies to Contracting Officers Representative.
 3. Sample and test mix ingredients as necessary to insure compliance with specifications.
 4. Sample and test aggregates daily and as necessary for moisture content. Test the dry rodded weight of the coarse aggregate whenever a sieve analysis is made, and when it appears there has been a change in the aggregate.
 5. Certify, in duplicate, ingredients and proportions and amounts of ingredients in concrete conform to approved trial mixes. When concrete is batched or mixed off immediate building site, certify (by signing, initialing or stamping thereon) on delivery slips (duplicate) that ingredients in truck-load mixes conform to proportions of aggregate weight, cement factor, and water-cement ratio of approved trial mixes.
- B. Field Inspection and Materials Testing:
1. Provide a technician at site of placement at all times to perform concrete sampling and testing.
 2. Review the delivery tickets of the ready-mix concrete trucks arriving on-site. Notify the Contractor if the concrete cannot be placed within the specified time limits or if the type of concrete delivered is incorrect. Reject any loads that do not comply with the Specification requirements. Rejected loads are to be removed from the site at the Contractor's expense. Any rejected concrete that is placed will be subject to removal.
 3. Take concrete samples at point of placement in accordance with ASTM C172. Mold and cure compression test cylinders in accordance with ASTM C31. Make at least three cylinders for each 40 m³ (50 cubic yards) or less of each concrete type, and at least three cylinders for any one day's pour for each concrete type. Label each cylinder with an identification number. Contracting Officers Representative may require additional cylinders to be molded and cured under job conditions.

4. Perform slump tests in accordance with ASTM C143. Test the first truck each day, and every time test cylinders are made. Test pumped concrete at the hopper and at the discharge end of the hose at the beginning of each day's pumping operations to determine change in slump.
5. Determine the air content of concrete per ASTM C173. For concrete required to be air-entrained, test the first truck and every 20 m³ (25 cubic yards) thereafter each day. For concrete not required to be air-entrained, test every 80 m³ (100 cubic yards) at random. For pumped concrete, initially test concrete at both the hopper and the discharge end of the hose to determine change in air content.
6. If slump or air content fall outside specified limits, make another test immediately from another portion of same batch.
7. Perform unit weight tests in compliance with ASTM C138 for normal weight concrete and ASTM C567 for lightweight concrete. Test the first truck and each time cylinders are made.
8. Notify laboratory technician at batch plant of mix irregularities and request materials and proportioning check.
9. Verify that specified mixing has been accomplished.
10. Environmental Conditions: Determine the temperature per ASTM C1064 for each truckload of concrete during hot weather and cold weather concreting operations:
 - a. When ambient air temperature falls below 4.4 degrees C (40 degrees F), record maximum and minimum air temperatures in each 24 hour period; record air temperature inside protective enclosure; record minimum temperature of surface of hardened concrete.
 - b. When ambient air temperature rises above 29.4 degrees C (85 degrees F), record maximum and minimum air temperature in each 24 hour period; record minimum relative humidity; record maximum wind velocity; record maximum temperature of surface of hardened concrete.
11. Inspect the reinforcing steel placement, including bar size, bar spacing, top and bottom concrete cover, proper tie into the chairs, and grade of steel prior to concrete placement. Submit detailed report of observations.

12. Observe conveying, placement, and consolidation of concrete for conformance to specifications.
 13. Observe condition of formed surfaces upon removal of formwork prior to repair of surface defects and observe repair of surface defects.
 14. Observe curing procedures for conformance with specifications, record dates of concrete placement, start of preliminary curing, start of final curing, end of curing period.
 15. Observe preparations for placement of concrete:
 - a. Inspect handling, conveying, and placing equipment, inspect vibrating and compaction equipment.
 - b. Inspect preparation of construction, expansion, and isolation joints.
 16. Observe preparations for protection from hot weather, cold weather, sun, and rain, and preparations for curing.
 17. Observe concrete mixing:
 - a. Monitor and record amount of water added at project site.
 - b. Observe minimum and maximum mixing times.
 18. Measure concrete flatwork for levelness and flatness as follows:
 - a. Perform Floor Tolerance Measurements F_F and F_L in accordance with ASTM E1155. Calculate the actual overall F- numbers using the inferior/superior area method.
 - b. Perform all floor tolerance measurements within 48 hours after slab installation and prior to removal of shoring and formwork.
 - c. Provide the Contractor and the Contracting Officers Representative with the results of all profile tests, including a running tabulation of the overall F_F and F_L values for all slabs installed to date, within 72 hours after each slab installation.
 19. Other inspections:
 - a. Grouting under base plates.
 - b. Grouting anchor bolts and reinforcing steel in hardened concrete.
- C. Laboratory Tests of Field Samples:
1. Test compression test cylinders for strength in accordance with ASTM C39. For each test series, test one cylinder at 7 days and one cylinder at 28 days. Use remaining cylinder as a spare tested as directed by Contracting Officers Representative. Compile laboratory test reports as follows: Compressive strength test shall be result of one cylinder, except when one cylinder shows evidence of improper

sampling, molding or testing, in which case it shall be discarded and strength of spare cylinder shall be used.

2. Make weight tests of hardened lightweight structural concrete in accordance with ASTM C567.
3. Furnish certified compression test reports (duplicate) to Contracting Officers Representative. In test report, indicate the following information:
 - a. Cylinder identification number and date cast.
 - b. Specific location at which test samples were taken.
 - c. Type of concrete, slump, and percent air.
 - d. Compressive strength of concrete in MPa (psi).
 - e. Weight of lightweight structural concrete in kg/m³ (pounds per cubic feet).
 - f. Weather conditions during placing.
 - g. Temperature of concrete in each test cylinder when test cylinder was molded.
 - h. Maximum and minimum ambient temperature during placing.
 - i. Ambient temperature when concrete sample in test cylinder was taken.
 - j. Date delivered to laboratory and date tested.

3.9 NOT USED

3.10 NOT USED

3.11 NOT USED

3.12 NOT USED

3.13 MASONRY:

A. Mortar Tests:

1. Laboratory compressive strength test:
 - a. Comply with ASTM C780.
 - b. Obtain samples during or immediately after discharge from batch mixer.
 - c. Furnish molds with 50 mm (2 inch), 3 compartment gang cube.
 - d. Test one sample at 7 days and 2 samples at 28 days.
2. Two tests during first week of operation; one test per week after initial test until masonry completion.

B. Grout Tests:

1. Laboratory compressive strength test:

- a. Comply with ASTM C1019.
 - b. Test one sample at 7 days and 2 samples at 28 days.
 - c. Perform test for each 230 m² (2500 square feet) of masonry.
- C. Masonry Unit Tests:
- 1. Laboratory Compressive Strength Test:
 - a. Comply with ASTM C140.
 - b. Test 3 samples for each 460 m² (5000 square feet) of wall area.
- D. Prism Tests: For each type of wall construction indicated, test masonry prisms per ASTM C1314 for each 460 m² (5000 square feet) of wall area. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.

3.14 STRUCTURAL STEEL:

- A. General: Provide shop and field inspection and testing services to certify structural steel work is done in accordance with contract documents. Welding shall conform to AWS D1.1 Structural Welding Code.
- B. Prefabrication Inspection:
 - 1. Review design and shop detail drawings for size, length, type and location of all welds to be made.
 - 2. Approve welding procedure qualifications either by pre-qualification or by witnessing qualifications tests.
 - 3. Approve welder qualifications by certification or retesting.
 - 4. Approve procedure for control of distortion and shrinkage stresses.
 - 5. Approve procedures for welding in accordance with applicable sections of AWS D1.1.
- C. Fabrication and Erection:
 - 1. Weld Inspection:
 - a. Inspect welding equipment for capacity, maintenance and working condition.
 - b. Verify specified electrodes and handling and storage of electrodes in accordance with AWS D1.1.
 - c. Inspect preparation and assembly of materials to be welded for conformance with AWS D1.1.
 - d. Inspect preheating and interpass temperatures for conformance with AWS D1.1.
 - e. Measure 25 percent of fillet welds.

- f. Welding Magnetic Particle Testing: Test in accordance with ASTM E709 for a minimum of:
 - 1) 20 percent of all shear plate fillet welds at random, final pass only.
 - 2) 20 percent of all continuity plate and bracing gusset plate fillet welds, at random, final pass only.
 - 3) 100 percent of tension member fillet welds (i.e., hanger connection plates and other similar connections) for root and final passes.
 - 4) 20 percent of length of built-up column member partial penetration and fillet welds at random for root and final passes.
 - 5) 100 percent of length of built-up girder member partial penetration and fillet welds for root and final passes.
 - g. Welding Ultrasonic Testing: Test in accordance with ASTM E164 and AWS D1.1 for 100 percent of all full penetration welds, braced and moment frame column splices, and a minimum of 20 percent of all other partial penetration column splices, at random.
 - h. Not Used
 - i. Verify that correction of rejected welds are made in accordance with AWS D1.1.
 - j. Testing and inspection do not relieve the Contractor of the responsibility for providing materials and fabrication procedures in compliance with the specified requirements.
2. Bolt Inspection:
- a. Inspect high-strength bolted connections in accordance AISC Specifications for Structural Joints Using ASTM F3125 Bolts.
 - b. Slip-Critical Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in each connection in accordance with AISC Specifications for Structural Joints Using ASTM F3125 Bolts. Inspect all bolts in connection when one or more are rejected.
 - c. Fully Pre-tensioned Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in 25 percent of connections in accordance with AISC Specification for Structural

Joints Using ASTM F3125 Bolts. Inspect all bolts in connection when one or more are rejected.

- d. Bolts installed by turn-of-nut tightening may be inspected with calibrated wrench when visual inspection was not performed during tightening.
 - e. Snug Tight Connections: Inspect 10 percent of connections verifying that plies of connected elements have been brought into snug contact.
 - f. Inspect field erected assemblies; verify locations of structural steel for plumbness, level, and alignment.
- D. Submit inspection reports, record of welders and their certification, and identification, and instances of noncompliance to Contracting Officers Representative.

3.15 STEEL DECKING:

- A. Provide field inspection of welds of metal deck to the supporting steel, and testing services to insure steel decking has been installed in accordance with contract documents and manufacturer's requirements.
- B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS D1.1. Refer to the "Plug Weld Qualification Procedure" in Part 3 "Field Quality Control."
- C. Submit inspection reports, certification, and instances of noncompliance to Resident Engineer.

3.16 SHEAR CONNECTOR STUDS:

- A. Provide field inspection and testing services required by AWS D.1 to insure shear connector studs have been installed in accordance with contract documents.
- B. Tests: Test 20 percent of headed studs for fastening strength in accordance with AWS D1.1.
- C. Submit inspection reports, certification, and instances of noncompliance to Contracting Officers Representative.

3.17 SPRAYED-ON FIREPROOFING:

- A. Provide field inspection and testing services to certify sprayed-on fireproofing has been applied in accordance with contract documents.
- B. Obtain a copy of approved submittals from Contracting Officers Representative.

- C. Use approved installation in test areas as criteria for inspection of work.
- D. Test sprayed-on fireproofing for thickness and density in accordance with ASTM E605.
 - 1. Thickness gauge specified in ASTM E605 may be modified for pole extension so that overhead sprayed material can be reached from floor.
- E. Location of test areas for field tests as follows:
 - 1. Thickness: Select one bay per floor, or one bay for each 930 m² (10,000 square feet) of floor area, whichever provides for greater number of tests. Take thickness determinations from each of following locations: Metal deck, beam, and column.
 - 2. Density: Take density determinations from each floor, or one test from each 930 m² (10,000 square feet) of floor area, whichever provides for greater number of tests, from each of the following areas: Underside of metal deck, beam flanges, and beam web.
- F. Submit inspection reports, certification, and instances of noncompliance to Contracting Officers Representative.

3.18 NOT USED

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**SECTION 01 45 35
SPECIAL INSPECTIONS**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This guide specification will be applicable to both new buildings and existing building rehabilitations/renovations. In addition to the Special Inspection and testing specified requirements, a registered design professional must perform structural observations during construction. All observed deficiencies will be immediately reported to the Contracting Officer. The registered design professional performing these observations will be a representative of the Designer of Record (DOR) for the building being constructed.
- B. Structural observations are required for the following project conditions per IBC Chapter 17:
 - 1. Seismic Design Category D, E or F; and assigned to Risk Cat III, IV or V.
 - 2. Seismic Design Category D, E or F; and with a height greater than 22860 mm 75 ft.
 - 3. Seismic Design Category E, assigned to Risk Category I or II and the building is greater than two stories above grade plane.
 - 4. Nominal design wind speed in excess of 49 m/sec 110 mph; and assigned to Risk Cat III, IV or V.
 - 5. Nominal design wind speed in excess of 49 m/sec 110 mph; and with a height greater than 23 m 75 ft.

1.2 APPLICABLE PUBLICATIONS

- A. The publication listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
- B. American Society of Civil Engineers (ASCE)
 - 1. ASCE 7 - (2010; Errata 2011; Supp 2 2013) Minimum Design Loads for Buildings and Other Structures
- C. International Code Council (ICC)
 - 2. ICC IBC - (2015) International Building Code

1.3 **GENERAL REQUIREMENTS**

- A. Perform Special Inspections in accordance with the Statement of Special Inspections, Schedule of Special Inspections and Chapter 17 of ICC IBC. The Statement of Special Inspections and Schedule of Special Inspections are included as an attachment to this specification. Special Inspections are to be performed by an independent third party and are intended to ensure that the work of the prime contractor is in accordance with the Contract Documents and applicable building codes. Special inspections do not take the place of the three phases of control inspections performed by the Contractor's QC Manager or any testing and inspections required by other sections of the specifications.
- B. Structural observations will be performed by the Government. The contractor must provide notification to the Contracting Officer's Representative 14 days prior to the following points of construction that structural observations need to occur:

1.4 **DEFINITIONS**

- A. Continuous Special Inspections - The constant monitoring of specific tasks by a special inspector. These inspections must be carried out continuously over the duration of the particular tasks.
- B. Periodic Special Inspections - Special Inspections by the special inspector who is intermittently present where the work to be inspected has been or is being performed. Specific time interval on a specific Special Inspection should be indicated on the Schedule of Special Inspections.
- C. Perform - Perform these Special Inspections tasks for each welded joint or member.
- D. Observe - Observe these Special Inspections items on a random daily basis. Operations need not be delayed pending these inspections.
- E. Special Inspector (SI) - A qualified person retained by the contractor and approved by the Contracting Officer as having the competence necessary to inspect a particular type of construction requiring Special Inspections. The SI must be an independent third party hired directly by the Prime Contractor.
- F. Associate Special Inspector (ASI) - A qualified person who assists the SI in performing Special Inspections but must perform inspection under

the direct supervision of the SI and cannot perform inspections without the SI on site.

- G. Third Party - A third party inspector must not be company employee of the Contractor or any Sub-Contractor performing the work to be inspected.
- H. Special Inspector of Record (SIOR) - SIOR must be an independent third party hired directly by the Prime Contractor and is required for the following project conditions:
 - 1. Seismic Design Category D, E, or F; and assigned to Risk Category III, IV, or V.
 - 2. Seismic Design Category D, E, or F; and with a height greater than 22860mm 75 ft.
 - 3. Seismic Design Category E, assigned to Risk Category I or II and the building is greater than two (2) stories above grade plane.
 - 4. Nominal design wind speed in excess of 49 m/sec 100 mph; and assigned to Risk Category III, IV, or V.
 - 5. Nominal design wind speed in excess of 49 mm/sec 100mph; and with a height greater than 23m 75ft.
 - 6. In addition to these conditions, the DOR is encouraged to consider using an SIOR on large magnitude or critical projects where this additional level of quality control is affordable.
- I. Contracting Officer - The Government official having overall authority for administrative contracting actions. Certain contracting actions may be delegated to the Contracting Officer's Representative (COR).
- J. Contractor's Quality Control (QC) Manager - An individual retained by the prime contractor and qualified in accordance with the Section 01 45 00.00 10 QUALITY CONTROL having the overall responsibility for the contractor's QC organization.
- K. Designer of Record (DOR) - A registered design professional is contracted by the Government as an A/E responsible for the overall design and review of submittal documents prepared by others. The DOR is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws in state in which the design professional works. The DOR is also referred to as the Engineer of Record (EOR) in design code documents.

- L. Statement of Special Inspections (SSI) - A document developed by the DOR identifying the material, systems, components and work required to have Special Inspections and covering the following:
1. List of the Architectural Designated Seismic Systems - these components are in or attached to a Risk Category IV or V structure and are needed for continued operation of the facility or their failure could impair the continued operation of the facility.
 2. List of the Mechanical Designated Seismic Systems
 - a. For Seismic Design Category C or Risk V, list the following:
 - 1) Heating, ventilation, and air-conditioning (HVAC) ductwork containing hazardous materials and anchorage of such ductwork
 - 2) Piping systems and mechanical units containing flammable, combustible, or highly toxic materials.
 - b. For Seismic Design Category D, E, or F or Risk Category V list mechanical system that meet one of the following:
 - 1) Life safety component required to function after an earthquake
 - 2) Component that contains hazardous content,
 - 3) All components in an essential facility needed for continued operation after an earthquake.
 3. List of the Electrical Designated Systems
 - a. For Seismic Design Category C or Risk V, list the anchorage of electrical equipment used for emergency or standby power systems.
 - b. For Seismic Design Category D, E or F list electrical system that meet one of the following:
 - 1) Life safety component required to function after an earthquake
 - 2) Component that contains hazardous content,
 - 3) All components in an essential facility needed for continued operation after an earthquake.
 4. List of elements that are part of the progressive collapse resistance system.
 - a. Provide a description of the following as they apply:
 - 1) Elements of the tie force system consisting of internal longitudinal and transverse, vertical, and peripheral ties.
 - 2) Elements of the alternate path system.

- 3) Schedule of Special Inspections - A schedule which lists each of the required Special Inspections, the extent to which each Special Inspections is to be performed, and the required frequency for each in accordance with ICC IBC Chapter 17.
 - a) Designated Seismic System - Those nonstructural components that require design in accordance with ASCE 7 Chapter 13 and for which the component importance factor, I_p , is greater than 1.0. This designation applies to systems that are required to be operational following the Design Earthquake for RC I - IV structures and following the MCER for RC V structures. All systems in RC V facilities designated as MC-1 in accordance with UFC 3-310-04 are considered part of the Designated Seismic Systems.
 - b. Submittals: Government approval is required for all submittals. CQC Special Inspection reports shall be submitted under this Specification section and follow the [Special Inspection]: [Applicable Specification section or description] naming convention. Submit the following:
 - 1) SD-01 Preconstruction Submittals;
 - 2) SIOR Letter of Acceptance;
 - 3) Special Inspections Project Manual;
 - 4) Special Inspections Agency's Written Practices
 - 5) NDT Procedures and Equipment' Calibration Records;
 - 6) SD-06 Test Reports;
 - 7) Special Inspections
 - 8) Daily Reports;
 - 9) Special Inspections; Biweekly Reports;
 - 10) SD-07 Certificates;
 - 11) Fabrication Plant
 - 12) Steel Truss Plant;
 - 13) Wood Truss Plant;
 - 14) AC472 Accreditation;
 - 15) Steel Joist Institute Membership;
 - 16) Precast Concrete Institute (PCI) Certified Plant;
 - 17) Certificate of Compliance;
 - 18) Special Inspector of Record Qualifications;
 - 19) Special Inspector Qualifications;

- 20) Qualification Records for NDT technicians;
 - 21) SD-11 Closeout Submittals;
 - 22) Interim Final Report of Special Inspections;
 - 23) Comprehensive Final Report of Special Inspections;
- c. Special Inspector Qualifications: Submit qualifications for each SI, ASI, and the SIOR from the following certifying associations: Associated Air Balance Council (AABC); American Concrete Institute (ACI); Association of the Wall and Ceiling Industry (AWCI); American Welding Society (AWS); Factory Mutual (FM); International Code Council (ICC); Nondestructive Testing (NDT); National Institute for Certification in Engineering Technologies (NICET); Precast/Prestressed Concrete Institute (PCI); Post-Tensioning Institute (PTI); Underwriters Laboratories (UL). Qualifications should be in accordance with the following minimums; PM or COR can restrict qualifications to the higher standards shown if multiple options are shown for a role based on complexity of project.

QUALIFICATIONS

Area	Special Inspector	Associated Special Inspector	SIOR
Steel Construction and High Strength Bolting	ICC Structural Steel and Bolting Special Inspector certificate with on year of related experience, or Registered Professional Engineer with related experience.	Engineer-In-Training with one year of related experience.	
Welding Structural Steel (For highly complex steel use only AWS Certified Welding Inspectors)	ICC Welding Special Inspector certificate with one year of related experience or AWS Certified Welding Inspector	AWS Certified Associate Welding Inspector	
Nondestructive Testing of Welds	NDT Level II Certificate	NDT Level II Certificate plus one year of related	

Area	Special Inspector	Associated Special Inspector	SIOR
		experience	
Cold Formed Steel Framing	ICC Structural Steel and Bolting Special Inspector certificate with on year of related experience, or ICC Commercial Building Inspector with one year of experience; or Registered Professional Engineer with related experience.	Engineer-In-Training with one year of related experience.	
Concrete Construction	ICC Reinforced Concrete Special Inspector Certificate with one year of related experience, or ACI Concrete Construction Special Inspector, or NICET Concrete Technician Level III Certificate in Construction Materials Testing, or, Registered Professional Engineer with related experience	ACI Concrete Construction Special Inspector in Training, or Engineer-In-Training with one year of related experience	
Masonry Construction	ICC Structural Masonry Special Inspector Certificate with one year of related experience, or Registered Professional Engineer with related experience	Engineer-In-Training with one year of related experience	
Wood	ICC Commercial Building Inspector Certificate with one year of related experience, or ICC Residential Building Inspector with on	Engineer-In-Training with one year of related experience	

Area	Special Inspector	Associated Special Inspector	SIOR
	year of experience, or Registered Professional Engineer with related experience		
Verification of Site Soil Condition, Fill Placement, and Load-Bearing Requirements	ICC Soils Special Inspector Certificate with one year of related experience, or NICET Soils Technician Level II Certificate in Construction Material Testing, or NICET Geotechnical Engineering Technician Level II Construction or Generalist Certificate, or Geologist-In-Training with one year of related experience, or Registered Professional Engineer with related experience	NICET Soils Technician Level I Certificate in Construction Material Testing with one year of related experience, or NICET Geotechnical Engineering Technician Level I Construction, or Generalist Certificate with one year of related experience, or Engineer-In-Training with one year of related experience	
Deep Foundations	NICET Soils Technician Level II Certificate in Construction Material Testing, or NICET Geotechnical Engineering Technician Level II Construction or Generalist Certificate, or Geologist-In-Training with one year of related experience, or Registered Professional Engineer with related experience	NICET Soils Technician Level I Certificate in Construction Material Testing with one year of related experience, or NICET Geotechnical Engineering Technician Level I Construction or Generalist Certificate with one year of related experience, or Engineer-In-Training with one year of related experience	
Sprayed Fire Resistant Manual	ICC Spray-applied Fireproofing Special Inspector	Engineer-In-Training with one year of related experience	

Area	Special Inspector	Associated Special Inspector	SIOR
	Certificate, or ICC Fire Inspector I Certificate with one year of related experience, or Registered Professional Engineer with related experience		
Mastic and Intumescent Fire Resistant Coatings	ICC Spray-applied Fireproofing Special Inspector Certificate, or ICC Fire Inspector I Certificate with one year of related experience, or Registered Professional Engineer with related experience	Engineer-In-Training with one year of related experience.	
Exterior Insulation and Finish Systems (EIFS)	AWCI EIFS Inspector Certificate, or Exterior Design Institute Certificate, or Registered Professional Engineer with related experience	Engineer-In-Training with one year of related experience	
Fire-Resistant Penetrations and Joints	Passed the UL Firestop Exam with one year of related experience, or Passed the FM Firestop Exam with one year of related experience, or Registered Professional Engineer with related experience	Engineer-In-Training with one year of related experience.	
Smoke Control	AABC Technician Certification with one year of related experience, or Registered	Engineer-In-Training with one year of related experience.	

Area	Special Inspector	Associated Special Inspector	SIOR
	Professional Engineer with related experience		
SIOR			Registered Professional Engineer

PART 2 - PRODUCTS

2.1 FABRICATORS SPECIAL INSPECTION

- A. Special Inspections of fabricator's work performed in the fabricator's shop is required to be inspected in accordance with the Statement of Special Inspections and the Schedule of Special Inspections unless the fabricator is certified by the approved agency to perform such work without Special Inspections. Submit the applicable certification(s) from the following list to the Contracting Officer for information to allow work performed in the fabricator's shop to not be subjected to Special Inspections.
- B. The following certifications meet the requirements for fabricator approval in accordance with paragraph 1704.2.5.2 of IBC:
 - 1. American Institute of Steel Construction (AISC) Certified Fabrication Plant, Category STD.
 - 2. Truss Plate Institute (TPI) steel truss plant quality assurance program certification.
 - 3. Truss Plate Institute (TPI) wood truss plant quality assurance program certification.
 - 4. International Accreditation Service, AC472 Accreditation Steel Joist Institute Membership
 - 5. Precast Concrete Institute (PCI) Certified Plant, Group C
- C. At the completion of fabrication, submit a certificate of compliance, to be included with the comprehensive final report of Special **Inspections, stating that the materials supplied and work performed by the fabricator are in accordance the construction documents.**

PART 3 - EXECUTION

3.1 RESPONSIBILITIES MATRIX

Inspector	Responsibility	Condition
SIOR	a. Supervise all Special Inspectors required by the contract documents and the IBC. b. Submit a SIOR Letter of Acceptance to the Contracting Officer attesting to acceptance of the duties of SIOR, signed and sealed by the SIOR. c. Verify the qualifications of all of the Special Inspectors. d. Verify the qualifications of fabricators.	Applicable when SIOR is required
	e. Submit Special Inspections agency's written practices for the monitoring and control of the agency's operations to include the following: <ol style="list-style-type: none"> 1. The agency's procedures for the selection and administration of inspection personnel, describing the training, experience and examination requirements for qualifications and certification of inspection personnel. 2. The agency's inspection procedures, including general inspection, material controls, and visual welding inspection. f. Submit qualification records for nondestructive testing (NDT) technicians designated for the project. Submit NDT procedures and equipment calibration records for NDT to be performed and equipment to be used for the project.	Applicable when SIOR is required and when the structural design is required to follow AISC341 for seismic design of steel structures
	g. Prepare a Special Inspections Project Manual, which will cover the following: <ol style="list-style-type: none"> 1. Roles and responsibilities of the following individuals during Special Inspections: SIOR, SI, General Contractor, Subcontractors, QC Manager, and DOR. 2. Organizational chart and/or communication plan, indicating lines of communication 3. Contractor's internal plan for scheduling inspections. Address items such as timeliness of inspection requests, who to contact for inspection requests, and availability of alternate inspectors. Contractor's internal plan for scheduling inspections. Address items such as timeliness of inspection requests, who to contact for inspection requests, and availability of alternate 	Applicable when SIOR is required

Inspector	Responsibility	Condition
	<p>inspectors.</p> <ol style="list-style-type: none"> 4. Indicate the government reporting procedures. 5. Propose forms or templates to be used by SI and SIOR to document inspections. 6. Indicate procedures for tracking nonconforming work and verification that corrective work is complete. 7. Indicate how the SIOR and/or SI will participate in weekly QC meetings. 8. Indicate how Special Inspections of shop fabricated items will be handled when the fabricator's shop is not certified per paragraph FABRICATOR SPECIAL INSPECTIONS. 9. Include a section in the manual that covers each specific item requiring Special Inspections that is indicated on the Schedule of Special Inspections. Provide names and qualifications of each special inspector who will be performing the Special Inspections for each specific item. Provide detail on how the Special Inspections are to be carried out for each item so that the expectations are clear for the General Contractor and the Subcontractor performing the work. Make a copy of the Special Inspections Project Manual available on the job site during construction. Submit a copy of the Special Inspections Project Manual for approval. h. Attend coordination and mutual understanding meeting where the information in the Special Inspections Project Manual will be reviewed to verify that all parties have a clear understanding of the Special Inspections provisions and the individual duties and responsibilities of each party. i. Maintain a 3- ring binder for the Special Inspector's daily and biweekly reports and the Special Inspections Project Manual. This file must be located in a conspicuous place in the project trailer/office to allow review by the Contracting Officer and the DOR. j. Submit a copy of the Special Inspector's daily reports to the QC Manager. k. Discrepancies that are observed during Special Inspections must be reported to the QC Manager for correction. If discrepancies are not corrected before the special inspector leaves the site the observed discrepancies must be 	

Inspector	Responsibility	Condition
	<p>documented in the daily report.</p> <ol style="list-style-type: none"> 1. Submit a biweekly Special Inspections report until all work requiring Special Inspections is complete. A report is required for each biweekly period in which Special Inspections activity occurs, and must include the following: <ol style="list-style-type: none"> 1. A brief summary of the work performed during the reporting time frame. 2. Changes and/or discrepancies with the drawings, specifications, and mechanical or electrical component certification if they require seismic systems, that were observed during the reporting period. 3. Discrepancies which were resolved or corrected. 4. A list of nonconforming items requiring resolution. 5. All applicable test results including nondestructive testing reports. 	
QC Manager	<ol style="list-style-type: none"> a. If there is no SIOR, QC Manager must Supervise all Special Inspectors required by the contract documents and the IBC; Verify the qualifications of all of the Special Inspectors; Verify the qualifications of fabricators; Maintain a 3-ring binder for the Special Inspector's daily and biweekly reports. This file must be located in a conspicuous place in the project trailer/office to allow review by the Contracting Officer and the DOR. 	Applicable when SIOR is not required
	<ol style="list-style-type: none"> b. Maintain a rework items list that includes discrepancies noted on the Special Inspectors daily report. 	n/a
Special Inspectors	<ol style="list-style-type: none"> a. Inspect all elements of the project for which the special inspector is qualified to inspect and are identified in the Schedule of Special Inspections. b. Attend preparatory phase meetings related to the Definable Feature of Work (DFOW) for which the special inspector is qualified to inspect. 	
	<ol style="list-style-type: none"> c. Submit Special Inspections agency's written practices for the monitoring and control of the agency's operations to include the following: <ol style="list-style-type: none"> 1. The agency's procedures for the selection and 	Applicable when SIOR is NOT required and when the structural

Inspector	Responsibility	Condition
	<p>administration of inspection personnel, describing the training, experience and examination requirements for qualifications and certification of inspection personnel.</p> <p>2. The agency's inspection procedures, including general inspection, material controls, and visual welding inspection.</p> <p>d. Submit qualification records for nondestructive testing (NDT) technicians designated for the project.</p> <p>e. Submit NDT procedures and equipment calibration records for NDT to be performed and equipment to be used for the project.]</p>	<p>design is required to follow AISC 341 for seismic design of steel structures</p>
	<p>f. Submit a copy of the daily reports to the QC Manager.</p> <p>g. Discrepancies that are observed during Special Inspections must be reported to the QC Manager for correction. If discrepancies are not corrected before the special inspector leaves the site the observed discrepancies must be documented in the daily report.</p> <p>h. Submit a biweekly Special Inspection Report until all inspections are complete. A report is required for each biweekly period in which Special Inspections activity occurs, and must include the following:</p> <ol style="list-style-type: none"> 1. A brief summary of the work performed during the reporting time frame 2. Changes and/or discrepancies with the drawings, specifications, and mechanical or electrical component certification if they require seismic systems that were observed during the reporting period. 3. Discrepancies which were resolved or corrected. 4. A list of nonconforming items requiring resolution. 5. All applicable test result including nondestructive testing reports. <p>j. At the completion of the project submit a comprehensive final report of Special Inspections that documents the Special Inspections completed for the project and corrections of all discrepancies noted in the daily reports. The comprehensive final report of Special Inspections must be signed, dated and indicate the certification of the special</p>	<p>Applicable when SIOR is not required</p>

Inspector	Responsibility	Condition
	inspector qualifying them to conduct the inspection.	
	k. Submit daily reports to the SIOR	Applicable when SIOR is required

3.2 DEFECTIVE WORK

Check work as it progresses, but failure to detect any defective work or materials must in no way prevent later rejection if defective work or materials are discovered, nor obligate the Government to accept such work.

-- End of Section -

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SECTION 01 57 19
TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the control of environmental pollution and damage that the Contractor must consider for air, water, and land resources. It includes management of visual aesthetics, noise, solid waste, radiant energy, and radioactive materials, as well as other pollutants and resources encountered or generated by the Contractor. The Contractor is obligated to consider specified control measures with the costs included within the various contract items of work.
- B. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:
1. Adversely effect human health or welfare,
 2. Unfavorably alter ecological balances of importance to human life,
 3. Effect other species of importance to humankind, or;
 4. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.
- C. Definitions of Pollutants:
1. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes.
 2. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.
 3. Sediment: Soil and other debris that has been eroded and transported by runoff water.
 4. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, and agricultural operations and from community activities.
 5. Surface Discharge: The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "water of the United States" and would require a permit to discharge water from the governing agency.
 6. Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass and crockery, metal and lumber scrap, tin cans, and bones.

7. Sanitary Wastes:

- a. Sewage: Domestic sanitary sewage and human and animal waste.
- b. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.2 QUALITY CONTROL

- A. Establish and maintain quality control for the environmental protection of all items set forth herein.
- B. Record on daily reports any problems in complying with laws, regulations, and ordinances. Note any corrective action taken.

1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. U.S. National Archives and Records Administration (NARA):
33 CFR 328.....Definitions

1.4 SUBMITTALS

- A. In accordance with Section, 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:
 - 1. Environmental Protection Plan: After the contract is awarded and prior to the commencement of the work, the Contractor shall meet with the COR to discuss the proposed Environmental Protection Plan and to develop mutual understanding relative to details of environmental protection. Not more than 20 days after the meeting, the Contractor shall prepare and submit to the COR and the Contracting Officer for approval, a written and/or graphic Environmental Protection Plan including, but not limited to, the following:
 - a. Name(s) of person(s) within the Contractor's organization who is (are) responsible for ensuring adherence to the Environmental Protection Plan.
 - b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site.
 - c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.
 - d. Description of the Contractor's environmental protection personnel training program.
 - e. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control, noise control and abatement that are applicable to the Contractor's

proposed operations and the requirements imposed by those laws, regulations, and permits.

- f. Methods for protection of features to be preserved within authorized work areas including trees, shrubs, vines, grasses, ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, and archeological and cultural resources.
 - g. Procedures to provide the environmental protection that comply with the applicable laws and regulations. Describe the procedures to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures as described in the Environmental Protection Plan.
 - h. Permits, licenses, and the location of the solid waste disposal area.
 - i. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials. Include as part of an Erosion Control Plan approved by the District Office of the U.S. Soil Conservation Service and the Department of Veterans Affairs.
 - j. Environmental Monitoring Plans for the job site including land, water, air, and noise.
 - k. Work Area Plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas. This plan may be incorporated within the Erosion Control Plan.
- B. Approval of the Contractor's Environmental Protection Plan will not relieve the Contractor of responsibility for adequate and continued control of pollutants and other environmental protection measures.

1.5 PROTECTION OF ENVIRONMENTAL RESOURCES

- A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this contract. Confine activities to areas defined by the specifications and drawings.
- B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without permission from the COR. Do not fasten or attach ropes, cables, or guys to trees for

anchorage unless specifically authorized, or where special emergency use is permitted.

1. Work Area Limits: Prior to any construction, mark the areas that require work to be performed under this contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
2. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.
 - a. Box and protect from damage existing trees and shrubs to remain on the construction site.
 - b. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
 - c. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
3. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
4. Temporary Protection of Disturbed Areas: Construct diversion ditches, benches, and berms to retard and divert runoff from the construction site to protected drainage areas approved under paragraph 208 of the Clean Water Act.
 - a. Sediment Basins: Trap sediment from construction areas in temporary sediment basins that accommodate the runoff of a local storm. After each storm, pump the basins dry and remove the accumulated sediment. Control overflow/drainage with paved weirs or by vertical overflow pipes, draining from the surface.
 - b. Reuse or conserve the collected topsoil sediment as directed by the Resident Engineer. Topsoil use and requirements are specified in Section 31 20 00, EARTH MOVING.
 - c. Institute effluent quality monitoring programs as required by Federal, State, and local environmental agencies.
5. Erosion and Sedimentation Control Devices: The erosion and sediment controls selected and maintained by the Contractor shall be such that

- water quality standards are not violated as a result of the Contractor's activities. Construct or install all temporary erosion and sedimentation control features shown. Maintain temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basins, grassing, and mulching, until permanent drainage and erosion control facilities are completed and operative.
6. Manage borrow areas on Government property to minimize erosion and to prevent sediment from entering nearby water courses or lakes.
 7. Manage and control spoil areas on Government property to limit spoil to areas shown and prevent erosion of soil or sediment from entering nearby water courses or lakes.
 8. Protect adjacent areas from despoilment by temporary excavations and embankments.
 9. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule. Transport all solid waste off Government property and dispose of waste in compliance with Federal, State, and local requirements.
 10. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
 11. Handle discarded materials other than those included in the solid waste category as directed by the COR.
- C. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this contract.
1. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in retention ponds allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.
 2. Control movement of materials and equipment at stream crossings during construction to prevent violation of water pollution control standards of the Federal, State, or local government.
 3. Monitor water areas affected by construction.
- D. Protection of Fish and Wildlife Resources: Keep construction activities under surveillance, management, and control to minimize interference

with, disturbance of, or damage to fish and wildlife. Prior to beginning construction operations, list species that require specific attention along with measures for their protection.

- E. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State of South Dakota and State Air Pollution Statue, Rule, or Regulation and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.
1. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.
 2. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinklering, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.
 3. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
 4. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- F. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the COR. Maintain noise-produced work at or below the decibel levels and within the time periods specified.
1. Perform construction activities involving repetitive, high-level impact noise only between 8:00a.m. and 6:00p.m unless otherwise permitted by local ordinance or the COR. Repetitive impact noise on the property shall not exceed the following dB limitations:

Time Duration of Impact Noise	Sound Level in dB
More than 12 minutes in any hour	70

Less than 30 seconds of any hour	85
Less than three minutes of any hour	80
Less than 12 minutes of any hour	75

2. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this contract, consisting of, but not limited to, the following:

a. Maintain maximum permissible construction equipment noise levels at 15 m (50 feet) (dBA):

EARTHMOVING		MATERIALS HANDLING	
FRONT LOADERS	75	CONCRETE MIXERS	75
BACKHOES	75	CONCRETE PUMPS	75
DOZERS	75	CRANES	75
TRACTORS	75	DERRICKS IMPACT	75
SCAPERS	80	PILE DRIVERS	95
GRADERS	75	JACK HAMMERS	75
TRUCKS	75	ROCK DRILLS	80
PAVERS, STATIONARY	80	PNEUMATIC TOOLS	80
PUMPS	75		
GENERATORS	75	SAWS	75
COMPRESSORS	75	VIBRATORS	75

- b. Use shields or other physical barriers to restrict noise transmission.
- c. Provide soundproof housings or enclosures for noise-producing machinery.
- d. Use efficient silencers on equipment air intakes.
- e. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
- f. Line hoppers and storage bins with sound deadening material.
- g. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.

3. Measure sound level for noise exposure due to the construction at least once every five successive working days while work is being performed above 55 dB(A) noise level. Measure noise exposure at the property line or 15 m (50 feet) from the noise source, whichever is greater. Measure the sound levels on the A weighing network of a

General Purpose sound level meter at slow response. To minimize the effect of reflective sound waves at buildings, take measurements at 900 to 1800 mm (three to six feet) in front of any building face.

Submit the recorded information to the COR noting any problems and the alternatives for mitigating actions.

- G. Restoration of Damaged Property: If any direct or indirect damage is done to public or private property resulting from any act, omission, neglect, or misconduct, the Contractor shall restore the damaged property to a condition equal to that existing before the damage at no additional cost to the Government. Repair, rebuild, or restore property as directed or make good such damage in an acceptable manner.
- H. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition satisfactory to the Resident Engineer. Cleaning shall include off the station disposal of all items and materials not required to be salvaged, as well as all debris and rubbish resulting from demolition and new work operations.

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SECTION 01 58 16
TEMPORARY INTERIOR SIGNAGE

PART 1 GENERAL

DESCRIPTION

This section specifies temporary interior signs.

PART 2 PRODUCTS

2.1 TEMPORARY SIGNS

- A. Fabricate from 50 Kg (110 pound) mat finish white paper.
- B. Cut to 100 mm (4-inch) wide by 300 mm (12 inch) long size tag.
- C. Punch 3 mm (1/8-inch) diameter hole centered on 100 mm (4-inch) dimension of tag. Edge of Hole spaced approximately 13 mm (1/2-inch) from one end on tag.
- D. Reinforce hole on both sides with gummed cloth washer or other suitable material capable of preventing tie pulling through paper edge.
- E. Ties: Steel wire 0.3 mm (0.0120-inch) thick, attach to tag with twist tie, leaving 150 mm (6-inch) long free ends.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install temporary signs attached to room door frame or room door knob, lever, or pull for doors on corridor openings.
- B. Mark on signs with felt tip marker having approximately 3 mm (1/8-inch) wide stroke for clearly legible numbers or letters.
- C. Identify room with numbers as designated on floor plans.

3.2 LOCATION

- A. Install on doors that have room, corridor, and space numbers shown.
- B. Doors that do not require signs are as follows:
 - 1. Corridor barrier doors (cross-corridor) in corridor with same number.
 - 2. Folding doors or partitions.
 - 3. Toilet or bathroom doors within and between rooms.
 - 4. Communicating doors in partitions between rooms with corridor entrance doors.
 - 5. Closet doors within rooms.
- C. Replace missing, damaged, or illegible signs.

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SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the requirements for the management of non-hazardous building construction and demolition waste.
- B. Waste disposal in landfills shall be minimized to the greatest extent possible. Of the inevitable waste that is generated, as much of the waste material as economically feasible shall be salvaged, recycled or reused.
- C. Contractor shall use all reasonable means to divert construction and demolition waste from landfills and incinerators, and facilitate their salvage and recycle not limited to the following:
 - 1. Waste Management Plan development and implementation.
 - 2. Techniques to minimize waste generation.
 - 3. Sorting and separating of waste materials.
 - 4. Salvage of existing materials and items for reuse or resale.
 - 5. Recycling of materials that cannot be reused or sold.
- D. At a minimum, the following waste categories shall be diverted from landfills:
 - 1. Soil.
 - 2. Inerts (eg, concrete, masonry and asphalt).
 - 3. Clean dimensional wood and palette wood.
 - 4. Green waste (biodegradable landscaping materials).
 - 5. Engineered wood products (plywood, particle board and I-joists, etc).
 - 6. Metal products (eg, steel, wire, beverage containers, copper, etc).
 - 7. Cardboard, paper and packaging.
 - 8. Bitumen roofing materials.
 - 9. Plastics (eg, ABS, PVC).
 - 10. Carpet and/or pad.
 - 11. Gypsum board.
 - 12. Insulation.
 - 13. Paint.
 - 14. Fluorescent lamps.

1.2 RELATED WORK

- A. Section 02 41 00, DEMOLITION.

B. Section 01 00 00, GENERAL REQUIREMENTS.

C. Lead Paint: Section 02 83 33.13, LEAD BASED PAINT REMOVAL AND DISPOSAL.

1.3 QUALITY ASSURANCE

A. Contractor shall practice efficient waste management when sizing, cutting and installing building products. Processes shall be employed to ensure the generation of as little waste as possible. Construction /Demolition waste includes products of the following:

1. Excess or unusable construction materials.
2. Packaging used for construction products.
3. Poor planning and/or layout.
4. Construction error.
5. Over ordering.
6. Weather damage.
7. Contamination.
8. Mishandling.
9. Breakage.

B. Establish and maintain the management of non-hazardous building construction and demolition waste set forth herein. Conduct a site assessment to estimate the types of materials that will be generated by demolition and construction.

C. Contractor shall develop and implement procedures to recycle construction and demolition waste to a minimum of 50 percent.

D. Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling. Any revenues or savings obtained from salvage or recycling shall accrue to the contractor.

E. Contractor shall provide all demolition, removal and legal disposal of materials. Contractor shall ensure that facilities used for recycling, reuse and disposal shall be permitted for the intended use to the extent required by local, state, federal regulations. The Whole Building Design Guide website <http://www.wbdg.org/tools/cwm.php> provides a Construction Waste Management Database that contains information on companies that haul, collect, and process recyclable debris from construction projects.

F. Contractor shall assign a specific area to facilitate separation of materials for reuse, salvage, recycling, and return. Such areas are to

be kept neat and clean and clearly marked in order to avoid contamination or mixing of materials.

- G. Contractor shall provide on-site instructions and supervision of separation, handling, salvaging, recycling, reuse and return methods to be used by all parties during waste generating stages.
- H. Record on daily reports any problems in complying with laws, regulations and ordinances with corrective action taken.

1.4 TERMINOLOGY

- A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial and industrial waste resulting from construction, remodeling, repair and demolition operations.
- B. Clean: Untreated and unpainted; uncontaminated with adhesives, oils, solvents, mastics and like products.
- C. Construction and Demolition Waste: Includes all non-hazardous resources resulting from construction, remodeling, alterations, repair and demolition operations.
- D. Dismantle: The process of parting out a building in such a way as to preserve the usefulness of its materials and components.
- E. Disposal: Acceptance of solid wastes at a legally operating facility for the purpose of land filling (includes Class III landfills and inert fills).
- F. Inert Backfill Site: A location, other than inert fill or other disposal facility, to which inert materials are taken for the purpose of filling an excavation, shoring or other soil engineering operation.
- G. Inert Fill: A facility that can legally accept inert waste, such as asphalt and concrete exclusively for the purpose of disposal.
- H. Inert Solids/Inert Waste: Non-liquid solid resources including, but not limited to, soil and concrete that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional water board, and does not contain significant quantities of decomposable solid resources.
- I. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.
- J. Mixed Debris Recycling Facility: A solid resource processing facility that accepts loads of mixed construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing non-recyclable materials.

- K. Permitted Waste Hauler: A company that holds a valid permit to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.
- L. Recycling: The process of sorting, cleansing, treating, and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
 - 1. On-site Recycling - Materials that are sorted and processed on site for use in an altered state in the work, i.e. concrete crushed for use as a sub-base in paving.
 - 2. Off-site Recycling - Materials hauled to a location and used in an altered form in the manufacture of new products.
- M. Recycling Facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of new products. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a solid waste facilities permit or be regulated by the local enforcement agency.
- N. Reuse: Materials that are recovered for use in the same form, on-site or off-site.
- O. Return: To give back reusable items or unused products to vendors for credit.
- P. Salvage: To remove waste materials from the site for resale or re-use by a third party.
- Q. Source-Separated Materials: Materials that are sorted by type at the site for the purpose of reuse and recycling.
- R. Solid Waste: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.
- S. Transfer Station: A facility that can legally accept solid waste for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal, or recovering some materials for re-use or recycling.

1.5 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES, furnish the following:

- B. Prepare and submit to the COR a written demolition debris management plan. The plan shall include, but not be limited to, the following information:
1. Procedures to be used for debris management.
 2. Techniques to be used to minimize waste generation.
 3. Analysis of the estimated job site waste to be generated:
 - a. List of each material and quantity to be salvaged, reused, recycled.
 - b. List of each material and quantity proposed to be taken to a landfill.
 4. Detailed description of the Means/Methods to be used for material handling.
 - a. On site: Material separation, storage, protection where applicable.
 - b. Off site: Transportation means and destination. Include list of materials.
 - 1) Description of materials to be site-separated and self-hauled to designated facilities.
 - 2) Description of mixed materials to be collected by designated waste haulers and removed from the site.
 - c. The names and locations of mixed debris reuse and recycling facilities or sites.
 - d. The names and locations of trash disposal landfill facilities or sites.
 - e. Documentation that the facilities or sites are approved to receive the materials.
- C. Designated Manager responsible for instructing personnel, supervising, documenting and administer over meetings relevant to the Waste Management Plan.
- D. Monthly summary of construction and demolition debris diversion and disposal, quantifying all materials generated at the work site and disposed of or diverted from disposal through recycling.

1.6 APPLICABLE PUBLICATIONS

- A Publications listed below form a part of this specification to the extent referenced. Publications are referenced by the basic designation only. In the event that criteria requirements conflict, the most stringent requirements shall be met.

B. U.S. Green Building Council (USGBC):

LEED Green Building Rating System for New Construction

1.7 RECORDS

Maintain records to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. Records shall be kept in accordance with the LEED Reference Guide and LEED Template.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. List of each material and quantity to be salvaged, recycled, reused.
- B. List of each material and quantity proposed to be taken to a landfill.
- C. Material tracking data: Receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices, net total costs or savings.

PART 3 - EXECUTION

3.1 COLLECTION

- A. Provide all necessary containers, bins and storage areas to facilitate effective waste management.
- B. Clearly identify containers, bins and storage areas so that recyclable materials are separated from trash and can be transported to respective recycling facility for processing.
- C. Hazardous wastes shall be separated, stored, disposed of according to local, state, federal regulations.

3.2 DISPOSAL

- A. Contractor shall be responsible for transporting and disposing of materials that cannot be delivered to a source-separated or mixed materials recycling facility to a transfer station or disposal facility that can accept the materials in accordance with state and federal regulations.
- B. Construction or demolition materials with no practical reuse or that cannot be salvaged or recycled shall be disposed of at a landfill or incinerator.

3.3 REPORT

- A. With each application for progress payment, submit a summary of construction and demolition debris diversion and disposal including beginning and ending dates of period covered.

- B. Quantify all materials diverted from landfill disposal through salvage or recycling during the period with the receiving parties, dates removed, transportation costs, weight tickets, manifests, invoices. Include the net total costs or savings for each salvaged or recycled material.
- C. Quantify all materials disposed of during the period with the receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices. Include the net total costs for each disposal.

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SECTION 01 81 13
SUSTAINABLE CONSTRUCTION REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section describes general requirements and procedures to comply with federal mandates and U.S. Department of Veterans Affairs (VA) policies for sustainable construction.
- B. The Design Professional has selected materials and utilized integrated design processes that achieve the Government's objectives. Contractor is responsible to maintain and support these objectives in developing means and methods for performing work and in proposing product substitutions or changes to specified processes. Obtain approval from Contracting Officer for all changes and substitutions to materials or processes. Proposed changes must meet, or exceed, materials or processes specified.

1.2 RELATED WORK

- A. Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS.
- B. Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT.
- C. NOT USED
- D. NOT USED
- E. NOT USED
- F. NOT USED
- G. Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.

1.3 DEFINITIONS

- A. Recycled Content: Recycled content of materials is defined according to Federal Trade Commission Guides for the Use of Environmental Marketing Claims (16 CFR Part 260). Recycled content value of a material assembly is determined by weight. Recycled fraction of assembly is multiplied by cost of assembly to determine recycled content value.
 - 1. "Post-Consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
 - 2. "Pre-Consumer" material is defined as material diverted from waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a

process and capable of being reclaimed within the same process that generated it.

- B. **Biobased Products:** Biobased products are derived from plants and other renewable agricultural, marine, and forestry materials and provide an alternative to conventional petroleum derived products. Biobased products include diverse categories such as lubricants, cleaning products, inks, fertilizers, and bioplastics.
- C. **Low Pollutant-Emitting Materials:** Materials and products which are minimally odorous, irritating, or harmful to comfort and well-being of installers and occupants.
- D. **Volatile Organic Compounds (VOC):** Chemicals that are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects.

1.4 REFERENCE STANDARDS

- A. Carpet and Rug Institute Green Label Plus program.
- B. U.S. Department of Agriculture BioPreferred program (USDA BioPreferred).
- C. U.S. Environmental Protection Agency Comprehensive Procurement Guidelines (CPG).
- D. U.S. Environmental Protection Agency WaterSense Program (WaterSense).
- E. U.S. Environmental Protection Agency ENERGY STAR Program (ENERGY STAR).
- F. U. S. Department of Energy Federal Energy Management Program (FEMP).
- G. Green Electronic Council EPEAT Program (EPEAT).

1.5 SUBMITTALS

- A. All submittals to be provided by contractor to COR.
- B. Sustainability Action Plan:
 - 1. Submit documentation as required by this section; provide additional copies of typical submittals required under technical sections when sustainable construction requires copies of record submittals.
 - 2. Within 30 days after Preconstruction Meeting provide a narrative plan for complying with requirements stipulated within this section.
 - 3. Sustainability Action Plan must:
 - a. Make reference to sustainable construction submittals defined by this section.
 - b. Address all items listed under PERFORMANCE CRITERIA.
 - c. Indicate individual(s) responsible for implementing the plan.

- C. Low Pollutant-Emitting Materials Tracking Spreadsheet: Within 30 days after Preconstruction Meeting provide a preliminary Low Pollutant-Emitting Materials Tracking Spreadsheet. The Low Pollutant-Emitting Materials Tracking Spreadsheet must be an electronic file and include all materials on Project in categories described under Low Pollutant-Emitting Materials in 01 81 13.
- D. Construction Indoor Air Quality (IAQ) Management Plan:
1. Not more than 30 days after Preconstruction Meeting provide a Construction IAQ Management Plan as an electronic file including descriptions of the following:
 - a. Instruction procedures for meeting or exceeding minimum requirements of ANSI/SMACNA 008-2008, Chapter 3, including procedures for HVAC Protection, Source Control, Pathway Interruption, Housekeeping, and Scheduling.
 - b. Instruction procedures for protecting absorptive materials stored on-site or installed from moisture damage.
 - c. Schedule of submission of photographs of on-site construction IAQ management measures such as protection of ducts and on-site stored oil installed absorptive materials.
 - d. Instruction procedures if air handlers must be used during construction, including a description of filtration media to be used at each return air grille.
 - e. Instruction procedure for replacing all air-filtration media immediately prior to occupancy after completion of construction, including a description of filtration media to be used at each air handling or air supply unit.
 - f. Instruction procedures and schedule for implementing building flush-out.
- E. Product Submittals:
1. Recycled Content: Submit product data from manufacturer indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content (excluding MEP systems equipment and components).
 2. Biobased Content: Submit product data for products to be installed or used which are included in any of the USDA BioPreferred program's product categories. Data to include percentage of biobased content and source of biobased material.

3. Low Pollutant-Emitting Materials: Submit product data confirming compliance with relevant requirements for all materials on Project in categories described under Low Pollutant-Emitting Materials in 01 81 13.
 4. For applicable products and equipment, submit product documentation confirming ENERGY STAR label, FEMP certification, WaterSense, and/or EPEAT certification.
- F. Sustainable Construction Progress Reports: Concurrent with each Application for Payment, submit a Sustainable Construction Progress Report to confirm adherence with Sustainability Action Plan.
1. Include narratives of revised strategies for bringing work progress into compliance with plan and product submittal data.
 2. Include updated and current Low Pollutant-Emitting Materials Tracking Spreadsheet.
 3. Include construction waste tracking, in tons or cubic yards, including waste description, whether diverted or landfilled, hauler, and percent diverted for comingled quantities; and excluding land-clearing debris and soil. Provide haul receipts and documentation of diverted percentages for comingled wastes.
- G. Closeout Submittals: Within 14 days after Substantial Completion provide the following:
1. Final version of Low Pollutant-Emitting Materials Tracking Spreadsheet.
 2. Manufacturer's cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for filtration media installed at return air grilles during construction if permanently installed air handling units are used during construction.
 3. Manufacturer's cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for final filtration media in air handling units.
 4. Minimum 18 construction photographs including six photographs taken on three different occasions during construction of ANSI/SMACNA 008-2008, Chapter 3 approaches employed, along with a brief description of each approach, documenting implementation of IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.
 5. Flush-out Documentation:

- a. Product data for filtration media used during flush-out.
- b. Product data for filtration media installed immediately prior to occupancy.
- c. Signed statement describing building air flush-out procedures including dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.

1.6 QUALITY ASSURANCE

- A. Preconstruction Meeting: After award of Contract and prior to commencement of Work, schedule and conduct meeting with COR and Architect to discuss the Project Sustainable Action Plan content as it applies to submittals, project delivery, required Construction Indoor Air Quality (IAQ) Management Plan, and other Sustainable Construction Requirements. The purpose of this meeting is to develop a mutual understanding of the Sustainable Construction Requirements and coordination of contractor's management of these requirements with the Contracting Officer and the Construction Quality Manager.
- B. Construction Job Conferences: Status of compliance with Sustainable Construction Requirements of these specifications will be an agenda item at regular job meetings conducted during the course of work at the site.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. Sheet Metal and Air Conditioning National Contractors' Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd Edition (ANSI/SMACNA 008-2008), Chapter 3.
- C. California Department of Public Health Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1, Emission Testing method for California Specification 01350 (CDPH Standard Method V1.1-2010).
- D. Federal Trade Commission Guides for the Use of Environmental Marketing Claims (16 CFR Part 260).

E. ASHRAE Standard 52.2-2007.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

A. Construction waste diversion from landfill disposal must comprise at least 50 percent of total construction waste, excluding land clearing debris and soil. Alternative daily cover (ADC) does not qualify as material diverted from disposal.

B. Low Pollutant-Emitting Materials:

1. Adhesives, sealants and sealant primers applied on site within the weatherproofing membrane must comply with VOC limits of SCAQMD Rule 1168:

a. Flooring Adhesives and Sealants:

- 1) Indoor carpet adhesives: 50 g/L.
- 2) Wood Flooring Adhesive: 100 g/L.
- 3) Rubber Floor Adhesives: 60 g/L.
- 4) Subfloor Adhesives: 50 g/L.
- 5) Ceramic Tile Adhesives and Grout: 65 g/L.
- 6) Cove Base Adhesives: 50 g/L.
- 7) Multipurpose Construction Adhesives: 70 g/L.
- 8) Porous Material (Except Wood) Substrate: 50 g/L.
- 9) Wood Substrate: 30 g/L.
- 10) Architectural Non-Porous Sealant Primer: 250 g/L.
- 11) Architectural Porous Sealant Primer: 775 g/L.
- 12) Other Sealant Primer: 750 g/L.
- 13) Structural Wood Member Adhesive: 140 g/L.
- 14) Sheet-Applied Rubber Lining Operations: 850 g/L.
- 15) Top and Trim Adhesive: 250 g/L.
- 16) Architectural Sealant: 250 g/L.
- 17) Other Sealant: 420 g/L.

b. Non-Flooring Adhesives and Sealants:

- 1) Drywall and Panel Adhesives: 50 g/L.
- 2) Multipurpose Construction Adhesives: 70 g/L.
- 3) Structural Glazing Adhesives: 100 g/L.
- 4) Metal-to-Metal Substrate Adhesives: 30 g/L.
- 5) Plastic Foam Substrate Adhesive: 50 g/L.
- 6) Porous Material (Except Wood) Substrate Adhesive: 50 g/L.

- 7) Wood Substrate Adhesive: 30 g/L.
 - 8) Fiberglass Substrate Adhesive: 80 g/L.
 - 9) Architectural Non-Porous Sealant Primer: 250 g/L.
 - 10) Architectural Porous Sealant Primer: 775 g/L.
 - 11) Other Sealant Primer: 750 g/L.
 - 12) PVC Welding Adhesives: 510 g/L.
 - 13) CPVC Welding Adhesives: 490 g/L.
 - 14) ABS Welding Adhesives: 325 g/L.
 - 15) Plastic Cement Welding Adhesives: 250 g/L.
 - 16) Adhesive Primer for Plastic: 550 g/L.
 - 17) Contact Adhesive: 80 g/L.
 - 18) Special Purpose Contact Adhesive: 250 g/L.
 - 19) Structural Wood Member Adhesive: 140 g/L.
 - 20) Sheet Applied Rubber Lining Operations: 850 g/L.
 - 21) Top and Trim Adhesive: 250 g/L.
 - 22) Architectural Sealants: 250 g/L.
 - 23) Other Sealants: 420 g/L.
2. Aerosol adhesives applied on site within the weatherproofing membrane must comply with the following Green Seal GS-36.
 - a. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent VOCs by weight.
 - b. Aerosol Adhesive, General-Purpose Web Spray: 55 percent VOCs by weight.
 - c. Special-Purpose Aerosol Adhesive (All Types): 70 percent VOCs by weight.
 3. Paints and coatings applied on site within the weatherproofing membrane must comply with the following criteria:
 - a. VOC content limits for paints and coatings established in Green Seal Standard GS-11.
 - b. VOC content limit for anti-corrosive and anti-rust paints applied to interior ferrous metal substrates of 250 g/L established in Green Seal GC-03.
 - c. Clear wood finishes, floor coatings, stains, primers, sealers, and shellacs applied to interior elements must not exceed VOC content limits established in SCAQMD Rule 1113.
 - d. Comply with the following VOC content limits:
 - 1) Anti-Corrosive/Antirust Paints: 250 g/L.

- 2) Clear Wood Finish, Lacquer: 550 g/L.
 - 3) Clear Wood Finish, Sanding Sealer: 350 g/L.
 - 4) Clear Wood Finish, Varnish: 350 g/L.
 - 5) Floor Coating: 100 g/L.
 - 6) Interior Flat Paint, Coating or Primer: 50 g/L.
 - 7) Interior Non-Flat Paint, Coating or Primer: 150 g/L.
 - 8) Sealers and Undercoaters: 200 g/L.
 - 9) Shellac, Clear: 730 g/L.
 - 10) Shellac, Pigmented: 550 g/L.
 - 11) Stain: 250 g/L.
 - 12) Clear Brushing Lacquer: 680 g/L.
 - 13) Concrete Curing Compounds: 350 g/L.
 - 14) Japans/Faux Finishing Coatings: 350 g/L.
 - 15) Magnesite Cement Coatings: 450 g/L.
 - 16) Pigmented Lacquer: 550 g/L.
 - 17) Waterproofing Sealers: 250 g/L.
 - 18) Wood Preservatives: 350 g/L.
 - 19) Low-Solids Coatings: 120 g/L.
4. Carpet installed in building interior must comply with one of the following:
 - a. Meet testing and product requirements of the Carpet and Rug Institute Green Label Plus program.
 - b. Maximum VOC concentrations specified in CDPH Standard Method V1.1-2010, using office scenario at the 14 day time point.
 5. Each non-carpet flooring element installed in building interior which is not inherently non-emitting (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood flooring) must comply with one of the following:
 - a. Meet requirements of the FloorScore standard as shown with testing by an independent third-party.
 - b. Maximum VOC concentrations specified in CDPH Standard Method V1.1-2010, using office scenario at 14 day time point.
 6. Composite wood and agrifiber products used within the weatherproofing membrane must contain no added urea-formaldehyde resins.

7. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies must not contain added urea-formaldehyde.

C. Recycled Content:

1. Any products being installed or used that are listed on EPA Comprehensive Procurement Guidelines designated product list must meet or exceed the EPA's recycled content recommendations. The EPA Comprehensive Procurement Guidelines categories include:
 - a. Building insulation.
 - b. Cement and concrete.
 - c. Consolidated and reprocessed latex paint.
 - d. Floor tiles.
 - e. Flowable fill.
 - f. Laminated paperboard.
 - g. Modular threshold ramps.
 - h. Nonpressure pipe.
 - i. Patio blocks.
 - j. Railroad grade crossing surfaces.
 - k. Roofing materials.
 - l. Shower and restroom dividers/partitions.
 - m. Structural fiberboard.
 - n. Nylon carpet and nylon carpet backing.
 - o. Compost and fertilizer made from recovered organic materials.
 - p. Hydraulic mulch.
 - q. Lawn and garden edging.
 - r. Plastic lumber landscaping timbers and posts.
 - s. Park benches and picnic tables.
 - t. Plastic fencing.
 - u. Playground equipment.
 - v. Playground surfaces.
 - w. Bike racks.

D. Biobased Content:

1. Materials and equipment being installed or used that are listed on the USDA BioPreferred program product category list must meet or exceed USDA's minimum biobased content threshold. Refer to individual specification sections for detailed requirements applicable to that section.

a. USDA BioPreferred program categories include:

- 1) Adhesive and Mastic Removers.
- 2) Carpets.
- 3) Cleaners.
- 4) Composite Panels.
- 5) Corrosion Preventatives.
- 6) Erosion Control Materials.
- 7) Dust Suppressants.
- 8) Fertilizers.
- 9) Floor Cleaners and Protectors.
- 10) Floor Coverings (Non-Carpet).
- 11) Glass Cleaners.
- 12) Hydraulic Fluids.
- 13) Industrial Cleaners.
- 14) Interior Paints and Coatings.
- 15) Mulch and Compost Materials.
- 16) Multipurpose Cleaners.
- 17) Multipurpose Lubricants.
- 18) Packaging Films.
- 19) Paint Removers.
- 20) Plastic Insulating Foam.
- 21) Pneumatic Equipment Lubricants.
- 22) Roof Coatings.
- 23) Wastewater Systems Coatings.
- 24) Water Tank Coatings.
- 25) Wood and Concrete Sealers.
- 26) Wood and Concrete Stains.

E. Materials, products, and equipment being installed which fall into a category covered by the WaterSense program must be WaterSense-labeled or meet or exceed WaterSense program performance requirements, unless disallowed for infection control reasons.

1. WaterSense categories include:

- a. Bathroom Faucets
- b. Commercial Toilets
- c. Irrigation Controllers
- d. Pre-Rinse Spray Valves
- e. Residential Toilets

- f. Showerheads
 - g. Spray Sprinkler Bodies
 - h. Urinals
- F. Materials, products, and equipment being installed which fall into any of the following product categories must be Energy Star-labeled.
1. Applicable Energy Star product categories as of 09/14/2017 include:
 - a. Appliances:
 - 1) Air Purifiers and Cleaners.
 - 2) Clothes Dryers (Residential).
 - 3) Clothes Washers (Commercial & Residential).
 - 4) Dehumidifiers.
 - 5) Dishwashers (Residential).
 - 6) Freezers (Residential).
 - 7) Refrigerators (Residential).
 - b. Electronics and Information Technology:
 - 1) Audio/Video Equipment.
 - 2) Computers.
 - 3) Data Center Storage.
 - 4) Digital Media Player.
 - 5) Enterprise Servers.
 - 6) Imaging Equipment.
 - 7) Monitors.
 - 8) Professional Displays.
 - 9) Set-Top and Cable Boxes.
 - 10) Telephones.
 - 11) Televisions.
 - 12) Uninterruptible Power Supplies.
 - 13) Voice over Internet Protocol (VoIP) Phones.
 - c. Food Service Equipment (Commercial):
 - 1) Dishwashers.
 - 2) Fryers.
 - 3) Griddles.
 - 4) Hot Food Holding Cabinets.
 - 5) Ice Makers.
 - 6) Ovens.
 - 7) Refrigerators and Freezers.
 - 8) Steam Cookers.

- 9) Vending Machines.
- d. Heating and Cooling Equipment:
 - 1) Air-Source Heat Pumps (Residential).
 - 2) Boilers.
 - 3) Ceiling Fans (Residential).
 - 4) Central Air Conditioners (Residential).
 - 5) Ductless Heating and Cooling (Residential).
 - 6) Furnaces (Residential).
 - 7) Water Heaters.
 - 8) Geothermal Heat Pumps (Residential).
 - 9) Light Commercial Heating and Cooling Equipment.
 - 10) Room Air Conditioners (Residential).
 - 11) Ventilation Fans (Residential).
- e. Other:
 - 1) Decorative Light Strings.
 - 2) Electric Vehicle Supply Equipment.
 - 3) Laboratory-Grade Refrigerators and Freezers.
 - 4) Light Bulbs.
 - 5) Light Fixtures.
 - 6) Pool Pumps.
 - 7) Roof Products.
 - 8) Water Coolers.
 - 9) Windows, Doors, and Skylights.
- G. Materials, products, and equipment being installed which fall into any of the following categories must be FEMP-designated. FEMP-designated product categories as of 09/14/2017 include:
 - 1. Boilers (Commercial).
 - 2. Dishwashers (Commercial).
 - 3. Electric Chillers, Air-Cooled (Commercial).
 - 4. Electric Chillers, Water-Cooled (Commercial).
 - 5. Exterior Lighting.
 - 6. Fluorescent Ballasts.
 - 7. Fluorescent Lamps, General Service.
 - 8. Ice Machines, Water-Cooled.
 - 9. Industrial Lighting (High/Low Bay).
 - 10. Light Emitting Diode (LED) Luminaires.

H. Electronic products and equipment being installed which fall into any of the following categories shall be EPEAT registered. Electronic products and equipment covered by EPEAT program as of 09/14/2017 include:

1. Computers.
2. Displays.
3. Imaging Equipment.
4. Televisions.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Construction Indoor Air Quality Management:

1. During construction, meet or exceed recommended control measures of ANSI/SMACNA 008-2008, Chapter 3.
2. Protect stored on-site and installed absorptive materials from moisture damage.
3. If permanently installed air handlers are used during construction, filtration media with a minimum efficiency reporting value (MERV) of 8 must be used at each return air grille, as determined by ASHRAE Standard 52.2-1999 (with errata but without addenda). Replace all filtration media immediately prior to occupancy.
4. Perform building flush-out as follows:
 - a. After construction ends, prior to occupancy and with interior finishes installed, perform a building flush-out by supplying a total volume of 14000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 degrees Fahrenheit and a relative humidity no higher than 60 percent. OR
 - b. If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3500 cu. ft. of outdoor air per sq. ft. of floor area to the space. Once a space is occupied, it must be ventilated at a minimum rate of 0.30 cfm per sq. ft. of outside air or design minimum outside air rate determined until a total of 14000 cu. ft./sq. ft. of outside air has been delivered to the space. During each day of flush-out period, ventilation must begin a minimum of three hours prior to occupancy and continue during occupancy.

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5. Provide construction dust control to comply with SCAQMD Rule 403.

-----END-----

SECTION 01 91 00

GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 COMMISSIONING DESCRIPTION

- A. This Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS shall form the basis of the construction phase commissioning process and procedures. The Commissioning Agent shall add, modify, and refine the commissioning procedures, as approved by the Department of Veterans Affairs (VA), to suit field conditions and actual manufacturer's equipment, incorporate test data and procedure results, and provide detailed scheduling for all commissioning tasks.
- B. Various sections of the project specifications require equipment startup, testing, and adjusting services. Requirements for startup, testing, and adjusting services specified in the Division 22, Division 23 and Division 26, Division 27 and Division 28 series sections of these specifications are intended to be provided in coordination with the commissioning services and are not intended to duplicate services. The Contractor shall coordinate the work required by individual specification sections with the commissioning services requirements specified herein.
- C. Where individual testing, adjusting, or related services are required in the project specifications and not specifically required by this commissioning requirements specification, the specified services shall be provided and copies of documentation, as required by those specifications shall be submitted to the VA and the Commissioning Agent to be indexed for future reference.
- D. Where training or educational services for VA are required and specified in other sections of the specifications, including but not limited to Division 22, Division 23, Division 26, Division 27 and Division 28 series sections of the specification, these services are intended to be provided in addition to the training and educational services specified herein.
- E. Commissioning is a systematic process of verifying that the building systems perform interactively according to the construction documents and the VA's operational needs. The commissioning process shall encompass and coordinate the system documentation, equipment startup,

control system calibration, testing and balancing, performance testing and training. Commissioning during the construction and post-occupancy phases is intended to achieve the following specific objectives according to the contract documents:

1. Verify that the applicable equipment and systems are installed in accordance with the contract documents and according to the manufacturer's recommendations.
 2. Verify and document proper integrated performance of equipment and systems.
 3. Verify that Operations & Maintenance documentation is complete.
 4. Verify that all components requiring servicing can be accessed, serviced and removed without disturbing nearby components including ducts, piping, cabling or wiring.
 5. Verify that the VA's operating personnel are adequately trained to enable them to operate, monitor, adjust, maintain, and repair building systems in an effective and energy-efficient manner.
 6. Document the successful achievement of the commissioning objectives listed above.
- F. The commissioning process does not take away from or reduce the responsibility of the Contractor to provide a finished and fully functioning product.

1.2 CONTRACTUAL RELATIONSHIPS

- A. For this construction project, the Department of Veterans Affairs contracts with a Contractor to provide construction services. The contracts are administered by the VA Contracting Officer and the COR as the designated representative of the Contracting Officer. On this project, the authority to modify the contract in any way is strictly limited to the authority of the Contracting Officer.
- B. In this project, only two contract parties are recognized and communications on contractual issues are strictly limited to VA COR and the Contractor. It is the practice of the VA to require that communications between other parties to the contracts (Subcontractors and Vendors) be conducted through the COR and Contractor. It is also the practice of the VA that communications between other parties of the project (Commissioning Agent and Architect/Engineer) be conducted through the COR.

- C. Whole Building Commissioning is a process that relies upon frequent and direct communications, as well as collaboration between all parties to the construction process. By its nature, a high level of communication and cooperation between the Commissioning Agent and all other parties (Architects, Engineers, Subcontractors, Vendors, third party testing agencies, etc.) is essential to the success of the Commissioning effort.
- D. With these fundamental practices in mind, the commissioning process described herein has been developed to recognize that, in the execution of the Commissioning Process, the Commissioning Agent must develop effective methods to communicate with every member of the construction team involved in delivering commissioned systems while simultaneously respecting the exclusive contract authority of the Contracting Officer and COR. Thus, the procedures outlined in this specification must be executed within the following limitations:
1. No communications (verbal or written) from the Commissioning Agent shall be deemed to constitute direction that modifies the terms of any contract between the Department of Veterans Affairs and the Contractor.
 2. Commissioning Issues identified by the Commissioning Agent will be delivered to the COR and copied to the designated Commissioning Representatives for the Contractor and subcontractors on the Commissioning Team for information only in order to expedite the communication process. These issues must be understood as the professional opinion of the Commissioning Agent and as suggestions for resolution.
 3. In the event that any Commissioning Issues and suggested resolutions are deemed by the COR to require either an official interpretation of the construction documents or require a modification of the contract documents, the Contracting Officer or COR will issue an official directive to this effect.
 4. All parties to the Commissioning Process shall be individually responsible for alerting the COR of any issues that they deem to constitute a potential contract change prior to acting on these issues.
 5. Authority for resolution or modification of design and construction issues rests solely with the Contracting Officer or COR, with

appropriate technical guidance from the Architect/Engineer and/or
 Commissioning Agent.

1.3 RELATED WORK

- A. Section 01 00 00 GENERAL REQUIREMENTS.
- B. Section 01 32.16.15 PROJECT SCHEDULES (SMALL PROJECTS - DESIGN/BID/BUILD)
- C. Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
- D. Section 01 81 13 SUSTAINABLE CONSTRUCTION REQUIREMENTS
- E. Section 22 08 00 COMMISSIONING OF PLUMBING SYSTEMS.
- F. Section 23 08 00 COMMISSIONING OF HVAC SYSTEMS.
- G. Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS.
- H. Section 27 08 00 COMMISSIONING OF COMMUNICATIONS SYSTEMS.
- I. Section 28 08 00 COMMISSIONING OF ELECTRONIC SAFETY AND SECURITY SYSTEMS.

1.4 SUMMARY

- A. This Section includes general requirements that apply to implementation of commissioning without regard to systems, subsystems, and equipment being commissioned.
- B. The commissioning activities have been developed to support the VA requirements to meet guidelines for Federal Leadership in Environmental, Energy, and Economic Performance.
- D. The commissioning activities have been developed to support the Green Buildings Initiative's Green Globes rating program and to support delivery of project performance in accordance with the VA requirements developed for the project.

1.5 ACRONYMS

List of Acronyms	
Acronym	Meaning
A/E	Architect / Engineer Design Team
AHJ	Authority Having Jurisdiction
ASHRAE	Association Society for Heating Air Condition and Refrigeration Engineers
BOD	Basis of Design
BSC	Building Systems Commissioning
CCTV	Closed Circuit Television

List of Acronyms	
Acronym	Meaning
CD	Construction Documents
CMMS	Computerized Maintenance Management System
CO	Contracting Officer (VA)
COR	Contracting Officer's Representative (see also VA-RE)
COBie	Construction Operations Building Information Exchange
CPC	Construction Phase Commissioning
Cx	Commissioning
CxA	Commissioning Agent
CxM	Commissioning Manager
CxR	Commissioning Representative
DPC	Design Phase Commissioning
FPT	Functional Performance Test
GBI-GG	Green Building Initiative - Green Globes
HVAC	Heating, Ventilation, and Air Conditioning
LEED	Leadership in Energy and Environmental Design
NC	Department of Veterans Affairs National Cemetery
NCA	Department of Veterans Affairs National Cemetery Administration
NEBB	National Environmental Balancing Bureau
O&M	Operations & Maintenance
OPR	Owner's Project Requirements
PFC	Pre-Functional Checklist
PFT	Pre-Functional Test
SD	Schematic Design
SO	Site Observation
TAB	Test Adjust and Balance
VA	Department of Veterans Affairs
VAMC	VA Medical Center
VA CFM	VA Office of Construction and Facilities Management
VACO	VA Central Office
VA PM	VA Project Manager
VA-RE	VA Resident Engineer
USGBC	United States Green Building Council

1.6 DEFINITIONS

Acceptance Phase Commissioning: Commissioning tasks executed after most construction has been completed, most Site Observations and Static Tests have been completed and Pre-Functional Testing has been completed and accepted. The main commissioning activities performed during this phase are verification that the installed systems are functional by conducting Systems Functional Performance tests and Owner Training.

Accuracy: The capability of an instrument to indicate the true value of a measured quantity.

Back Check: A back check is a verification that an agreed upon solution to a design comment has been adequately addressed in a subsequent design review

Basis of Design (BOD): The Engineer's Basis of Design is comprised of two components: the Design Criteria and the Design Narrative, these documents record the concepts, calculations, decisions, and product selections used to meet the Owner's Project Requirements (OPR) and to satisfy applicable regulatory requirements, standards, and guidelines.

Benchmarks: Benchmarks are the comparison of a building's energy usage to other similar buildings and to the building itself. For example, ENERGY STAR Portfolio Manager is a frequently used and nationally recognized building energy benchmarking tool.

Building Information Modeling (BIM): Building Information Modeling is a parametric database which allows a building to be designed and constructed virtually in 3D, and provides reports both in 2D views and as schedules. This electronic information can be extracted and reused for pre-populating facility management CMMS systems. Building Systems Commissioning (BSC): NEBB acronym used to designate its commissioning program.

Calibrate: The act of comparing an instrument of unknown accuracy with a standard of known accuracy to detect, correlate, report, or eliminate by adjustment any variation in the accuracy of the tested instrument.

CCTV: Closed circuit Television. Normally used for security surveillance and alarm detections as part of a special electrical security system.

COBie: Construction Operations Building Information Exchange (COBie) is an electronic industry data format used to transfer information developed during design, construction, and commissioning into the

Computer Maintenance Management Systems (CMMS) used to operate facilities. See the Whole Building Design Guide website for further information (<http://www.wbdg.org/resources/cobie.php>)

Commissionability: Defines a design component or construction process that has the necessary elements that will allow a system or component to be effectively measured, tested, operated and commissioned

Commissioning Agent (CxA): The qualified Commissioning Professional who administers the Cx process by managing the Cx team and overseeing the Commissioning Process. Where CxA is used in this specification it means the Commissioning Agent, members of his staff or appointed members of the commissioning team. Note that LEED uses the term Commissioning Authority in lieu of Commissioning Agent.

Commissioning Checklists: Lists of data or inspections to be verified to ensure proper system or component installation, operation, and function. Verification checklists are developed and used during all phases of the commissioning process to verify that the Owner's Project Requirements (OPR) is being achieved.

Commissioning Design Review: The commissioning design review is a collaborative review of the design professionals design documents for items pertaining to the following: owner's project requirements; basis of design; operability and maintainability (O&M) including documentation; functionality; training; energy efficiency, control systems' sequence of operations including building automation system features; commissioning specifications and the ability to functionally test the systems.

Commissioning Issue: A condition identified by the Commissioning Agent or other member of the Commissioning Team that adversely affects the commissionability, operability, maintainability, or functionality of a system, equipment, or component. A condition that is in conflict with the Contract Documents and/or performance requirements of the installed systems and components. (See also - Commissioning Observation).

Commissioning Manager (CxM): A qualified individual appointed by the Contractor to manage the commissioning process on behalf of the Contractor.

Commissioning Observation: An issue identified by the Commissioning Agent or other member of the Commissioning Team that does not conform

to the project OPR, contract documents or standard industry best practices. (See also Commissioning Issue)

Commissioning Plan: A document that outlines the commissioning process, commissioning scope and defines responsibilities, processes, schedules, and the documentation requirements of the Commissioning Process.

Commissioning Process: A quality focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that the facility and all of its systems, components, and assemblies are planned, designed, installed, tested, can be operated, and maintained to meet the Owner's Project Requirements.

Commissioning Report: The final commissioning document which presents the commissioning process results for the project. Cx reports include an executive summary, the commissioning plan, issue log, correspondence, and all appropriate check sheets and test forms.

Commissioning Representative (CxR): An individual appointed by a sub-contractor to manage the commissioning process on behalf of the sub-contractor.

Commissioning Specifications: The contract documents that detail the objective, scope and implementation of the commissioning process as developed in the Commissioning Plan.

Commissioning Team: Individual team members whose coordinated actions are responsible for implementing the Commissioning Process.

Construction Phase Commissioning: All commissioning efforts executed during the construction process after the design phase and prior to the Acceptance Phase Commissioning.

Contract Documents (CD): Contract documents include design and construction contracts, price agreements and procedure agreements. Contract Documents also include all final and complete drawings, specifications and all applicable contract modifications or supplements.

Construction Phase Commissioning (CPC): All commissioning efforts executed during the construction process after the design phase and prior to the Acceptance Phase Commissioning.

Coordination Drawings: Drawings showing the work of all trades that are used to illustrate that equipment can be installed in the space allocated without compromising equipment function or access for maintenance and replacement. These drawings graphically illustrate and

dimension manufacturers' recommended maintenance clearances. On mechanical projects, coordination drawings include structural steel, ductwork, major piping and electrical conduit and show the elevations and locations of the above components.

Data Logging: The monitoring and recording of temperature, flow, current, status, pressure, etc. of equipment using stand-alone data recorders.

Deferred System Test: Tests that cannot be completed at the end of the acceptance phase due to ambient conditions, schedule issues or other conditions preventing testing during the normal acceptance testing period.

Deficiency: See "Commissioning Issue".

Design Criteria: A listing of the VA Design Criteria outlining the project design requirements, including its source. These are used during the design process to show the design elements meet the OPR.

Design Intent: The overall term that includes the OPR and the BOD. It is a detailed explanation of the ideas, concepts, and criteria that are defined by the owner to be important. The design intent documents are utilized to provide a written record of these ideas, concepts and criteria.

Design Narrative: A written description of the proposed design solutions that satisfy the requirements of the OPR.

Design Phase Commissioning (DPC): All commissioning tasks executed during the design phase of the project.

Environmental Systems: Systems that use a combination of mechanical equipment, airflow, water flow and electrical energy to provide heating, ventilating, air conditioning, humidification, and dehumidification for the purpose of human comfort or process control of temperature and humidity.

Executive Summary: A section of the Commissioning report that reviews the general outcome of the project. It also includes any unresolved issues, recommendations for the resolution of unresolved issues and all deferred testing requirements.

Functionality: This defines a design component or construction process which will allow a system or component to operate or be constructed in a manner that will produce the required outcome of the OPR.

Functional Test Procedure (FTP): A written protocol that defines methods, steps, personnel, and acceptance criteria for tests conducted on components, equipment, assemblies, systems, and interfaces among systems.

Industry Accepted Best Practice: A design component or construction process that has achieved industry consensus for quality performance and functionality. Refer to the current edition of the NEBB Design Phase Commissioning Handbook for examples.

Installation Verification: Observations or inspections that confirm the system or component has been installed in accordance with the contract documents and to industry accepted best practices.

Integrated System Testing: Integrated Systems Testing procedures entail testing of multiple integrated systems performance to verify proper functional interface between systems. Typical Integrated Systems Testing includes verifying that building systems respond properly to loss of utility, transfer to emergency power sources, re-transfer from emergency power source to normal utility source; interface between HVAC controls and Fire Alarm systems for equipment shutdown, interface between Fire Alarm system and elevator control systems for elevator recall and shutdown; interface between Fire Alarm System and Security Access Control Systems to control access to spaces during fire alarm conditions; and other similar tests as determined for each specific project.

Issues Log: A formal and ongoing record of problems or concerns - and their resolution - that have been raised by members of the Commissioning Team during the course of the Commissioning Process.

Lessons Learned Workshop: A workshop conducted to discuss and document project successes and identify opportunities for improvements for future projects.

Maintainability: A design component or construction process that will allow a system or component to be effectively maintained. This includes adequate room for access to adjust and repair the equipment. Maintainability also includes components that have readily obtainable repair parts or service.

Manual Test: Testing using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the 'observation').

Owner's Project Requirements (OPR): A written document that details the project requirements and the expectations of how the building and its systems will be used and operated. These include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

Peer Review: A formal in-depth review separate from the commissioning review processes. The level of effort and intensity is much greater than a typical commissioning facilitation or extended commissioning review. The VA usually hires an independent third-party (called the IDIQ A/E) to conduct peer reviews.

Precision: The ability of an instrument to produce repeatable readings of the same quantity under the same conditions. The precision of an instrument refers to its ability to produce a tightly grouped set of values around the mean value of the measured quantity.

Pre-Design Phase Commissioning: Commissioning tasks performed prior to the commencement of design activities that includes project programming and the development of the commissioning process for the project

Pre-Functional Checklist (PFC): A form used by the contractor to verify that appropriate components are onsite, correctly installed, set up, calibrated, functional and ready for functional testing.

Pre-Functional Test (PFT): An inspection or test that is done before functional testing. PFT's include installation verification and system and component start up tests.

Procedure or Protocol: A defined approach that outlines the execution of a sequence of work or operations. Procedures are used to produce repeatable and defined results.

Range: The upper and lower limits of an instrument's ability to measure the value of a quantity for which the instrument is calibrated.

Resolution: This word has two meanings in the Cx Process. The first refers to the smallest change in a measured variable that an instrument can detect. The second refers to the implementation of actions that correct a tested or observed deficiency.

Site Observation Visit: On-site inspections and observations made by the Commissioning Agent for the purpose of verifying component, equipment, and system installation, to observe contractor testing, equipment start-up procedures, or other purposes.

Site Observation Reports (SO): Reports of site inspections and observations made by the Commissioning Agent. Observation reports are intended to provide early indication of an installation issue which will need correction or analysis.

Special System Inspections: Inspections required by a local code authority prior to occupancy and are not normally a part of the commissioning process.

Static Tests: Tests or inspections that validate a specified static condition such as pressure testing. Static tests may be specification or code initiated.

Start Up Tests: Tests that validate the component or system is ready for automatic operation in accordance with the manufactures requirements.

Systems Manual: A system-focused composite document that includes all information required for the owners operators to operate the systems.

Test Procedure: A written protocol that defines methods, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces among systems.

Testing: The use of specialized and calibrated instruments to measure parameters such as: temperature, pressure, vapor flow, air flow, fluid flow, rotational speed, electrical characteristics, velocity, and other data in order to determine performance, operation, or function.

Testing, Adjusting, and Balancing (TAB): A systematic process or service applied to heating, ventilating and air-conditioning (HVAC) systems and other environmental systems to achieve and document air and hydronic flow rates. The standards and procedures for providing these services are referred to as "Testing, Adjusting, and Balancing" and are described in the Procedural Standards for the Testing, Adjusting and Balancing of Environmental Systems, published by NEBB or AABC.

Thermal Scans: Thermographic pictures taken with an Infrared Thermographic Camera. Thermographic pictures show the relative temperatures of objects and surfaces and are used to identify leaks, thermal bridging, thermal intrusion, electrical overload conditions, moisture containment, and insulation failure.

Training Plan: A written document that details, in outline form the expectations of the operator training. Training agendas should include

instruction on how to obtain service, operate, startup, shutdown and maintain all systems and components of the project.

Trending: Monitoring over a period of time with the building automation system.

Unresolved Commissioning Issue: Any Commissioning Issue that, at the time that the Final Report or the Amended Final Report is issued that has not been either resolved by the construction team or accepted by the VA. **Validation:** The process by which work is verified as complete and operating correctly:

1. First party validation occurs when a firm or individual verifying the task is the same firm or individual performing the task.
2. Second party validation occurs when the firm or individual verifying the task is under the control of the firm performing the task or has other possibilities of financial conflicts of interest in the resolution (Architects, Designers, General Contractors and Third Tier Subcontractors or Vendors).
3. Third party validation occurs when the firm verifying the task is not associated with or under control of the firm performing or designing the task.

Verification: The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the Owner's Project Requirements.

Warranty Phase Commissioning: Commissioning efforts executed after a project has been completed and accepted by the Owner. Warranty Phase Commissioning includes follow-up on verification of system performance, measurement and verification tasks and assistance in identifying warranty issues and enforcing warranty provisions of the construction contract.

Warranty Visit: A commissioning meeting and site review where all outstanding warranty issues and deferred testing is reviewed and discussed.

Whole Building Commissioning: Commissioning of building systems such as Building Envelope, HVAC, Electrical, Special Electrical (Fire Alarm, Security & Communications), Plumbing and Fire Protection as described in this specification.

1.7 SYSTEMS TO BE COMMISSIONED

- A. Commissioning of a system or systems specified for this project is part of the construction process. Documentation and testing of these systems, as well as training of the VA's Operation and Maintenance personnel, is required in cooperation with the VA and the Commissioning Agent.
- B. The following systems will be commissioned as part of this project:

Systems To Be Commissioned	
System	Description
Plumbing	
Wastewater Pump Systems	Sump pumps
HVAC	
Noise and Vibration Control	Noise and vibration levels for critical equipment such as Chillers will be commissioned as part of the system commissioning
Direct Digital Control System**	Operator Interface Computer, Operator Work Station (including graphics, point mapping, trends, alarms), Network Communications Modules and Wiring, Integration Panels. [DDC Control panels will be commissioned with the systems controlled by the panel]
Chilled Water System**	Chillers (air-cooled), pumps (variable primary), VFDs associated with chilled water system components, DDC Control Panels (including integration with Building Control System)
HVAC Ventilation/Exhaust Systems	General relief/exhaust systems
HVAC Energy Recovery Systems**	Energy Recovery Ventilation Unit
HVAC Terminal Unit Systems**	Four-pipe fan coil units

Systems To Be Commissioned	
System	Description
Decentralized Unitary HVAC Systems*	Split-system HVAC units, VRF cassette unit, controls, interface with facility DDC
Unitary Heat Pump Systems**	Water-source heat pumps, controls, interface with facility DDC
Hydronic Distribution Systems	Pumps, VFD's, DDC control panels, heat exchangers, hot water unit heater
Electrical	
Grounding & Bonding Systems	Witness 3rd party testing, review reports
Low-Voltage Distribution System	Normal power distribution system, Life-safety power distribution system, equipment power distribution system, panelboards, verify breaker testing results (injection current, etc)
Lighting & Lighting Control** Systems	Emergency lighting, occupancy sensors, lighting control systems
Communications	
Grounding & Bonding System	Witness 3rd party testing, review reports
Structured Cabling System	Witness 3rd party testing, review reports
Public Address & Mass Notification Systems	Witness 3rd party testing, review reports
Intercom & Program Systems	Witness 3rd party testing, review reports
Security Emergency Call Systems	Witness 3rd party testing, review reports
Duress Alarm Systems	Witness 3rd party testing, review reports
Electronic Safety and Security	
Grounding & Bonding	Witness 3rd party testing, review reports
Physical Access Control Systems	Witness 3rd party testing, review reports
Access Control Systems	Witness 3rd party testing, review reports

Systems To Be Commissioned	
System	Description
Security Access Detection Systems	Witness 3rd party testing, review reports
Video Surveillance System	Witness 3rd party testing, review reports
Fire Detection and Alarm System	Witness 3 rd party device acceptance testing, battery draw-down test, verify system monitoring, verify interface with other systems.
Table Notes	
** Denotes systems that LEED requires to be commissioned to comply with the LEED Fundamental Commissioning pre-requisite.	

1.8 COMMISSIONING TEAM

- A. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project Superintendent and subcontractors, installers, schedulers, suppliers, and specialists deemed appropriate by the Department of Veterans Affairs (VA) and Commissioning Agent.
- B. Members Appointed by Contractor:
 - 1. Contractor' Commissioning Manager: The designated person, company, or entity that plans, schedules and coordinates the commissioning activities for the construction team.
 - 2. Contractor's Commissioning Representative(s): Individual(s), each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions.
- C. Members Appointed by VA:
 - 1. Commissioning Agent: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. The VA will engage the CxA under a separate contract.
 - 2. User: Representatives of the facility user and operation and maintenance personnel.

3. A/E: Representative of the Architect and engineering design professionals.

1.9 VA'S COMMISSIONING RESPONSIBILITIES

- A. Appoint an individual, company or firm to act as the Commissioning Agent.
- B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:
 1. Coordination meetings.
 2. Training in operation and maintenance of systems, subsystems, and equipment.
 3. Testing meetings.
 4. Witness and assist in Systems Functional Performance Testing.
 5. Demonstration of operation of systems, subsystems, and equipment.
- C. Provide the Construction Documents, prepared by Architect and approved by VA, to the Commissioning Agent and for use in managing the commissioning process, developing the commissioning plan, systems manuals, and reviewing the operation and maintenance training plan.

1.10 CONTRACTOR'S COMMISSIONING RESPONSIBILITIES

- A. The Contractor shall assign a Commissioning Manager to manage commissioning activities of the Contractor, and subcontractors.
- B. The Contractor shall ensure that the commissioning responsibilities outlined in these specifications are included in all subcontracts and that subcontractors comply with the requirements of these specifications.
- C. The Contractor shall ensure that each installing subcontractor shall assign representatives with expertise and authority to act on behalf of the subcontractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
 1. Participate in commissioning coordination meetings.
 2. Conduct operation and maintenance training sessions in accordance with approved training plans.
 3. Verify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.

4. Evaluate commissioning issues and commissioning observations identified in the Commissioning Issues Log, field reports, test reports or other commissioning documents. In collaboration with entity responsible for system and equipment installation, recommend corrective action.
5. Review and comment on commissioning documentation.
6. Participate in meetings to coordinate Systems Functional Performance Testing.
7. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to Commissioning Agent for incorporation into the commissioning plan.
8. Provide information to the Commissioning Agent for developing commissioning plan.
9. Participate in training sessions for VA's operation and maintenance personnel.
10. Provide technicians who are familiar with the construction and operation of installed systems and who shall develop specific test procedures to conduct Systems Functional Performance Testing of installed systems.

1.11 COMMISSIONING AGENT'S RESPONSIBILITIES

- A. Organize and lead the commissioning team.
- B. Prepare the commissioning plan. See Paragraph 1.11-A of this specification Section for further information.
- C. Review and comment on selected submittals from the Contractor for general conformance with the Construction Documents. Review and comment on the ability to test and operate the system and/or equipment, including providing gages, controls and other components required to operate, maintain, and test the system. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the Construction Documents.
- D. At the beginning of the construction phase, conduct an initial construction phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for operation and maintenance submittals; operation and maintenance training sessions; TAB Work; Pre-Functional Checklists, Systems Functional Performance Testing; and project completion.

- E. Convene commissioning team meetings for the purpose of coordination, communication, and conflict resolution; discuss status of the commissioning processes. Responsibilities include arranging for facilities, preparing agenda and attendance lists, and notifying participants. The Commissioning Agent shall prepare and distribute minutes to commissioning team members and attendees within five workdays of the commissioning meeting.
- F. Observe construction and report progress, observations and issues. Observe systems and equipment installation for adequate accessibility for maintenance and component replacement or repair, and for general conformance with the Construction Documents.
- G. Prepare Project specific Pre-Functional Checklists and Systems Functional Performance Test procedures.
- H. Coordinate Systems Functional Performance Testing schedule with the Contractor.
- I. Witness selected systems startups.
- J. Verify selected Pre-Functional Checklists completed and submitted by the Contractor.
- K. Witness and document Systems Functional Performance Testing.
- L. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning report.
- M. Review and comment on operation and maintenance (O&M) documentation and systems manual outline for compliance with the Contract Documents. Operation and maintenance documentation requirements are specified in Paragraph 1.25, Section 01 00 00 GENERAL REQUIREMENTS.
- N. Review operation and maintenance training program developed by the Contractor. Verify training plans provide qualified instructors to conduct operation and maintenance training.
- O. Prepare commissioning Field Observation Reports.
- P. Prepare the Final Commissioning Report.
- Q. Return to the site at 10 months into the 12 month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal Systems Functional Performance Testing. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may

come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.

- R. Assemble the final commissioning documentation, including the Final Commissioning Report and Addendum to the Final Commissioning Report.

1.12 COMMISSIONING DOCUMENTATION

- A. Commissioning Plan: A document, prepared by Commissioning Agent, that outlines the schedule, allocation of resources, and documentation requirements of the commissioning process, and shall include, but is not limited, to the following:
 1. Plan for delivery and review of submittals, systems manuals, and other documents and reports. Identification of the relationship of these documents to other functions and a detailed description of submittals that are required to support the commissioning processes. Submittal dates shall include the latest date approved submittals must be received without adversely affecting commissioning plan.
 2. Description of the organization, layout, and content of commissioning documentation (including systems manual) and a detailed description of documents to be provided along with identification of responsible parties.
 3. Identification of systems and equipment to be commissioned.
 4. Schedule of Commissioning Coordination meetings.
 5. Identification of items that must be completed before the next operation can proceed.
 6. Description of responsibilities of commissioning team members.
 7. Description of observations to be made.
 8. Description of requirements for operation and maintenance training.
 9. Schedule for commissioning activities with dates coordinated with overall construction schedule.
 10. Process and schedule for documenting changes on a continuous basis to appear in Project Record Documents.
 11. Process and schedule for completing prestart and startup checklists for systems, subsystems, and equipment to be verified and tested.
 12. Preliminary Systems Functional Performance Test procedures.
- B. Systems Functional Performance Test Procedures: The Commissioning Agent will develop Systems Functional Performance Test Procedures for each system to be commissioned, including subsystems, or equipment and

interfaces or interlocks with other systems. Systems Functional Performance Test Procedures will include a separate entry, with space for comments, for each item to be tested. Preliminary Systems Functional Performance Test Procedures will be provided to the VA, Architect/Engineer, and Contractor for review and comment. The Systems Performance Test Procedure will include test procedures for each mode of operation and provide space to indicate whether the mode under test responded as required. Each System Functional Performance Test procedure, regardless of system, subsystem, or equipment being tested, shall include, but not be limited to, the following:

1. Name and identification code of tested system.
 2. Test number.
 3. Time and date of test.
 4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
 5. Dated signatures of the person performing test and of the witness, if applicable.
 6. Individuals present for test.
 7. Observations and Issues.
 8. Issue number, if any, generated as the result of test.
- C. Pre-Functional Checklists: The Commissioning Agent will prepare Pre-Functional Checklists. Pre-Functional Checklists shall be completed and signed by the Contractor, verifying that systems, subsystems, equipment, and associated controls are ready for testing. The Commissioning Agent will spot check Pre-Functional Checklists to verify accuracy and readiness for testing. Inaccurate or incomplete Pre-Functional Checklists shall be returned to the Contractor for correction and resubmission.
- D. Test and Inspection Reports: The Commissioning Agent will record test data, observations, and measurements on Systems Functional Performance Test Procedure. The report will also include recommendation for system acceptance or non-acceptance. Photographs, forms, and other means appropriate for the application shall be included with data. Commissioning Agent Will compile test and inspection reports and test and inspection certificates and include them in systems manual and commissioning report.

- E. Corrective Action Documents: The Commissioning Agent will document corrective action taken for systems and equipment that fail tests. The documentation will include any required modifications to systems and equipment and/or revisions to test procedures, if any. The Commissioning Agent will witness and document any retesting of systems and/or equipment requiring corrective action and document retest results.
- F. Commissioning Issues Log: The Commissioning Agent will prepare and maintain Commissioning Issues Log that describes Commissioning Issues and Commissioning Observations that are identified during the Commissioning process. These observations and issues include, but are not limited to, those that are at variance with the Contract Documents. The Commissioning Issues Log will identify and track issues as they are encountered, the party responsible for resolution, progress toward resolution, and document how the issue was resolved. The Master Commissioning Issues Log will also track the status of unresolved issues.
1. Creating a Commissioning Issues Log Entry:
 - a. Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
 - b. Assign a descriptive title for the issue.
 - c. Identify date and time of the issue.
 - d. Identify test number of test being performed at the time of the observation, if applicable, for cross reference.
 - e. Identify system, subsystem, and equipment to which the issue applies.
 - f. Identify location of system, subsystem, and equipment.
 - g. Include information that may be helpful in diagnosing or evaluating the issue.
 - h. Note recommended corrective action.
 - i. Identify commissioning team member responsible for corrective action.
 - j. Identify expected date of correction.
 - k. Identify person that identified the issue.
 2. Documenting Issue Resolution:
 - a. Log date correction is completed or the issue is resolved.

- b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
 - c. Identify changes to the Contract Documents that may require action.
 - d. State that correction was completed and system, subsystem, and equipment are ready for retest, if applicable.
 - e. Identify person(s) who corrected or resolved the issue.
 - f. Identify person(s) verifying the issue resolution.
- G. Final Commissioning Report: The Commissioning Agent will document results of the commissioning process, including unresolved issues, and performance of systems, subsystems, and equipment. The Commissioning Report will indicate whether systems, subsystems, and equipment have been properly installed and are performing according to the Contract Documents. This report will be used by the Department of Veterans Affairs when determining that systems will be accepted. This report will be used to evaluate systems, subsystems, and equipment and will serve as a future reference document during VA occupancy and operation. It shall describe components and performance that exceed requirements of the Contract Documents and those that do not meet requirements of the Contract Documents. The commissioning report will include, but is not limited to, the following:
- 1. Lists and explanations of substitutions; compromises; variances with the Contract Documents; record of conditions; and, if appropriate, recommendations for resolution. Design Narrative documentation maintained by the Commissioning Agent.
 - 2. Commissioning plan.
 - 3. Pre-Functional Checklists completed by the Contractor, with annotation of the Commissioning Agent review and spot check.
 - 4. Systems Functional Performance Test Procedures, with annotation of test results and test completion.
 - 5. Commissioning Issues Log.
 - 6. Listing of deferred and off-season test(s) not performed, including the schedule for their completion.
- H. Addendum to Final Commissioning Report: The Commissioning Agent will prepare an Addendum to the Final Commissioning Report near the end of the Warranty Period. The Addendum will indicate whether systems,

subsystems, and equipment are complete and continue to perform according to the Contract Documents. The Addendum to the Final Commissioning Report shall include, but is not limited to, the following:

1. Documentation of deferred and off season test(s) results.
 2. Completed Systems Functional Performance Test Procedures for off season test(s).
 3. Documentation that unresolved system performance issues have been resolved.
 4. Updated Commissioning Issues Log, including status of unresolved issues.
 5. Identification of potential Warranty Claims to be corrected by the Contractor.
- I. Systems Manual: The Commissioning Agent will gather required information and compile the Systems Manual. The Systems Manual will include, but is not limited to, the following:
1. Design Narrative, including system narratives, schematics, single-line diagrams, flow diagrams, equipment schedules, and changes made throughout the Project.
 2. Reference to Final Commissioning Plan.
 3. Reference to Final Commissioning Report.
 4. Approved Operation and Maintenance Data as submitted by the Contractor.

1.13 SUBMITTALS

- A. Preliminary Commissioning Plan Submittal: The Commissioning Agent has prepared a Preliminary Commissioning Plan based on the final Construction Documents. The Preliminary Commissioning Plan is included as an Appendix to this specification section. The Preliminary Commissioning Plan is provided for information only. It contains preliminary information about the following commissioning activities:
1. The Commissioning Team: A list of commissioning team members by organization.
 2. Systems to be commissioned. A detailed list of systems to be commissioned for the project. This list also provides preliminary information on systems/equipment submittals to be reviewed by the Commissioning Agent; preliminary information on Pre-Functional Checklists that are to be completed; preliminary information on

- Systems Performance Testing, including information on testing sample size (where authorized by the VA).
3. Commissioning Team Roles and Responsibilities: Preliminary roles and responsibilities for each Commissioning Team member.
 4. Commissioning Documents: A preliminary list of commissioning-related documents, include identification of the parties responsible for preparation, review, approval, and action on each document.
 5. Commissioning Activities Schedule: Identification of Commissioning Activities, including Systems Functional Testing, the expected duration and predecessors for the activity.
 6. Pre-Functional Checklists: Preliminary Pre-Functional Checklists for equipment, components, subsystems, and systems to be commissioned. These Preliminary Pre-Functional Checklists provide guidance on the level of detailed information the Contractor shall include on the final submission.
 7. Systems Functional Performance Test Procedures: Preliminary step-by-step System Functional Performance Test Procedures to be used during Systems Functional Performance Testing. These Preliminary Systems Functional Performance procedures provide information on the level of testing rigor, and the level of Contractor support required during performance of system's testing.
- B. Final Commissioning Plan Submittal: Based on the Final Construction Documents and the Contractor's project team, the Commissioning Agent will prepare the Final Commissioning Plan as described in this section. The Commissioning Agent will submit three hard copies and three sets of electronic files of Final Commissioning Plan. The Contractor shall review the Commissioning Plan and provide any comments to the VA. The Commissioning Agent will incorporate review comments into the Final Commissioning Plan as directed by the VA.
- C. Systems Functional Performance Test Procedure: The Commissioning Agent will submit preliminary Systems Functional Performance Test Procedures to the Contractor, and the VA for review and comment. The Contractor shall return review comments to the VA and the Commissioning Agent. The VA will also return review comments to the Commissioning Agent. The Commissioning Agent will incorporate review comments into the Final Systems Functional Test Procedures to be used in Systems Functional Performance Testing.

- D. Pre-Functional Checklists: The Commissioning Agent will submit Pre-Functional Checklists to be completed by the Contractor.
- E. Test and Inspection Reports: The Commissioning Agent will submit test and inspection reports to the VA with copies to the Contractor and the Architect/Engineer.
- F. Corrective Action Documents: The Commissioning Agent will submit corrective action documents to the VA COR with copies to the Contractor and Architect.
- G. Preliminary Commissioning Report Submittal: The Commissioning Agent will submit three electronic copies of the preliminary commissioning report. One electronic copy, with review comments, will be returned to the Commissioning Agent for preparation of the final submittal.
- H. Final Commissioning Report Submittal: The Commissioning Agent will submit four sets of electronically formatted information of the final commissioning report to the VA. The final submittal will incorporate comments as directed by the VA.
- I. Data for Commissioning:
 - 1. The Commissioning Agent will request in writing from the Contractor specific information needed about each piece of commissioned equipment or system to fulfill requirements of the Commissioning Plan.
 - 2. The Commissioning Agent may request further documentation as is necessary for the commissioning process or to support other VA data collection requirements, including Construction Operations Building Information Exchange (COBIE), Building Information Modeling (BIM), etc.

1.14 COMMISSIONING PROCESS

- A. The Commissioning Agent will be responsible for the overall management of the commissioning process as well as coordinating scheduling of commissioning tasks with the VA and the Contractor. As directed by the VA, the Contractor shall incorporate Commissioning tasks, including, but not limited to, Systems Functional Performance Testing (including predecessors) with the Master Construction Schedule.
- B. Within two (2) weeks of contract award, the Contractor shall designate a specific individual as the Commissioning Manager (CxM) to manage and lead the commissioning effort on behalf of the Contractor. The

Commissioning Manager shall be the single point of contact and communications for all commissioning related services by the Contractor.

- C. Within two (2) weeks of contract award, the Contractor shall ensure that each subcontractor designates specific individuals as Commissioning Representatives (CXR) to be responsible for commissioning related tasks. The Contractor shall ensure the designated Commissioning Representatives participate in the commissioning process as team members providing commissioning testing services, equipment operation, adjustments, and corrections if necessary. The Contractor shall ensure that all Commissioning Representatives shall have sufficient authority to direct their respective staff to provide the services required, and to speak on behalf of their organizations in all commissioning related contractual matters.

1.15 QUALITY ASSURANCE

- A. Instructor Qualifications: Factory authorized service representatives shall be experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.
- B. Test Equipment Calibration: The Contractor shall comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. Instruments shall have been calibrated within six months prior to use.

1.16 COORDINATION

- A. Management: The Commissioning Agent will coordinate the commissioning activities with the VA and Contractor. The Commissioning Agent will submit commissioning documents and information to the VA. All commissioning team members shall work together to fulfill their contracted responsibilities and meet the objectives of the contract documents.
- B. Scheduling: The Contractor shall work with the Commissioning Agent and the VA to incorporate the commissioning activities into the construction schedule. The Commissioning Agent will provide sufficient information (including, but not limited to, tasks, durations and predecessors) on commissioning activities to allow the Contractor and the VA to schedule commissioning activities. All parties shall address

scheduling issues and make necessary notifications in a timely manner in order to expedite the project and the commissioning process. The Contractor shall update the Master Construction as directed by the VA.

- C. Initial Schedule of Commissioning Events: The Commissioning Agent will provide the initial schedule of primary commissioning events in the Commissioning Plan and at the commissioning coordination meetings. The Commissioning Plan will provide a format for this schedule. As construction progresses, more detailed schedules will be developed by the Contractor with information from the Commissioning Agent.
- D. Commissioning Coordinating Meetings: The Commissioning Agent will conduct periodic Commissioning Coordination Meetings of the commissioning team to review status of commissioning activities, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities.
- E. Pretesting Meetings: The Commissioning Agent will conduct pretest meetings of the commissioning team to review startup reports, Pre-Functional Checklist results, Systems Functional Performance Testing procedures, testing personnel and instrumentation requirements.
- F. Systems Functional Performance Testing Coordination: The Contractor shall coordinate testing activities to accommodate required quality assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting. The Contractor shall coordinate the schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

- A. The Contractor shall provide all standard and specialized testing equipment required to perform Systems Functional Performance Testing. Test equipment required for Systems Functional Performance Testing will be identified in the detailed System Functional Performance Test Procedure prepared by the Commissioning Agent.
- B. Data logging equipment and software required to test equipment shall be provided by the Contractor.
- C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall

have a certified calibration within the past year to an accuracy of 0.5 °C (1.0 °F) and a resolution of + or - 0.1 °C (0.2 °F). Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and following any repairs to the equipment. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.1 COMMISSIONING PROCESS ROLES AND RESPONSIBILITIES

A. The following table outlines the roles and responsibilities for the Commissioning Team members during the Construction Phase:

Construction Phase		CxA = Commissioning Agent COR = CO Representative A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					
Commissioning Roles & Responsibilities							
Category	Task Description	CxA	COR	A/E	PC	O&M	No
Meetings	Construction Commissioning Kick Off meeting	L	A	P	P	O	
	Commissioning Meetings	L	A	P	P	O	
	Project Progress Meetings	P	A	P	L	O	
	Controls Meeting	L	A	P	P	O	
Coordination	Coordinate with [OGC's, AHJ, Vendors, etc.] to ensure that Cx interacts properly with other systems as needed to support the OPR and BOD.	L	A	P	P	N/A	
Cx Plan & Spec	Final Commissioning Plan	L	A	R	R	O	
Schedules	Duration Schedule for Commissioning Activities	L	A	R	R	N/A	
OPR and BOD	Maintain OPR on behalf of Owner	L	A	R	R	O	
	Maintain BOD/DID on behalf of Owner	L	A	R	R	O	
Document Reviews	TAB Plan Review	L	A	R	R	O	
	Submittal and Shop Drawing Review	R	A	R	L	O	
	Review Contractor Equipment Startup Checklists	L	A	R	R	N/A	
	Review Change Orders, ASI, and RFI	L	A	R	R	N/A	
Site	Witness Factory Testing	P	A	P	L	O	

Construction Phase		CxA = Commissioning Agent COR = CO Representative A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L
Commissioning Roles & Responsibilities							P
Category	Task Description	CxA	COR	A/E	PC	O&M	No
Observations	Construction Observation Site Visits	L	A	R	R	O	
Functional Test Protocols	Final Pre-Functional Checklists	L	A	R	R	O	
	Final Functional Performance Test Protocols	L	A	R	R	O	
Technical Activities	Issues Resolution Meetings	P	A	P	L	O	
Reports and Logs	Status Reports	L	A	R	R	O	
	Maintain Commissioning Issues Log	L	A	R	R	O	

B. The following table outlines the roles and responsibilities for the Commissioning Team members during the Acceptance Phase:

Acceptance Phase		CxA = Commissioning Agent COR = CO Representative A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L
Commissioning Roles & Responsibilities							P
Category	Task Description	CxA	COR	A/E	PC	O&M	N
Meetings	Commissioning Meetings	L	A	P	P	O	
	Project Progress Meetings	P	A	P	L	O	
	Pre-Test Coordination Meeting	L	A	P	P	O	
	Lessons Learned and Commissioning Report Review Meeting	L	A	P	P	O	
Coordination	Coordinate with [OGC's, AHJ, Vendors, etc.] to ensure that Cx interacts properly with other systems as needed to support OPR and BOD	L	P	P	P	O	

Acceptance Phase		CxA = Commissioning Agent COR = CO Representative A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L
Commissioning Roles & Responsibilities							P
							A
							R
							O
Category	Task Description	CxA	COR	A/E	PC	O&M	N
Cx Plan & Spec	Maintain/Update Commissioning Plan	L	A	R	R	O	
Schedules	Prepare Functional Test Schedule	L	A	R	R	O	
OPR and BOD	Maintain OPR on behalf of Owner	L	A	R	R	O	
	Maintain BOD/DID on behalf of Owner	L	A	R	R	O	
Document Reviews	Review Completed Pre-Functional Checklists	L	A	R	R	O	
	Pre-Functional Checklist Verification	L	A	R	R	O	
	Review Operations & Maintenance Manuals	L	A	R	R	R	
	Training Plan Review	L	A	R	R	R	
	Warranty Review	L	A	R	R	O	
	Review TAB Report	L	A	R	R	O	
Site Observations	Construction Observation Site Visits	L	A	R	R	O	
	Witness Selected Equipment Startup	L	A	R	R	O	
Functional Test Protocols	TAB Verification	L	A	R	R	O	
	Systems Functional Performance Testing	L	A	P	P	P	
	Retesting	L	A	P	P	P	
Technical Activities	Issues Resolution Meetings	P	A	P	L	O	
	Systems Training	L	S	R	P	P	
Reports and Logs	Status Reports	L	A	R	R	O	
	Maintain Commissioning Issues Log	L	A	R	R	O	
	Final Commissioning Report	L	A	R	R	R	
	Prepare Systems Manuals	L	A	R	R	R	

C. The following table outlines the roles and responsibilities for the Commissioning Team members during the Warranty Phase:

Warranty Phase		CxA = Commissioning Agent COR = CO Representative A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L
Commissioning Roles & Responsibilities							P
Category	Task Description	CxA	COR	A/E	PC	O&M	N
Meetings	Post-Occupancy User Review Meeting	L	A	O	P	P	
Site Observations	Periodic Site Visits	L	A	O	O	P	
Functional Test Protocols	Deferred and/or seasonal Testing	L	A	O	P	P	
Technical Activities	Issues Resolution Meetings	L	S	O	O	P	
	Post-Occupancy Warranty Checkup and review of Significant Outstanding Issues	L	A		R	P	
Reports and Logs	Final Commissioning Report Amendment	L	A		R	R	
	Status Reports	L	A		R	R	

3.2 STARTUP, INITIAL CHECKOUT, AND PRE-FUNCTIONAL CHECKLISTS

A. The following procedures shall apply to all equipment and systems to be commissioned, according to Part 1, Systems to Be Commissioned.

1. Pre-Functional Checklists are important to ensure that the equipment and systems are hooked up and operational. These ensure that Systems Functional Performance Testing may proceed without unnecessary delays. Each system to be commissioned shall have a full Pre-Functional Checklist completed by the Contractor prior to Systems Functional Performance Testing. No sampling strategies are used.
 - a. The Pre-Functional Checklist will identify the trades responsible for completing the checklist. The Contractor shall ensure the appropriate trades complete the checklists.

- b. The Commissioning Agent will review completed Pre-Functional Checklists and field-verify the accuracy of the completed checklist using sampling techniques.
2. Startup and Initial Checkout Plan: The Contractor shall develop detailed startup plans for all equipment. The primary role of the Contractor in this process is to ensure that there is written documentation that each of the manufacturer recommended procedures have been completed. Parties responsible for startup shall be identified in the Startup Plan and in the checklist forms.
- a. The Contractor shall develop the full startup plan by combining (or adding to) the checklists with the manufacturer's detailed startup and checkout procedures from the O&M manual data and the field checkout sheets normally used by the Contractor. The plan shall include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.
 - b. The full startup plan shall at a minimum consist of the following items:
 - 1) The Pre-Functional Checklists.
 - 2) The manufacturer's standard written startup procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
 - 3) The manufacturer's normally used field checkout sheets.
 - c. The Commissioning Agent will submit the full startup plan to the VA and Contractor for review. Final approval will be by the VA.
 - d. The Contractor shall review and evaluate the procedures and the format for documenting them, noting any procedures that need to be revised or added.
3. Sensor and Actuator Calibration
- a. All field installed temperature, relative humidity, CO2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described in Division 22, Division 23, Division 26, Division 27, and Division 28 specifications.
 - b. All procedures used shall be fully documented on the Pre-Functional Checklists or other suitable forms, clearly

referencing the procedures followed and written documentation of initial, intermediate and final results.

4. Execution of Equipment Startup
 - a. Four (4) weeks prior to equipment startup, the Contractor shall schedule startup and checkout with the VA and Commissioning Agent. The performance of the startup and checkout shall be directed and executed by the Contractor.
 - b. The Commissioning Agent will observe the startup procedures for selected pieces of primary equipment.
 - c. The Contractor shall execute startup and provide the VA and Commissioning Agent with a signed and dated copy of the completed startup checklists, and contractor tests.
 - d. Only individuals that have direct knowledge and witnessed that a line item task on the Startup Checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

3.3 DEFICIENCIES, NONCONFORMANCE, AND APPROVAL IN CHECKLISTS AND STARTUP

- A. The Contractor shall clearly list any outstanding items of the initial startup and Pre-Functional Checklist procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies shall be provided to the VA and the Commissioning Agent within two days of completion.
- B. The Commissioning Agent will review the report and submit comments to the VA. The Commissioning Agent will work with the Contractor to correct and verify deficiencies or uncompleted items. The Commissioning Agent will involve the VA and others as necessary. The Contractor shall correct all areas that are noncompliant or incomplete in the checklists in a timely manner, and shall notify the VA and Commissioning Agent as soon as outstanding items have been corrected. The Contractor shall submit an updated startup report and a Statement of Correction on the original noncompliance report. When satisfactorily completed, the Commissioning Agent will recommend approval of the checklists and startup of each system to the VA.
- C. The Contractor shall be responsible for resolution of deficiencies as directed the VA.

3.4 PHASED COMMISSIONING

- A. The project may require startup and initial checkout to be executed in phases. This phasing shall be planned and scheduled in a coordination meeting of the VA, Commissioning Agent, and the Contractor. Results will be added to the master construction schedule and the commissioning schedule.

3.5 DDC SYSTEM TRENDING FOR COMMISSIONING

- A. Trending is a method of testing as a standalone method or to augment manual testing. The Contractor shall trend any and all points of the system or systems at intervals specified below.
- B. Alarms are a means to notify the system operator that abnormal conditions are present in the system. Alarms shall be structured into three tiers - Critical, Priority, and Maintenance.
 - 1. Critical alarms are intended to be alarms that require the immediate attention of and action by the Operator. These alarms shall be displayed on the Operator Workstation in a popup style window that is graphically linked to the associated unit's graphical display. The popup style window shall be displayed on top of any active window within the screen, including non DDC system software.
 - 2. Priority level alarms are to be printed to a printer which is connected to the Operator's Work Station located within the engineer's office. Additionally Priority level alarms shall be able to be monitored and viewed through an active alarm application. Priority level alarms are alarms which shall require reaction from the operator or maintenance personnel within a normal work shift, and not immediate action.
 - 3. Maintenance alarms are intended to be minor issues which would require examination by maintenance personnel within the following shift. These alarms shall be generated in a scheduled report automatically by the DDC system at the start of each shift. The generated maintenance report will be printed to a printer located within the engineer's office.
- C. The Contractor shall provide a wireless internet network in the building for use during controls programming, checkout, and commissioning. This network will allow project team members to more effectively program, view, manipulate and test control devices while being in the same room as the controlled device.

D. The Contractor shall provide graphical trending through the DDC control system of systems being commissioned. Trending requirements are indicated below and included with the Systems Functional Performance Test Procedures. Trending shall occur before, during and after Systems Functional Performance Testing. The Contractor shall be responsible for producing graphical representations of the trended DDC points that show each system operating properly during steady state conditions as well as during the System Functional Testing. These graphical reports shall be submitted to the COR and Commissioning Agent for review and analysis before, during dynamic operation, and after Systems Functional Performance Testing. The Contractor shall provide, but not limited to, the following trend requirements and trend submissions:

1. Pre-testing, Testing, and Post-testing - Trend reports of trend logs and graphical trend plots are required as defined by the Commissioning Agent. The trend log points, sampling rate, graphical plot configuration, and duration will be dictated by the Commissioning Agent. At any time during the Commissioning Process the Commissioning Agent may recommend changes to aspects of trending as deemed necessary for proper system analysis. The Contractor shall implement any changes as directed by the COR. Any pre-test trend analysis comments generated by the Commissioning Team should be addressed and resolved by the Contractor, as directed by the COR, prior to the execution of Systems Functional Performance Testing.
2. Dynamic plotting - The Contractor shall also provide dynamic plotting during Systems Functional Performance testing at frequent intervals for points determined by the Systems Functional Performance Test Procedure. The graphical plots will be formatted and plotted at durations listed in the Systems Functional Performance Test Procedure.
3. Graphical plotting - The graphical plots shall be provided with a dual y-axis allowing 15 or more trend points (series) plotted simultaneously on the graph with each series in distinct color. The plots will further require title, axis naming, legend etc. all described by the Systems Functional Performance Test Procedure. If this cannot be sufficiently accomplished directly in the Direct Digital Control System then it is the responsibility of the Contractor to plot these trend logs in Microsoft Excel.

4. The following tables indicate the points to be trended and alarmed by system. The Operational Trend Duration column indicates the trend duration for normal operations. The Testing Trend Duration column indicates the trend duration prior to Systems Functional Performance Testing and again after Systems Functional Performance Testing. The Type column indicates point type: AI = Analog Input, AO = Analog Output, DI = Digital Input, DO = Digital Output, Calc = Calculated Point. In the Trend Interval Column, COV = Change of Value. The Alarm Type indicates the alarm priority; C = Critical, P = Priority, and M = Maintenance. The Alarm Range column indicates when the point is considered in the alarm state. The Alarm Delay column indicates the length of time the point must remain in an alarm state before the alarm is recorded in the DDC. The intent is to allow minor, short-duration events to be corrected by the DDC system prior to recording an alarm.

Dual-Path Air Handling Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
OA Temperature	AI	15 Min	24 hours	3 days	N/A		
RA Temperature	AI	15 Min	24 hours	3 days	N/A		
RA Humidity	AI	15 Min	24 hours	3 days	P	>60% RH	10 min
Mixed Air Temp	AI	None	None	None	N/A		
SA Temp	AI	15 Min	24 hours	3 days	C	±5°F from SP	10 min
Supply Fan Speed	AI	15 Min	24 hours	3 days	N/A		
Return Fan Speed	AI	15 Min	24 hours	3 days	N/A		
RA Pre-Filter Status	AI	None	None	None	N/A		
OA Pre-Filter Status	AI	None	None	None	N/A		
After Filter Status	AI	None	None	None	N/A		
SA Flow	AI	15 Min	24 hours	3 days	C	±10% from SP	10 min
OA Supply Temp	AI	15 Min	24 hours	3 days	P	±5°F from SP	10 min

Dual-Path Air Handling Unit Trending and Alarms							
Point	Type	Trend Interval	Operationa l Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
RA Supply Temp	AI	15 Min	24 hours	3 days	N/A		
RA CHW Valve Position	AI	15 Min	24 hours	3 days	N/A		
OA CHW Valve Position	AI	15 Min	24 hours	3 days	N/A		
OA HW Valve Position	AI	15 Min	24 hours	3 days	N/A		
OA Flow	AI	15 Min	24 hours	3 days	P	±10% from SP	5 min
RA Flow	AI	15 Min	24 hours	3 days	P	±10% from SP	5 min
Initial UVC Intensity (%)	AI	None	None	None	N/A		
Duct Pressure	AI	15 Min	24 hours	3 days	C	±25% from SP	6 min
CO2 Level	AI	15 Min	24 hours	3 days	P	±10% from SP	10 min
Supply Fan Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Return Fan Status	DI	COV	24 hours	3 days	C	Status <> Command	10 Min
High Static Status	DI	COV	24 hours	3 days	P	True	1 min
Fire Alarm Status	DI	COV	24 hours	3 days	C	True	5 min
Freeze Stat Level 1	DI	COV	24 hours	3 days	C	True	10 min
Emergency AHU Shutdown	DI	COV	24 hours	3 days	P	True	1 min
Exhaust Fan #1 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
OA Alarm	DI	COV	24 hours	3 days	C	True	10 min
High Static Alarm	DI	COV	24 hours	3 days	C	True	10 min
Power Failure	DI	COV	24 hours	3 days	P	True	1 min
CHW Valve Position	AO	15 Min	24 hours	3 days	N/A		
HW Valve Position	AO	15 Min	24 hours	3 days	N/A		
Supply Fan S/S	DO	COV	24 hours	3 days	N/A		

Dual-Path Air Handling Unit Trending and Alarms							
Point	Type	Trend Interval	Operationa l Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		

4-Pipe Fan Coil Trending and Alarms							
Point	Type	Trend Interval	Operationa l Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Space Temperature	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min
SA Temperature	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min
Cooling Coil Valve Position	AO	15 Minutes	12 hours	3 days	N/A		
Heating coil Valve Position	AO	15 Minutes	12 hours	3 days	N/A		
Fan Coil ON/OFF	DO	COV	12 hours	3 days	M	Status <> Command	30 min

Hydronic Hot Water Trending and Alarms							
Point	Type	Trend Interval	Operationa l Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
System HWS Temperature	AI	15 min	12 hours	3 days	C	±5°F from SP	10 Min
System HWR Temperature	AI	15 min	12 hours	3 days	M	±15°F from SP	300 Min
HX-1 Entering Temperature	AI	15 min	12 hours	3 days	P	±5°F from SP	10 Min
HX-1 Leaving Temperature	AI	15 min	12 hours	3 days	P	±5°F from SP	10 Min
System Flow (GPM)	AI	15 min	12 hours	3 days	N/A		
System Differential Pressure	AI	15 min	12 hours	3 days	P	±10% from SP	8 Min
HW Pump 1 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min

Hydronic Hot Water Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
HW Pump 2 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
HW Pump 1 VFD Speed	AO	15 Min	12 Hours	3 days	N/A		
HW Pump 2 VFD Speed	AO	15 Min	12 Hours	3 days	N/A		
Steam Control Valve Position	AO	15 Min	12 Hours	3 days	N/A		
HW Pump 1 Start/Stop	DO	COV	12 Hours	3 days	N/A		
HW Pump 2 Start/Stop	DO	COV	12 Hours	3 days	N/A		

Chilled Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Chiller 1 Entering Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 Leaving Temperature	AI	15 Minutes	12 Hours	3 days	P	±5°F from SP	10 Min
Chiller 1 Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller Percent Load	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller KW Consumption	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller Tonnage	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller Entering Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller Leaving Temperature	AI	15 Minutes	12 Hours	3 days	P	±5°F from SP	10 Min
Chiller Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller Percent Load	AI	15 Minutes	12 Hours	3 days	N/A		

Chilled Water System Trending and Alarms							
Point	Type	Trend Interval	Operationa 1 Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Primary Loop Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Supply Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Pump 1 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Primary Loop Pump 2 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Chiller 1 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Chiller 1 Evaporator Iso-Valve	DI	COV	12 Hours	3 days	N/A		
Chiller 1 Evaporator Flow Switch	DI	COV	12 Hours	3 days	N/A		
Chiller 1 Unit Alarm	DI	COV	12 Hours	3 days	C	True	10 Min
Emergency Shutdown	DI	COV	12 Hours	3 days	P	True	1 Min
Primary Loop Pump 1 VFD Speed	AO	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Pump 2 VFD Speed	AO	15 Minutes	12 Hours	3 days	N/A		
Pump 1 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Chiller 1 Enable	DO	COV	12 Hours	3 days	N/A		
Chiller 1 Iso-Valve Command	DO	COV	12 Hours	3 days	N/A		

E. The Contractor shall provide the following information prior to Systems Functional Performance Testing. Any documentation that is modified after submission shall be recorded and resubmitted to the COR and Commissioning Agent.

1. Point-to-Point checkout documentation;

2. Sensor field calibration documentation including system name, sensor/point name, measured value, DDC value, and Correction Factor.
3. A sensor calibration table listing the referencing the location of procedures to following in the O&M manuals, and the frequency at which calibration should be performed for all sensors, separated by system, subsystem, and type. The calibration requirements shall be submitted both in the O&M manuals and separately in a standalone document containing all sensors for inclusion in the commissioning documentation. The following table is a sample that can be used as a template for submission.

SYSTEM		
Sensor	Calibration Frequency	O&M Calibration Procedure Reference
Discharge air temperature	Once a year	Volume I Section D.3.aa
Discharge static pressure	Every 6 months	Volume II Section A.1.c

4. Loop tuning documentation and constants for each loop of the building systems. The documentation shall be submitted in outline or table separated by system, control type (e.g. heating valve temperature control); proportional, integral and derivative constants, interval (and bias if used) for each loop. The following table is a sample that can be used as a template for submission.

AIR HANDLING UNIT AHU-1				
Control Reference	Proportional Constant	Integral Constant	Derivative Constant	Interval
Heating Valve Output	1000	20	10	2 sec.

3.6 SYSTEMS FUNCTIONAL PERFORMANCE TESTING

- A. This paragraph applies to Systems Functional Performance Testing of systems for all referenced specification Divisions.
- B. Objectives and Scope: The objective of Systems Functional Performance Testing is to demonstrate that each system is operating according to the Contract Documents. Systems Functional Performance Testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process,

areas of noncompliant performance are identified and corrected, thereby improving the operation and functioning of the systems. In general, each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load, fire alarm and emergency power) where there is a specified system response. The Contractor shall verify each sequence in the sequences of operation. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.

C. Development of Systems Functional Performance Test Procedures: Before Systems Functional Performance Test procedures are written, the Contractor shall submit all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements found in the Contract Documents and approved submittals and shop drawings, the Commissioning Agent will develop specific Systems Functional Test Procedures to verify and document proper operation of each piece of equipment and system to be commissioned. The Contractor shall assist the Commissioning Agent in developing the Systems Functional Performance Test procedures as requested by the Commissioning Agent i.e. by answering questions about equipment, operation, sequences, etc. Prior to execution, the Commissioning Agent will provide a copy of the Systems Functional Performance Test procedures to the VA, the Architect/Engineer, and the Contractor, who shall review the tests for feasibility, safety, equipment and warranty protection.

D. Purpose of Test Procedures: The purpose of each specific Systems Functional Performance Test is to verify and document compliance with the stated criteria of acceptance given on the test form. Representative test formats and examples are found in the Commissioning Plan for this project. (The Commissioning Plan is issued as a separate document and is available for review.) The test procedure forms developed by the Commissioning Agent will include, but not be limited to, the following information:

1. System and equipment or component name(s)
2. Equipment location and ID number

3. Unique test ID number, and reference to unique Pre-Functional Checklists and startup documentation, and ID numbers for the piece of equipment
 4. Date
 5. Project name
 6. Participating parties
 7. A copy of the specification section describing the test requirements
 8. A copy of the specific sequence of operations or other specified parameters being verified
 9. Formulas used in any calculations
 10. Required pretest field measurements
 11. Instructions for setting up the test.
 12. Special cautions, alarm limits, etc.
 13. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
 14. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
 15. A section for comments.
 16. Signatures and date block for the Commissioning Agent. A place for the Contractor to initial to signify attendance at the test.
- E. Test Methods: Systems Functional Performance Testing shall be achieved by manual testing (i.e. persons manipulate the equipment and observe performance) and/or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by standalone data loggers. The Contractor and Commissioning Agent shall determine which method is most appropriate for tests that do not have a method specified.
1. Simulated Conditions: Simulating conditions (not by an overwritten value) shall be allowed, although timing the testing to experience actual conditions is encouraged wherever practical.
 2. Overwritten Values: Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be

erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.

3. Simulated Signals: Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
4. Altering Setpoints: Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the Air Conditioning compressor lockout initiate at an outside air temperature below 12 C (54 F), when the outside air temperature is above 12 C (54 F), temporarily change the lockout setpoint to be 2 C (4 F) above the current outside air temperature.
5. Indirect Indicators: Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification shall be completed during systems startup and initial checkout.
- F. Setup: Each function and test shall be performed under conditions that simulate actual conditions as closely as is practically possible. The Contractor shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Contractor shall return all affected building equipment and systems, due to these temporary modifications, to their pretest condition.
- G. Sampling: No sampling is allowed in completing Pre-Functional Checklists. Sampling is allowed for Systems Functional Performance Test Procedures execution. The Commissioning Agent will determine the sampling rate. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the Commissioning Agent may stop the testing and require the Contractor to

perform and document a checkout of the remaining units, prior to continuing with Systems Functional Performance Testing of the remaining units.

- H. Cost of Retesting: The cost associated with expanded sample System Functional Performance Tests shall be solely the responsibility of the Contractor. Any required retesting by the Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.
- I. Coordination and Scheduling: The Contractor shall provide a minimum of 7 days' notice to the Commissioning Agent and the VA regarding the completion schedule for the Pre-Functional Checklists and startup of all equipment and systems. The Commissioning Agent will schedule Systems Functional Performance Tests with the Contractor and VA. The Commissioning Agent will witness and document the Systems Functional Performance Testing of systems. The Contractor shall execute the tests in accordance with the Systems Functional Performance Test Procedure.
- J. Testing Prerequisites: In general, Systems Functional Performance Testing will be conducted only after Pre-Functional Checklists have been satisfactorily completed. The control system shall be sufficiently tested and approved by the Commissioning Agent and the VA before it is used to verify performance of other components or systems. The air balancing and water balancing shall be completed before Systems Functional Performance Testing of air-related or water-related equipment or systems are scheduled. Systems Functional Performance Testing will proceed from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems will be checked.
- K. Problem Solving: The Commissioning Agent will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the Contractor.

3.7 DOCUMENTATION, NONCONFORMANCE AND APPROVAL OF TESTS

- A. Documentation: The Commissioning Agent will witness, and document the results of all Systems Functional Performance Tests using the specific procedural forms developed by the Commissioning Agent for that purpose. Prior to testing, the Commissioning Agent will provide these forms to

the VA and the Contractor for review and approval. The Contractor shall include the filled out forms with the O&M manual data.

- B. Nonconformance: The Commissioning Agent will record the results of the Systems Functional Performance Tests on the procedure or test form. All items of nonconformance issues will be noted and reported to the VA on Commissioning Field Reports and/or the Commissioning Master Issues Log.
1. Corrections of minor items of noncompliance identified may be made during the tests. In such cases, the item of noncompliance and resolution shall be documented on the Systems Functional Test Procedure.
 2. Every effort shall be made to expedite the systems functional Performance Testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the Commissioning Agent shall not be pressured into overlooking noncompliant work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so by direction from the VA.
 3. As the Systems Functional Performance Tests progresses and an item of noncompliance is identified, the Commissioning Agent shall discuss the issue with the Contractor and the VA.
 4. When there is no dispute on an item of noncompliance, and the Contractor accepts responsibility to correct it:
 - a. The Commissioning Agent will document the item of noncompliance and the Contractor's response and/or intentions. The Systems Functional Performance Test then continues or proceeds to another test or sequence. After the day's work is complete, the Commissioning Agent will submit a Commissioning Field Report to the VA. The Commissioning Agent will also note items of noncompliance and the Contractor's response in the Master Commissioning Issues Log. The Contractor shall correct the item of noncompliance and report completion to the VA and the Commissioning Agent.
 - b. The need for retesting will be determined by the Commissioning Agent. If retesting is required, the Commissioning Agent and the Contractor shall reschedule the test and the test shall be repeated.

5. If there is a dispute about item of noncompliance, regarding whether it is an item of noncompliance, or who is responsible:
 - a. The item of noncompliance shall be documented on the test form with the Contractor's response. The item of noncompliance with the Contractor's response shall also be reported on a Commissioning Field Report and on the Master Commissioning Issues Log.
 - b. Resolutions shall be made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive and acceptance authority is with the Department of Veterans Affairs.
 - c. The Commissioning Agent will document the resolution process.
 - d. Once the interpretation and resolution have been decided, the Contractor shall correct the item of noncompliance, report it to the Commissioning Agent. The requirement for retesting will be determined by the Commissioning Agent. If retesting is required, the Commissioning Agent and the Contractor shall reschedule the test. Retesting shall be repeated until satisfactory performance is achieved.
- C. Cost of Retesting: The cost to retest a System Functional Performance Test shall be solely the responsibility of the Contractor. Any required retesting by the Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.
- D. Failure Due to Manufacturer Defect: If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform in compliance with the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance specifications, all identical units may be considered unacceptable by the VA. In such case, the Contractor shall provide the VA with the following:
 1. Within one week of notification from the VA, the Contractor shall examine all other identical units making a record of the findings. The findings shall be provided to the VA within two weeks of the original notice.

2. Within two weeks of the original notification, the Contractor shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
 3. The VA shall determine whether a replacement of all identical units or a repair is acceptable.
 4. Two examples of the proposed solution shall be installed by the Contractor and the VA shall be allowed to test the installations for up to one week, upon which the VA will decide whether to accept the solution.
 5. Upon acceptance, the Contractor shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.
- E. Approval: The Commissioning Agent will note each satisfactorily demonstrated function on the test form. Formal approval of the Systems Functional Performance Test shall be made later after review by the Commissioning Agent and by the VA. The Commissioning Agent will evaluate each test and report to the VA using a standard form. The VA will give final approval on each test using the same form, and provide signed copies to the Commissioning Agent and the Contractor.

3.8 DEFERRED TESTING

- A. Unforeseen Deferred Systems Functional Performance Tests: If any Systems Functional Performance Test cannot be completed due to the building structure, required occupancy condition or other conditions, execution of the Systems Functional Performance Testing may be delayed upon approval of the VA. These Systems Functional Performance Tests shall be conducted in the same manner as the seasonal tests as soon as possible. Services of the Contractor to conduct these unforeseen Deferred Systems Functional Performance Tests shall be negotiated between the VA and the Contractor.
- B. Deferred Seasonal Testing: Deferred Seasonal Systems Functional Performance Tests are those that must be deferred until weather conditions are closer to the systems design parameters. The

Commissioning Agent will review systems parameters and recommend which Systems Functional Performance Tests should be deferred until weather conditions more closely match systems parameters. The Contractor shall review and comment on the proposed schedule for Deferred Seasonal Testing. The VA will review and approve the schedule for Deferred Seasonal Testing. Deferred Seasonal Systems Functional Performances Tests shall be witnessed and documented by the Commissioning Agent. Deferred Seasonal Systems Functional Performance Tests shall be executed by the Contractor in accordance with these specifications.

3.9 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

- A. Training Preparation Conference: Before operation and maintenance training, the Commissioning Agent will convene a training preparation conference to include VA's COR, VA's Operations and Maintenance personnel, and the Contractor. The purpose of this conference will be to discuss and plan for Training and Demonstration of VA Operations and Maintenance personnel.
- B. The Contractor shall provide training and demonstration as required by other Division 21, Division 22, Division 23, Division 26, Division 27, Division 28, and Division 31 sections. The Training and Demonstration shall include, but is not limited to, the following:
 - 1. Review the Contract Documents.
 - 2. Review installed systems, subsystems, and equipment.
 - 3. Review instructor qualifications.
 - 4. Review instructional methods and procedures.
 - 5. Review training module outlines and contents.
 - 6. Review course materials (including operation and maintenance manuals).
 - 7. Review and discuss locations and other facilities required for instruction.
 - 8. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.
 - 9. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.
- C. Training Module Submittals: The Contractor shall submit the following information to the VA and the Commissioning Agent:

1. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module. At completion of training, submit two complete training manuals for VA's use.
 2. Qualification Data: Submit qualifications for facilitator and/or instructor.
 3. Attendance Record: For each training module, submit list of participants and length of instruction time.
 4. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.
 5. Demonstration and Training Recording:
 - a. General: Engage a qualified commercial photographer to record demonstration and training. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice. At beginning of each training module, record each chart containing learning objective and lesson outline.
 - b. Video Format: Provide high quality color DVD color on standard size DVD disks.
 - c. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
 - d. Narration: Describe scenes on video recording by audio narration by microphone while demonstration and training is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - e. Submit two copies within seven days of end of each training module.
 6. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.
- D. Quality Assurance:

1. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
2. Instructor Qualifications: A factory authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.
3. Photographer Qualifications: A professional photographer who is experienced photographing construction projects.

E. Training Coordination:

1. Coordinate instruction schedule with VA's operations. Adjust schedule as required to minimize disrupting VA's operations.
2. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
3. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by the VA.

F. Instruction Program:

1. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
 - a. Fire protection systems, including fire alarm and fire suppression systems.
 - b. Intrusion detection systems.
 - c. Conveying systems, including elevators.
 - d. Heat generation, including pumps, steam distribution piping, condensate return systems, heating hot water heat exchangers and heating hot water distribution piping.
 - g. Refrigeration systems, including chillers, pumps and distribution piping.
 - h. HVAC systems, including air handling equipment, air distribution systems, and terminal equipment and devices.
 - i. HVAC instrumentation and controls.

- j. Electrical service and distribution, including panelboards and motor controls.
 - k. Lighting equipment and controls.
 - m. Communication systems, including intercommunication, surveillance, public address, mass evacuation, voice and data, and entertainment television equipment.
- G. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participants are expected to master. For each module, include instruction for the following:
- 1. Basis of System Design, Operational Requirements, and Criteria:
Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - H, Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project Record Documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.

- e. Sequences for electric or electronic systems.
- f. Special operating instructions and procedures.
- 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.

- c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
- d. Instructions for identifying parts and components.
- e. Review of spare parts needed for operation and maintenance.

H. Training Execution:

1. Preparation: Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual. Set up instructional equipment at instruction location.
2. Instruction:
 - a. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Department of Veterans Affairs for number of participants, instruction times, and location.
 - b. Instructor: Engage qualified instructors to instruct VA's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1) The Commissioning Agent will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2) The VA will furnish an instructor to describe VA's operational philosophy.
 - 3) The VA will furnish the Contractor with names and positions of participants.
3. Scheduling: Provide instruction at mutually agreed times. For equipment that requires seasonal operation, provide similar instruction at start of each season. Schedule training with the VA and the Commissioning Agent with at least seven days' advance notice.
4. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, or a written, performance-based test.
5. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

I. Demonstration and Training Recording:

1. General: Engage a qualified commercial photographer to record demonstration and training. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice. At beginning of each training module, record each chart containing learning objective and lesson outline.
2. Video Format: Provide high quality color DVD color on standard size DVD disks.
3. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
4. Narration: Describe scenes on videotape by audio narration by microphone while demonstration and training is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

----- END -----

SECTION 02 41 00
DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies demolition and removal of buildings, portions of buildings, utilities, other structures and debris from trash dumps shown.
- B. This section also relates to the careful removal, salvaging and reuse / reinstallation of slate shingles where the following work is indicated:
 - 1. Replacement of existing step / counter flashing at existing slate shingle roof.
 - 2. Removal of existing dormer and reconstruction of connector / passageway roof in this area.

1.2 RELATED WORK:

- A. Demolition and removal of walks, curbs, and on-grade slabs outside buildings to be demolished: Section 31 20 11, EARTH MOVING (SHORT FORM) .
- B. Safety Requirements: Section 01 35 26 Safety Requirements Article, ACCIDENT PREVENTION PLAN (APP) .
- C. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Reserved items that are to remain the property of the Government: Section 01 00 00, GENERAL REQUIREMENTS.
- E. Asbestos Removal: Section 02 82 11, TRADITIONAL ASBESTOS ABATEMENT; Section 02 82 13.13, GLOVEBAG ASBESTOS ABATEMENT; Section 02 82 13.19, ASBESTOS FLOOR TILE AND MASTIC ABATEMENT; Section 02 82 13.31, ASBESTOS TRANSITE ABATEMENT.
- F. Lead Paint: Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL.
- G. Environmental Protection: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- H. Construction Waste Management: Section 017419 CONSTRUCTION WASTE MANAGEMENT.
- I. Not used.
- J. Slate Shingles removal / reinstallation: Section 07 31 26: SLATE SHINGLES.

1.3 PROTECTION:

- A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Comply with requirements of GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations. Comply with requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS.
- C. Maintain fences, barricades, lights, and other similar items around exposed excavations until such excavations have been completely filled.
- D. Provide enclosed dust chutes with control gates from each floor to carry debris to truck beds and govern flow of material into truck. Provide overhead bridges of tight board or prefabricated metal construction at dust chutes to protect persons and property from falling debris.
- E. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Do not use water if it results in hazardous or objectionable condition such as, but not limited to; ice, flooding, or pollution. Vacuum and dust the work area daily.
- F. In addition to previously listed fire and safety rules to be observed in performance of work, include following:
 - 1. No wall or part of wall shall be permitted to fall outwardly from structures.
 - 2. Maintain at least one stairway in each structure in usable condition to highest remaining floor. Keep stairway free of obstructions and debris until that level of structure has been removed.
 - 3. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. Instruct all possible users in use of fire extinguishers.

4. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 4500 mm (15 feet) of fire hydrants.
- G. Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The contractor shall take necessary precautions to avoid damages to existing items to remain in place, to be reused, or to remain the property of the Medical Center ; any damaged items shall be repaired or replaced as approved by the COR. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal works. Repairs, reinforcement, or structural replacement must have COR approval.
- H. The work shall comply with the requirements of Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- I. The work shall comply with the requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article 1.7 INFECTION PREVENTION MEASURES.

1.4 UTILITY SERVICES:

- A. Demolish and remove outside utility service lines shown to be removed.
- B. Remove abandoned outside utility lines that would interfere with installation of new utility lines and new construction.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 DEMOLITION:

- A. Completely demolish and remove select portions of buildings and structures, including all appurtenances related or connected thereto, as noted below:
 1. As required for installation of new utility service lines.
 2. Not Used.
 3. As indicated on the Construction Drawings.
- B. Debris, including brick, concrete, stone, metals and similar materials shall become property of Contractor and shall be disposed of by him

daily, off the Medical Center to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the COR. Break up concrete slabs below grade that do not require removal from present location into pieces not exceeding 600 mm (24 inches) square to permit drainage. Contractor shall dispose debris in compliance with applicable federal, state or local permits, rules and/or regulations.

- C. In removing buildings and structures of more than two stories, demolish work story by story starting at highest level and progressing down to third floor level. Demolition of first and second stories may proceed simultaneously.
- D. Remove and legally dispose of all materials, other than earth to remain as part of project work, from any trash dumps shown. Materials removed shall become property of contractor and shall be disposed of in compliance with applicable federal, state or local permits, rules and/or regulations . All materials in the indicated trash dump areas, including above surrounding grade and extending to a depth of 1500mm (5feet) below surrounding grade, shall be included as part of the lump sum compensation for the work of this section. Materials that are located beneath the surface of the surrounding ground more than 1500 mm (5 feet), or materials that are discovered to be hazardous, shall be handled as unforeseen. The removal of hazardous material shall be referred to Hazardous Materials specifications.
- E. Remove existing utilities as indicated or uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the COR. When Utility lines are encountered that are not indicated on the drawings, the COR shall be notified prior to further work in that area.

3.2 CLEAN-UP:

On completion of work of this section and after removal of all debris, leave site in clean condition satisfactory to COR. Clean-up shall include off the Medical Center disposal of all items and materials not required to remain property of the Government as well as all debris and rubbish resulting from demolition operations.

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SECTION 02 82 11
TRADITIONAL ASBESTOS ABATEMENT

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09-01-15
Renovate Tower of Building 1
VAMC, Sioux Falls, SD
VA Project #438-18-102

PART 1 - GENERAL

1.1 SUMMARY OF THE WORK

1.1.1 CONTRACT DOCUMENTS AND RELATED REQUIREMENTS

Drawings, general provisions of the contract, including general and supplementary conditions and other Division 01 specifications, shall apply to the work of this section. The contract documents show the work to be done under the contract and related requirements and conditions impacting the project. Related requirements and conditions include applicable codes and regulations, notices and permits, existing site conditions and restrictions on use of the site, requirements for partial owner occupancy during the work, coordination with other work and the phasing of the work. In the event the Asbestos Abatement Contractor discovers a conflict in the contract documents and/or requirements or codes, the conflict must be brought to the immediate attention of the Contracting Officer for resolution. Whenever there is a conflict or overlap in the requirements, the most stringent shall apply. Any actions taken by the Contractor without obtaining guidance from the Contracting Officer shall become the sole risk and responsibility of the Asbestos Abatement Contractor. All costs incurred due to such action are also the responsibility of the Asbestos Abatement Contractor.

1.1.2 EXTENT OF WORK

- A. Below is a brief description of the estimated quantities of asbestos containing materials to be abated. These quantities are for informational purposes only and are based on the best information available at the time of the specification preparation. The Contractor shall satisfy himself as the actual quantities to be abated. Nothing in this section may be interpreted as limiting the extent of work otherwise required by this contract and related documents.
- B. Removal, clean-up and disposal of asbestos containing materials (ACM) and asbestos/waste contaminated elements in an appropriate regulated area for the following approximate quantities;

200 Square Feet of TSI debris in pipe chase below floor level
Inaccessible pipe chases located within the project may contain additional ACM pipe insulation; this includes vertical enclosed pipe chases, and a below floor level tunnel chase, with TSI debris.
Tunnel is under concrete in parts of the project area and may contain concealed TSI pipes and/or elbows.

For use if glovebag removal is not feasible on ACM TSI pipe

1.1.3 RELATED WORK

- A. Section 02 41 00, DEMOLITION.
- B. Section 02 82 13.13, GLOVEBAG ASBESTOS ABATEMENT.
- C. Section 02 82 13.19, ASBESTOS FLOOR TILE AND MASTIC ABATEMENT.
- D. Section 02 82 13.31, CLASS II ASBESTOS ABATEMENT.

1.1.4 TASKS

The work tasks are summarized briefly as follows:

- A. Pre-abatement activities including pre-abatement meeting(s), inspection(s), notifications, permits, submittal approvals, regulated area preparations, emergency procedures arrangements, and standard operating procedures for asbestos abatement work.
- B. Abatement activities including removal, clean-up and disposal of ACM waste, recordkeeping, security, monitoring, and inspections.
- C. Cleaning and decontamination activities including final visual inspection, air monitoring and certification of decontamination.

1.1.5 CONTRACTORS USE OF PREMISES

- A. The Contractor and Contractor's personnel shall cooperate fully with the VA representative/consultant to facilitate efficient use of buildings and areas within buildings. The Contractor shall perform the work in accordance with the VA specifications, drawings, phasing plan and in compliance with any/all applicable Federal, State and Local regulations and requirements.
- B. The Contractor shall use the existing facilities in the building strictly within the limits indicated in contract documents as well as the approved VA Design and Construction Procedures. VA Design and Construction Procedures drawings of partially occupied buildings will show the limits of regulated areas; the placement of decontamination facilities; the temporary location of bagged waste ACM; the path of transport to outside the building; and the temporary waste storage area for each building/regulated area. Any variation from the arrangements shown on drawings shall be secured in writing from the VA representative through the pre-abatement plan of action. The following limitations of use shall apply to existing facilities shown on drawings:

1.2 VARIATIONS IN QUANTITY

The quantities and locations of ACM as indicated on the drawings and the extent of work included in this section are estimated which are limited by the physical constraints imposed by occupancy of the buildings and accessibility to ACM. Accordingly, minor variations (+/- 5%) in quantities of ACM within the regulated area are considered as having no impact on contract price and time requirements of this contract. Where additional work is required beyond the above variation, the contractor shall provide unit prices for newly discovered ACM and those prices shall be used for additional work required under the contractor.

1.3 STOP ASBESTOS REMOVAL

If the Contracting Officer; their field representative; (the facility Safety Officer/Manager or their designee, or the VA Professional Industrial Hygienist/Certified Industrial Hygienist (VPIH/CIH) presents a verbal **Stop Asbestos Removal Order**, the Contractor/Personnel shall immediately stop all asbestos removal and maintain HEPA filtered negative pressure air flow in the containment and adequately wet any exposed ACM. If a verbal Stop Asbestos Removal Order is issued, the VA shall follow-up with a written order to the Contractor as soon as it is practicable. The Contractor shall not resume any asbestos removal activity until

authorized to do so in writing by the VA Contracting Officer. A stop asbestos removal order may be issued at any time the VA Contracting Officer determines abatement conditions/activities are not within VA specification, regulatory requirements or that an imminent hazard exists to human health or the environment. Work stoppage will continue until conditions have been corrected to the satisfaction of the VA. Standby time and costs for corrective actions will be borne by the Contractor, including the VPIH/CIH time. The occurrence of any of the following events shall be reported immediately by the Contractor's competent person to the VA Contracting Office or field representative using the most expeditious means (e.g., verbal or telephonic), followed up with written notification to the Contracting Officer as soon as practical. The Contractor shall immediately stop asbestos removal/disturbance activities and initiate fiber reduction activities:

- A. Airborne PCM analysis results equal to or greater than 0.01 f/cc outside a regulated area or >0.05 f/cc inside a regulated area;
- B. breach or break in regulated area containment barrier(s);
- C. less than -0.02" WCG pressure in the regulated area;
- D. serious injury/death at the site;
- E. fire/safety emergency at the site;
- F. respiratory protection system failure;
- G. power failure or loss of wetting agent; or
- H. any visible emissions observed outside the regulated area.

1.4 DEFINITIONS

1.4.1 GENERAL

Definitions and explanations here are neither complete nor exclusive of all terms used in the contract documents, but are general for the work to the extent they are not stated more explicitly in another element of the contract documents. Drawings must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated therein.

1.4.2 GLOSSARY

Abatement - Procedures to control fiber release from asbestos-containing materials. Includes removal, encapsulation, enclosure, demolition, and renovation activities related to asbestos containing materials (ACM).

Aerosol - Solid or liquid particulate suspended in air.

Adequately wet - Sufficiently mixed or penetrated with liquid to prevent the release of particulates. If visible emissions are observed coming from the ACM, then that material has not been adequately wetted.

Aggressive method - Removal or disturbance of building material by sanding, abrading, grinding, or other method that breaks, crumbles, or disintegrates intact ACM.

Aggressive sampling - EPA AHERA defined clearance sampling method using air moving equipment such as fans and leaf blowers to aggressively disturb and maintain in the air residual fibers after abatement.

AHERA - Asbestos Hazard Emergency Response Act. Asbestos regulations for schools issued in 1987.

Aircell - Pipe or duct insulation made of corrugated cardboard which contains asbestos.

Air monitoring - The process of measuring the fiber content of a known volume of air collected over a specified period of time. The NIOSH 7400 Method, Issue 2 is used to determine the fiber levels in air. For personal samples and clearance air testing using Phase Contrast Microscopy (PCM) analysis. NIOSH Method 7402 can be used when it is necessary to confirm fibers counted by PCM as being asbestos. The AHERA TEM analysis may be used for background, area samples and clearance samples when required by this specification, or at the discretion of the VPIH/CIH as appropriate.

Air sample filter - The filter used to collect fibers which are then counted. The filter is made of mixed cellulose ester membrane for PCM (Phase Contrast Microscopy) and polycarbonate for TEM (Transmission Electron Microscopy)

Amended water - Water to which a surfactant (wetting agent) has been added to increase the penetrating ability of the liquid.

Asbestos - Includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated or altered. Asbestos also includes PACM, as defined below.

Asbestos Hazard Abatement Plan (AHAP) - Asbestos work procedures required to be submitted by the contractor before work begins.

Asbestos-containing material (ACM) - Any material containing more than one percent of asbestos.

Asbestos contaminated elements (ACE) - Building elements such as ceilings, walls, lights, or ductwork that are contaminated with asbestos.

Asbestos-contaminated soil (ACS) - Soil found in the work area or in adjacent areas such as crawlspaces or pipe tunnels which is contaminated with asbestos-containing material debris and cannot be easily separated from the material.

Asbestos-containing waste (ACW) material - Asbestos-containing material or asbestos contaminated objects requiring disposal.

Asbestos Project Monitor - Some states require that any person conducting asbestos abatement clearance inspections and clearance air sampling be licensed as an asbestos project monitor.

Asbestos waste decontamination facility - A system consisting of drum/bag washing facilities and a temporary storage area for cleaned containers of asbestos waste. Used as the exit for waste and equipment leaving the regulated area. In an emergency, it may be used to evacuate personnel.

Authorized person - Any person authorized by the VA, the Contractor, or government agency and required by work duties to be present in regulated areas.

Authorized visitor - Any person approved by the VA; the contractor; or any government agency representative having jurisdiction over the regulated area (e.g., OSHA, Federal and State EPA).

Barrier - Any surface that isolates the regulated area and inhibits fiber migration from the regulated area.

Containment Barrier - An airtight barrier consisting of walls, floors, and/or ceilings of sealed plastic sheeting which surrounds and seals the outer perimeter of the regulated area.

Critical Barrier - The barrier responsible for isolating the regulated area from adjacent spaces, typically constructed of plastic sheeting secured in place at openings such as doors, windows, or any other opening into the regulated area.

Primary Barrier - Plastic barriers placed over critical barriers and exposed directly to abatement work.

Secondary Barrier - Any additional plastic barriers used to isolate and provide protection from debris during abatement work.

Breathing zone - The hemisphere forward of the shoulders with a radius of about 150 - 225 mm (6 - 9 inches) from the worker's nose.

Bridging encapsulant - An encapsulant that forms a layer on the surface of the ACM.

Building/facility owner - The legal entity, including a lessee, which exercises control over management and recordkeeping functions relating to a building and/or facility in which asbestos activities take place.

Bulk testing - The collection and analysis of suspect asbestos containing materials.

Certified Industrial Hygienist (CIH) - A person certified in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene.

Class I asbestos work - Activities involving the removal of Thermal System Insulation (TSI) and surfacing ACM and Presumed Asbestos Containing Material (PACM).

Class II asbestos work - Activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic.

Clean room/Changing room - An uncontaminated room having facilities for the storage of employee's street clothing and uncontaminated materials and equipment.

Clearance sample - The final air sample taken after all asbestos work has been done and visually inspected. Performed by the VA's professional industrial hygiene consultant/Certified Industrial Hygienist (VPIH/CIH).

Closely resemble - The major workplace conditions which have contributed to the levels of historic asbestos exposure, are no more protective than conditions of the current workplace.

Competent person - In addition to the definition in 29 CFR 1926.32(f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f); in addition, for Class I and II work who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for supervisor.

Contractor's Professional Industrial Hygienist (CPIH/CIH) - The asbestos abatement contractor's industrial hygienist. The industrial hygienist must meet the qualification requirements of a PIH and may be a certified industrial hygienist (CIH).

Count - Refers to the fiber count or the average number of fibers greater than five microns in length with a length-to-width (aspect) ratio of at least 3 to 1, per cubic centimeter of air.

Crawlspace - An area which can be found either in or adjacent to the work area. This area has limited access and egress and may contain asbestos materials and/or asbestos contaminated soil.

Decontamination area/unit - An enclosed area adjacent to and connected to the regulated area and consisting of an equipment room, shower room, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos.

Demolition - The wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.

VA Total - means a building or substantial part of the building is completely removed, torn or knocked down, bulldozed, flattened, or razed, including removal of building debris.

Disposal bag - Typically 6 mil thick sift-proof, dustproof, leak-tight container used to package and transport asbestos waste from regulated areas to the approved landfill. Each bag/container must be labeled/marked in accordance with EPA, OSHA and DOT requirements.

Disturbance - Activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM or PACM, no greater than the amount that can be contained in one standard sized glove bag or waste bag in order to access a building component. In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or disposal bag which shall not exceed 60 inches in length or width.

Drum - A rigid, impermeable container made of cardboard fiber, plastic, or metal which can be sealed in order to be sift-proof, dustproof, and leak-tight.

Employee exposure - The exposure to airborne asbestos that would occur if the employee were not wearing respiratory protection equipment.

Encapsulant - A material that surrounds or embeds asbestos fibers in an adhesive matrix and prevents the release of fibers.

Encapsulation - Treating ACM with an encapsulant.

Enclosure - The construction of an air tight, impermeable, permanent barrier around ACM to control the release of asbestos fibers from the material and also eliminate access to the material.

Equipment room - A contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.

Fiber - A particulate form of asbestos, 5 microns or longer, with a length to width (aspect) ratio of at least 3 to 1.

Fibers per cubic centimeter (f/cc) - Abbreviation for fibers per cubic centimeter, used to describe the level of asbestos fibers in air.

Filter - Media used in respirators, vacuums, or other machines to remove particulate from air.

Firestopping - Material used to close the open parts of a structure in order to prevent a fire from spreading.

Friable asbestos containing material - Any material containing more than one (1) percent or asbestos as determined using the method specified in appendix A, Subpart F, 40 CFR 763, section 1, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

Glovebag - Not more than a 60 x 60 inch impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which materials and tools may be handled.

High efficiency particulate air (HEPA) filter - An ASHRAE MERV 17 filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.

HEPA vacuum - Vacuum collection equipment equipped with a HEPA filter system capable of collecting and retaining asbestos fibers.

Homogeneous area - An area of surfacing, thermal system insulation or miscellaneous ACM that is uniform in color, texture and date of application.

HVAC - Heating, Ventilation and Air Conditioning

Industrial hygienist (IH) - A professional qualified by education, training, and experience to anticipate, recognize, evaluate and develop controls for occupational health hazards. Meets definition requirements of the American Industrial Hygiene Association (AIHA).

Industrial hygienist technician (IH Technician) - A person working under the direction of an IH or CIH who has special training, experience, certifications and licenses required for the industrial hygiene work assigned. Some states require that an industrial hygienist technician conducting asbestos abatement clearance inspection and clearance air sampling be licensed as an asbestos project monitor.

Intact - The ACM has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix.

Lockdown - Applying encapsulant, after a final visual inspection, on all abated surfaces at the conclusion of ACM removal prior to removal of critical barriers.

National Emission Standards for Hazardous Air Pollutants (NESHAP) - EPA's rule to control emissions of asbestos to the environment (40 CFR part 61, Subpart M).

Negative initial exposure assessment - A demonstration by the employer which complies with the criteria in 29 CFR 1926.1101 (f)(2)(iii), that employee exposure during an operation is expected to be consistently below the PEL.

Negative pressure - Air pressure which is lower than the surrounding area, created by exhausting air from a sealed regulated area through HEPA equipped filtration units. OSHA requires maintaining -0.02" water column gauge inside the negative pressure enclosure.

Negative pressure respirator - A respirator in which the air pressure inside the facepiece is negative during inhalation relative to the air pressure outside the respirator facepiece.

Non-friable ACM - Material that contains more than 1 percent asbestos but cannot be crumbled, pulverized, or reduced to powder by hand pressure.

Organic vapor cartridge - The type of cartridge used on air purifying respirators to remove organic vapor hazardous air contaminants.

Outside air - The air outside buildings and structures, including, but not limited to, the air under a bridge or in an open ferry dock.

Owner/operator - Any person who owns, leases, operates, controls, or supervises the facility being demolished or renovated or any person who owns, leases, operates, controls, or supervises the demolition or renovation operation, or both.

Penetrating encapsulant - Encapsulant that is absorbed into the ACM matrix without leaving a surface layer.

Personal sampling/monitoring - Representative air samples obtained in the breathing zone for one or workers within the regulated area using a filter cassette and a calibrated air sampling pump to determine asbestos exposure.

Permissible exposure limit (PEL) - The level of exposure OSHA allows for an 8-hour time weighted average. For asbestos fibers, the eight (8) hour time weighted average PEL is 0.1 fibers per cubic centimeter (0.1 f/cc)

of air and the 30-minute Excursion Limit is 1.0 fibers per cubic centimeter (1 f/cc).

Personal protective equipment (PPE) - equipment designed to protect user from injury and/or specific job hazard. Such equipment may include protective clothing, hard hats, safety glasses, and respirators.

Pipe tunnel - An area, typically located adjacent to mechanical spaces or boiler rooms in which the pipes servicing the heating system in the building are routed to allow the pipes to access heating elements. These areas may contain asbestos pipe insulation, asbestos fittings, or asbestos-contaminated soil.

Polarized light microscopy (PLM) - Light microscopy using dispersion staining techniques and refractive indices to identify and quantify the type(s) of asbestos present in a bulk sample.

Polyethylene sheeting - Strong plastic barrier material 4 to 6 mils thick, semi-transparent, flame retardant per NFPA 241.

Positive/negative fit check - A method of verifying the seal of a facepiece respirator by temporarily occluding the filters and breathing in (inhaling) and then temporarily occluding the exhalation valve and breathing out (exhaling) while checking for inward or outward leakage of the respirator respectively.

Presumed ACM (PACM) - Thermal system insulation, surfacing, and flooring material installed in buildings prior to 1981. If the building owner has actual knowledge, or should have known through the exercise of due diligence that other materials are ACM, they too must be treated as PACM. The designation of PACM may be rebutted pursuant to 29 CFR 1926.1101 (b).

Professional IH - An IH who meets the definition requirements of AIHA; meets the definition requirements of OSHA as a "Competent Person" at 29 CFR 1926.1101 (b); has completed two specialized EPA approved courses on management and supervision of asbestos abatement projects; has formal training in respiratory protection and waste disposal; and has a minimum of four projects of similar complexity with this project of which at least three projects serving as the supervisory IH. The PIH may be either the VA's PIH (VPIH) or Contractor's PIH (CPIH/CIH).

Project designer - A person who has successfully completed the training requirements for an asbestos abatement project designer as required by 40 CFR 763 Appendix C, Part I; (B) (5).

Assigned protection factor - A value assigned by OSHA/NIOSH to indicate the expected protection provided by each respirator class, when the respirator is properly selected and worn correctly. The number indicates the reduction of exposure level from outside to inside the respirator facepiece.

Qualitative fit test (QLFT) - A fit test using a challenge material that can be sensed by the wearer if leakage in the respirator occurs.

Quantitative fit test (QNFT) - A fit test using a challenge material which is quantified outside and inside the respirator thus allowing the determination of the actual fit factor.

Regulated area - An area established by the employer to demarcate where Class I, II, III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work may accumulate; and a work area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed the PEL.

Regulated ACM (RACM) - Friable ACM; Category I non-friable ACM that has become friable; Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading or; Category II non-

friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of the demolition or renovation operation.

Removal - All operations where ACM, PACM and/or RACM is taken out or stripped from structures or substrates, including demolition operations.

Renovation - Altering a facility or one or more facility components in any way, including the stripping or removal of asbestos from a facility component which does not involve demolition activity.

Repair - Overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM or PACM attached to structures or substrates.

Shower room - The portion of the PDF where personnel shower before leaving the regulated area.

Supplied air respirator (SAR) - A respiratory protection system that supplies minimum Grade D respirable air per ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989.

Surfacing ACM - A material containing more than 1 percent asbestos that is sprayed, troweled on or otherwise applied to surfaces for acoustical, fireproofing and other purposes.

Surfactant - A chemical added to water to decrease water's surface tension thus making it more penetrating into ACM.

Thermal system ACM - A material containing more than 1 percent asbestos applied to pipes, fittings, boilers, breeching, tanks, ducts, or other structural components to prevent heat loss or gain.

Transmission electron microscopy (TEM) - A microscopy method that can identify and count asbestos fibers.

VA Professional Industrial Hygienist (VPIH/CIH) - The Department of Veterans Affairs Professional Industrial Hygienist must meet the qualifications of a PIH, and may be a Certified Industrial Hygienist (CIH).

VA Representative - The VA official responsible for on-going project work.

Visible emissions - Any emissions, which are visually detectable without the aid of instruments, coming from ACM/PACM/RACM/ACS or ACM waste material.

Waste/Equipment decontamination facility (W/EDF) - The area in which equipment is decontaminated before removal from the regulated area.

Waste generator - Any owner or operator whose act or process produces asbestos-containing waste material.

Waste shipment record - The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos-containing waste material.

Wet cleaning - The process of thoroughly eliminating, by wet methods, any asbestos contamination from surfaces or objects.

1.4.3 REFERENCED STANDARDS ORGANIZATIONS

The following acronyms or abbreviations as referenced in contract/specification documents are defined to mean the associated names. Names and addresses may be subject to change.

- A. VA Department of Veterans Affairs
810 Vermont Avenue, NW
Washington, DC 20420

- B. AIHA American Industrial Hygiene Association
2700 Prosperity Avenue, Suite 250
Fairfax, VA 22031
703-849-8888
- C. ANSI American National Standards Institute
1430 Broadway
New York, NY 10018
212-354-3300
- D. ASTM American Society for Testing and Materials
1916 Race St.
Philadelphia, PA 19103
215-299-5400
- E. CFR Code of Federal Regulations
Government Printing Office
Washington, DC 20420
- F. CGA Compressed Gas Association
1235 Jefferson Davis Highway
Arlington, VA 22202
703-979-0900
- G. CS Commercial Standard of the National Institute of Standards and
Technology (NIST)
U. S. Department of Commerce
Government Printing Office
Washington, DC 20420
- H. EPA Environmental Protection Agency
401 M St., SW
Washington, DC 20460
202-382-3949
- I. MIL-STD Military Standards/Standardization Division
Office of the Assistant Secretary of Defense
Washington, DC 20420
- J. NIST National Institute for Standards and Technology
U. S. Department of Commerce
Gaithersburg, MD 20234
301-921-1000
- K. NEC National Electrical Code (by NFPA)
- L. NEMA National Electrical Manufacturer's Association
2101 L Street, N.W.
Washington, DC 20037
- M. NFPA National Fire Protection Association
1 Batterymarch Park
P.O. Box 9101

Quincy, MA 02269-9101
800-344-3555

- N. NIOSH National Institutes for Occupational Safety and Health
4676 Columbia Parkway
Cincinnati, OH 45226
513-533-8236
- O. OSHA Occupational Safety and Health Administration
U.S. Department of Labor
Government Printing Office
Washington, DC 20402
- P. UL Underwriters Laboratory
333 Pfingsten Rd.
Northbrook, IL 60062
312-272-8800
- Q. South Dakota Dept. of Environment and Natural Resources
523 East Capitol
Pierre, SD 57501
605-773-3153

1.5 APPLICABLE CODES AND REGULATIONS

1.5.1 GENERAL APPLICABILITY OF CODES, REGULATIONS, AND STANDARDS

- A. All work under this contract shall be done in strict accordance with all applicable Federal, State, and local regulations, standards and codes governing asbestos abatement, and any other trade work done in conjunction with the abatement. All applicable codes, regulations and standards are adopted into this specification and will have the same force and effect as this specification.
- B. The most recent edition of any relevant regulation, standard, document or code shall be in effect. Where conflict among the requirements or with these specifications exists, the most stringent requirement(s) shall be utilized.
- C. Copies of all standards, regulations, codes and other applicable documents, including this specification and those listed in Section 1.5 shall be available at the worksite in the clean change area of the worker decontamination system.

1.5.2 ASBESTOS ABATEMENT CONTRACTOR RESPONSIBILITY

The Asbestos Abatement Contractor (Contractor) shall assume full responsibility and liability for compliance with all applicable Federal, State and Local regulations related to any and all aspects of the asbestos abatement project. The Contractor is responsible for providing and maintaining training, accreditations, medical exams, medical records, personal protective equipment (PPE) including respiratory protection including respirator fit testing, as required by applicable Federal, State and Local regulations. The Contractor shall hold the VA and VPIH/CIH consultants harmless for any Contractor's failure to comply with any applicable work, packaging, transporting, disposal, safety, health, or environmental requirement on the part of himself, his employees, or his

subcontractors. The Contractor will incur all costs of the CPIH/CIH, including all sampling/analytical costs to assure compliance with OSHA/EPA/State requirements related to failure to comply with the regulations applicable to the work.

1.5.3 FEDERAL REQUIREMENTS

Federal requirements which govern of asbestos abatement include, but are not limited to, the following regulations.

- A. Occupational Safety and Health Administration (**OSHA**)
 - 1. Title 29 CFR 1926.1101 - Construction Standard for Asbestos
 - 2. Title 29 CFR 1910 Subpart I - Personal Protective Equipment
 - 3. Title 29 CFR 1910.134 - Respiratory Protection
 - 4. Title 29 CFR 1926 - Construction Industry Standards
 - 5. Title 29 CFR 1910.1020 - Access to Employee Exposure and Medical Records
 - 6. Title 29 CFR 1910.1200 - Hazard Communication
 - 7. Title 29 CFR 1910 Subpart K - Medical and First Aid
- B. Environmental Protection Agency (**EPA**):
 - 1. 40 CFR 61 Subpart A and M (Revised Subpart B) - National Emission Standard for Hazardous Air Pollutants - Asbestos.
 - 2. 40 CFR 763.80 - Asbestos Hazard Emergency Response Act (AHERA)
- C. Department of Transportation (**DOT**)
 - Title 49 CFR 100 - 185 - Transportation

1.5.4 STATE REQUIREMENTS

State requirements that apply to the asbestos abatement work, disposal, clearance, etc., include, but are not limited to, the following:

Asbestos Waste Management Program
523 East Capitol
Pierre, SD 57501
605-773-3153

South Dakota Codified Law 34.44
Administrative Rules of South Dakota 74.36.08
Administrative Rules of South Dakota 74.31

1.5.5 LOCAL REQUIREMENTS

If local requirements are more stringent than federal or state standards, the local standards are to be followed.

1.5.6 STANDARDS

- A. Standards which govern asbestos abatement activities include, but are not limited to, the following:
 - 1. American National Standards Institute (ANSI) Z9.2-79 - Fundamentals Governing the Design and Operation of Local Exhaust Systems and ANSI Z88.2 - Practices for Respiratory Protection.
 - 2. Underwriters Laboratories (UL) 586-90 - UL Standard for Safety of HEPA Filter Units, 7th Edition.
- B. Standards which govern encapsulation work include, but are not limited to the following:
 - 1. American Society for Testing and Materials (ASTM)

- C. Standards which govern the fire and safety concerns in abatement work include, but are not limited to, the following:
1. National Fire Protection Association (NFPA) 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.
 2. NFPA 701 - Standard Methods for Fire Tests for Flame Resistant Textiles and Film.
 3. NFPA 101 - Life Safety Code

1.5.7 EPA GUIDANCE DOCUMENTS

- A. EPA guidance documents which discuss asbestos abatement work activities are listed below. These documents are made part of this section by reference. EPA publications can be ordered from (800) 424-9065.
- B. Guidance for Controlling ACM in Buildings (Purple Book) EPA 560/5-85-024
- C. Asbestos Waste Management Guidance EPA 530-SW-85-007
- D. A Guide to Respiratory Protection for the Asbestos Abatement Industry EPA-560-OPTS-86-001
- E. Guide to Managing Asbestos in Place (Green Book) TS 799 20T July 1990

1.5.8 NOTICES

- A. State and Local agencies: Send written notification as required by state and local regulations including the local fire department prior to beginning any work on ACM as follows:

South Dakota Dept. of Environment and Natural Resources
Asbestos Waste Management Program
523 East Capitol
Pierre, SD 57501
Asbestos Coordinator
Fax - 605-773-6035

- B. Copies of notifications shall be submitted to the VA for the facility's records in the same time frame notification are given to EPA, State, and Local authorities.

1.5.9 PERMITS/LICENSES

- A. The contractor shall apply for and have all required permits and licenses to perform asbestos abatement work as required by Federal, State, and Local regulations.

1.5.10 POSTING AND FILING OF REGULATIONS

- A. Maintain two (2) copies of applicable federal, state, and local regulations. Post one copy of each in the clean room at the regulated area where workers will have daily access to the regulations and keep another copy in the Contractor's office.

1.5.11 VA RESPONSIBILITIES

Prior to commencement of work:

- A. Notify occupants adjacent to regulated areas of project dates and requirements for relocation, if needed. Arrangements must be made prior to starting work for relocation of desks, files, equipment and personal

possessions to avoid unauthorized access into the regulated area. **Note: Notification of adjacent personnel is required by OSHA in 29 CFR 1926.1101 (k) to prevent unnecessary or unauthorized access to the regulated area.**

- B. Submit to the Contractor results of background air sampling; including location of samples, person who collected the samples, equipment utilized, calibration data and method of analysis. During abatement, submit to the Contractor, results of bulk material analysis and air sampling data collected during the course of the abatement. This information shall not release the Contractor from any responsibility for OSHA compliance.

1.5.12 EMERGENCY ACTION PLAN AND ARRANGEMENTS

- A. An Emergency Action Plan shall be developed prior to commencing abatement activities and shall be agreed to by the Contractor and the VA. The Plan shall meet the requirements of 29 CFR 1910.38 (a); (b).
- B. Emergency procedures shall be in written form and prominently posted in the clean room and equipment room of the decontamination unit. Everyone, prior to entering the regulated area, must read and sign these procedures to acknowledge understanding of the regulated area layout, location of emergency exits and emergency procedures.
- C. Emergency planning shall include written notification of police, fire, and emergency medical personnel of planned abatement activities; work schedule; layout of regulated area; and access to the regulated area, particularly barriers that may affect response capabilities.
- D. Emergency planning shall include consideration of fire, explosion, hazardous atmospheres, electrical hazards, slips/trips and falls, confined spaces, and heat stress illness. Written procedures for response to emergency situations shall be developed and employee training in procedures shall be provided.
- E. Employees shall be trained in regulated area/site evacuation procedures in the event of workplace emergencies.
 - 1. For non-life-threatening situations - employees injured or otherwise incapacitated shall decontaminate following normal procedures with assistance from fellow workers, if necessary, before exiting the regulated area to obtain proper medical treatment.
 - 2. For life-threatening injury or illness, worker decontamination shall take least priority after measures to stabilize the injured worker, remove them from the regulated area, and secure proper medical treatment.
- F. Telephone numbers of any/all emergency response personnel shall be prominently posted in the clean room, along with the location of the nearest telephone.
- G. The Contractor shall provide verification of first aid/CPR training for personnel responsible for providing first aid/CPR. OSHA requires medical assistance within 3-4 minutes of a life-threatening injury/illness. Bloodborne Pathogen training shall also be verified for those personnel required to provide first aid/CPR.
- H. The Emergency Action Plan shall provide for a Contingency Plan in the event that an incident occurs that may require the modification of the standard operating procedures during abatement. Such incidents include, but are not limited to, fire; accident; power failure; negative pressure failure; and supplied air system failure. The Contractor shall detail procedures to be followed in the event of an incident assuring that

asbestos abatement work is stopped and wetting is continued until correction of the problem.

1.5.13 PRE-CONSTRUCTION MEETING

Prior to commencing the work, the Contractor shall meet with the VA Certified Industrial Hygienist (VPCIH) to present and review, as appropriate, the items following this paragraph. The Contractor's Competent Person(s) who will be on-site shall participate in the pre-start meeting. The pre-start meeting is to discuss and determine procedures to be used during the project. At this meeting, the Contractor shall provide:

- A. Proof of Contractor licensing.
- B. Proof the Competent Person(s) is trained and accredited and approved for working in this State. Verification of the experience of the Competent Person(s) shall also be presented.
- C. A list of all workers who will participate in the project, including experience and verification of training and accreditation.
- D. A list of and verification of training for all personnel who have current first-aid/CPR training. A minimum of one person per shift must have adequate training.
- E. Current medical written opinions for all personnel working on-site meeting the requirements of 29 CFR 1926.1101 (m).
- F. Current fit-tests for all personnel wearing respirators on-site meeting the requirements of 29 CFR 1926.1101 (h) and Appendix C.
- G. A copy of the Contractor's Asbestos Hazard Abatement Plan. In these procedures, the following information must be detailed, specific for this project.
 - 1. Regulated area preparation procedures;
 - 2. Notification requirements procedure of Contractor as required in 29 CFR 1926.1101 (d);
 - 3. Decontamination area set-up/layout and decontamination procedures for employees;
 - 4. Abatement methods/procedures and equipment to be used;
 - 5. Personal protective equipment to be used;
- H. At this meeting the Contractor shall provide all submittals as required.
- I. Procedures for handling, packaging and disposal of asbestos waste.
- J. Emergency Action Plan and Contingency Plan Procedures.

1.6 PROJECT COORDINATION

The following are the minimum administrative and supervisory personnel necessary for coordination of the work.

1.6.1 PERSONNEL

- A. Administrative and supervisory personnel shall consist of a qualified Competent Person(s) as defined by OSHA in the Construction Standards and the Asbestos Construction Standard; Contractor Professional Industrial Hygienist and Industrial Hygiene Technicians. These employees are the Contractor's representatives responsible for compliance with these specifications and all other applicable requirements.
- B. Non-supervisory personnel shall consist of an adequate number of qualified personnel to meet the schedule requirements of the project. Personnel

shall meet required qualifications. Personnel utilized on-site shall be pre-approved by the VA representative. A request for approval shall be submitted for any person to be employed during the project giving the person's name; social security number; qualifications; accreditation card with color picture; Certificate of Worker's Acknowledgment; and Affidavit of Medical Surveillance and Respiratory Protection and current Respirator Fit Test.

- C. Minimum qualifications for Contractor and assigned personnel are:
1. The Contractor has conducted within the last three (3) years, three (3) projects of similar complexity and dollar value as this project; has not been cited and penalized for serious violations of federal (and state as applicable) EPA and OSHA asbestos regulations in the past three (3) years; has adequate liability/occurrence insurance for asbestos work as required by the state; is licensed in applicable states; has adequate and qualified personnel available to complete the work; has comprehensive standard operating procedures for asbestos work; has adequate materials, equipment and supplies to perform the work.
 2. The Competent Person has four (4) years of abatement experience of which two (2) years were as the Competent Person on the project; meets the OSHA definition of a Competent Person; has been the Competent Person on two (2) projects of similar size and complexity as this project within the past three (3) years; has completed EPA AHERA/OSHA/State/Local training requirements/accreditation(s) and refreshers; and has all required OSHA documentation related to medical and respiratory protection.
 3. The Contractor Professional Industrial Hygienist/CIH (CPIH/CIH) shall have five (5) years of monitoring experience and supervision of asbestos abatement projects; has participated as senior IH on five (5) abatement projects, three (3) of which are similar in size and complexity as this project; has developed at least one complete standard operating procedure for asbestos abatement; has trained abatement personnel for three (3) years; has specialized EPA AHERA/OSHA training in asbestos abatement management, respiratory protection, waste disposal and asbestos inspection; has completed the NIOSH 582 Course or equivalent, Contractor/Supervisor course; and has appropriate medical/respiratory protection records/documentation.
 4. The Abatement Personnel shall have completed the EPA AHERA/OSHA abatement worker course; have training on the standard operating procedures of the Contractor; has one year of asbestos abatement experience within the past three (3) years of similar size and complexity; has applicable medical and respiratory protection documentation; has certificate of training/current refresher and State accreditation/license.

All personnel should be in compliance with OSHA construction safety training as applicable and submit certification.

1.7 RESPIRATORY PROTECTION

1.7.1 GENERAL - RESPIRATORY PROTECTION PROGRAM

The Contractor shall develop and implement a written Respiratory Protection Program (RPP) which is in compliance with the January 8, 1998 OSHA requirements found at 29 CFR 1926.1101 and 29 CFR 1910.Subpart I;134.

ANSI Standard Z88.2-1992 provides excellent guidance for developing a respiratory protection program. All respirators used must be NIOSH approved for asbestos abatement activities. The written RPP shall, at a minimum, contain the basic requirements found at 29 CFR 1910.134 (c) (1) (i - ix) - Respiratory Protection Program.

1.7.2 RESPIRATORY PROTECTION PROGRAM COORDINATOR

The Respiratory Protection Program Coordinator (RPPC) must be identified and shall have two (2) years experience coordinating RPP of similar size and complexity. The RPPC must submit a signed statement attesting to the fact that the program meets the above requirements.

1.7.3 SELECTION AND USE OF RESPIRATORS

The procedure for the selection and use of respirators must be submitted to the VA as part of the Contractor's qualifications. The procedure must be written clearly enough for workers to understand. A copy of the Respiratory Protection Program must be available in the clean room of the decontamination unit for reference by employees or authorized visitors.

1.7.4 MINIMUM RESPIRATORY PROTECTION

Minimum respiratory protection shall be a full-face powered air purifying respirator when fiber levels are maintained consistently at or below 0.5 f/cc. A higher level of respiratory protection may be provided or required, depending on fiber levels. Respirator selection shall meet the requirements of 29 CFR 1926.1101 (h); Table 1, except as indicated in this paragraph. Abatement personnel must have a respirator for their exclusive use.

1.7.5 MEDICAL WRITTEN OPINION

No employee shall be allowed to wear a respirator unless a physician or other licensed health care professional has provided a written determination, they are medically qualified to wear the class of respirator to be used on the project while wearing whole body impermeable garments and subjected to heat or cold stress.

1.7.6 RESPIRATOR FIT TEST

All personnel wearing respirators shall have a current qualitative/quantitative fit test which was conducted in accordance with 29 CFR 1910.134 (f) and Appendix A. Quantitative fit tests shall be done for PAPRs which have been put into a motor/blower failure mode.

1.7.7 RESPIRATOR FIT CHECK

The Competent Person shall assure that the positive/negative pressure user seal check is done each time the respirator is donned by an employee. Head coverings must cover respirator head straps. Any situation that prevents an effective facepiece to face seal as evidenced by failure of a user seal check shall preclude that person from wearing a respirator inside the regulated area until resolution of the problem.

1.7.8 MAINTENANCE AND CARE OF RESPIRATORS

The Respiratory Protection Program Coordinator shall submit evidence and documentation showing compliance with 29 CFR 1910.134 (h) Maintenance and Care of Respirators.

1.7.9 SUPPLIED AIR SYSTEMS

If a supplied air system is used, the system shall meet all requirements of 29 CFR 1910.134 and the ANSI/Compressed Gas Association (CGA) Commodity Specification for Air current requirements for Type 1 - Grade D breathing air. Low pressure systems are not allowed to be used on asbestos abatement projects. Supplied Air respirator use shall be in accordance with EPA/NIOSH publication EPA-560-OPTS-86-001 "A Guide to Respiratory Protection for the Asbestos Abatement Industry". The competent person on site will be responsible for the supplied air system to ensure the safety of the worker.

1.8 WORKER PROTECTION

1.8.1 TRAINING OF ABATEMENT PERSONNEL

Prior to beginning any abatement activity, all personnel shall be trained in accordance with OSHA 29 CFR 1926.1101 (k)(9) and any additional State/Local requirements. Training must include, at a minimum, the elements listed at 29 CFR 1926.1101 (k)(9)(viii). Training shall have been conducted by a third party, EPA/State approved trainer meeting the requirements of EPA 40 CFR 763 Appendix C (AHERA MAP). Initial training certificates and current refresher and accreditation proof must be submitted for each person working at the site.

1.8.2 MEDICAL EXAMINATIONS

Medical examinations meeting the requirements of 29 CFR 1926.1101 (m) shall be provided for all personnel working in the regulated area, regardless of exposure levels. A current physician's written opinion as required by 29 CFR 1926.1101 (m)(4) shall be provided for each person and shall include in the medical opinion the person has been evaluated for working in a heat and cold stress environment while wearing personal protective equipment (PPE) and is able to perform the work without risk of material health impairment.

1.8.3 REGULATED AREA ENTRY PROCEDURE

The Competent Person shall ensure that each time workers enter the regulated area; they remove ALL street clothes in the clean room of the decontamination unit and put on new disposable coveralls, head coverings, a clean respirator, and then proceed through the shower room to the equipment room where they put on non-disposable required personal protective equipment.

1.8.4 DECONTAMINATION PROCEDURE

The Competent Person shall require all personnel to adhere to following decontamination procedures whenever they leave the regulated area.

- A. When exiting the regulated area, remove disposable coveralls, and ALL other clothes, disposable head coverings, and foot coverings or boots in the equipment room.
- B. Still wearing the respirator and completely naked, proceed to the shower. Showering is MANDATORY. Care must be taken to follow reasonable procedures in removing the respirator to avoid inhaling asbestos fibers while showering. The following procedure is required as a minimum:
 - 1. Thoroughly wet body including hair and face. If using a PAPR hold blower above head to keep filters dry.
 - 2. With respirator still in place, thoroughly decontaminate body, hair, respirator face piece, and all other parts of the respirator except the blower and battery pack on a PAPR. Pay particular attention to cleaning the seal between the face and respirator facepiece and under the respirator straps.
 - 3. Take a deep breath, hold it and/or exhale slowly, completely wetting hair, face, and respirator. While still holding breath, remove the respirator and hold it away from the face before starting to breathe.
- C. Carefully decontaminate the facepiece of the respirator inside and out. If using a PAPR, shut down using the following sequence: a) first cap inlets to filters; b) turn blower off to keep debris collected on the inlet side of the filter from dislodging and contaminating the outside of the unit; c) thoroughly decontaminate blower and hoses; d) carefully decontaminate battery pack with a wet rag being cautious of getting water in the battery pack thus preventing destruction. **(THIS PROCEDURE IS NOT A SUBSTITUTE FOR RESPIRATOR CLEANING!)**
- D. Shower and wash body completely with soap and water. Rinse thoroughly.
- E. Rinse shower room walls and floor to drain prior to exiting.
- F. Proceed from shower to clean room; dry off and change into street clothes or into new disposable work clothing.

1.8.5 REGULATED AREA REQUIREMENTS

The Competent Person shall meet all requirements of 29 CFR 1926.1101 (o) and assure that all requirements for regulated areas at 29 CFR 1926.1101 (e) are met. All personnel in the regulated area shall not be allowed to eat, drink, smoke, chew tobacco or gum, apply cosmetics, or in any way interfere with the fit of their respirator.

1.9 DECONTAMINATION FACILITIES

1.9.1 DESCRIPTION

Provide each regulated area with separate personnel decontamination facilities (PDF) and waste/equipment decontamination facilities (W/EDF). Ensure that the PDF are the only means of ingress and egress to the regulated area and that all equipment, bagged waste, and other material exit the regulated area only through the W/EDF.

1.9.2 GENERAL REQUIREMENTS

All personnel entering or exiting a regulated area must go through the PDF and shall follow the requirements at 29 CFR 1926.1101 (j) (1) and these specifications. All waste, equipment and contaminated materials must exit the regulated area through the W/EDF and be decontaminated in accordance with these specifications. Walls and ceilings of the PDF and W/EDF must be constructed of a minimum of 3 layers of 6 mil opaque fire-retardant

polyethylene sheeting and be securely attached to existing building components and/or an adequate temporary framework. A minimum of 3 layers of 6 mil poly shall also be used to cover the floor under the PDF and W/EDF units. Construct doors so that they overlap and secure to adjacent surfaces. Weight inner doorway sheets with layers of duct tape so that they close quickly after release. Put arrows on sheets so they show direction of travel and overlap. If the building adjacent area is occupied, construct a solid barrier on the occupied side(s) to protect the sheeting and reduce potential for non-authorized personnel entering the regulated area.

1.9.3 TEMPORARY FACILITIES TO THE PDF AND W/EDF

The Competent Person shall provide temporary water service connections to the PDF and W/EDF. Backflow prevention must be provided at the point of connection to the VA system. Water supply must be of adequate pressure and meet requirements of 29 CFR 1910.141(d)(3). Provide adequate temporary overhead electric power with ground fault circuit interruption (GFCI) protection. Provide a sub-panel equipped with GFCI protection for all temporary power in the clean room. Provide adequate lighting to provide a minimum of 50 foot candles in the PDF and W/EDF. Provide temporary heat, if needed, to maintain 70°F throughout the PDF and W/EDF.

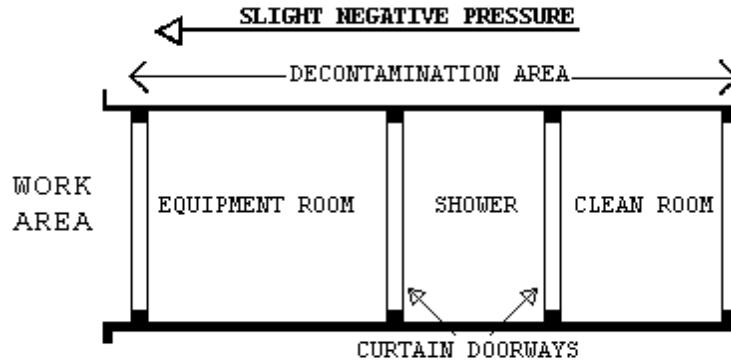
1.9.4 PERSONNEL DECONTAMINATION FACILITY (PDF)

The Competent Person shall provide a PDF consisting of shower room which is contiguous to a clean room and equipment room which is connected to the regulated area. The PDF must be sized to accommodate the number of personnel scheduled for the project. The shower room, located in the center of the PDF, shall be fitted with as many portable showers as necessary to insure all employees can complete the entire decontamination procedure within 15 minutes. The PDF shall be constructed of opaque poly for privacy. The PDF shall be constructed to eliminate any parallel routes of egress without showering.

1. Clean Room: The clean room must be physically and visually separated from the rest of the building to protect the privacy of personnel changing clothes. The clean room shall be constructed of at least 3 layers of 6 mil opaque fire-retardant poly to provide an air tight room. Provide a minimum of 2 - 900 mm (3 foot) wide 6 mil poly opaque fire-retardant doorways. One doorway shall be the entry from outside the PDF and the second doorway shall be to the shower room of the PDF. The floor of the clean room shall be maintained in a clean, dry condition. Shower overflow shall not be allowed into the clean room. Provide 1 storage locker per person. A portable fire extinguisher, minimum 10 pounds capacity, Type ABC, shall be provided in accordance with OSHA and NFPA Standard 10. All persons entering the regulated area shall remove all street clothing in the clean room and dress in disposable protective clothing and respiratory protection. Any person entering the clean room does so either from the outside with street clothing on or is coming from the shower room completely naked and thoroughly washed. Females required to enter the regulated area shall be ensured of their privacy throughout the entry/exit process by posting guards at both entry points to the PDF so no male can enter or exit the PDF during her stay in the PDF.
2. Shower Room: The Competent Person shall assure that the shower room is a completely water tight compartment to be used for the movement of

all personnel from the clean room to the equipment room and for the showering of all personnel going from the equipment room to the clean room. Each shower shall be constructed so water runs down the walls of the shower and into a drip pan. Install a freely draining smooth floor on top of the shower pan. The shower room shall be separated from the rest of the building and from the clean room and equipment room using air tight walls made from at least 3 layers of 6 mil opaque fire-retardant poly. The shower shall be equipped with a shower head and controls, hot and cold water, drainage, soap dish and continuous supply of soap, and shall be maintained in a sanitary condition throughout its use. The controls shall be arranged so an individual can shower without assistance. Provide a flexible hose shower head, hose bibs and all other items shown on Shower Schematic. Waste water will be pumped to a drain after being filtered through a minimum of a 100-micron sock in the shower drain; a 20-micron filter; and a final 5-micron filter. Filters will be changed a minimum of daily or more often as needed. Filter changes must be done in the shower to prevent loss of contaminated water. Hose down all shower surfaces after each shift and clean any debris from the shower pan. Residue is to be disposed of as asbestos waste.

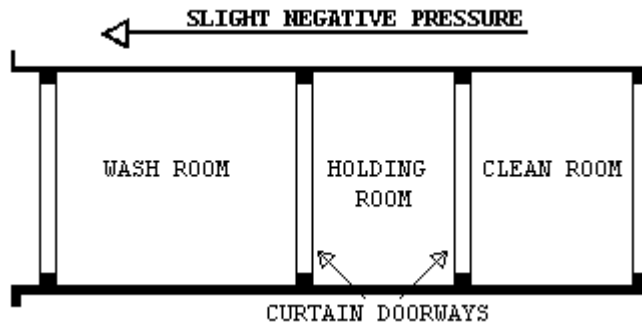
3. Equipment Room: The Competent Person shall provide an equipment room which shall be an air tight compartment for the storage of work equipment/tools, reusable personal protective equipment, except for a respirator and for use as a gross decontamination area for personnel exiting the regulated area. The equipment room shall be separated from the regulated area by a minimum 3 foot wide door made with 2 layers of 6 mil opaque fire-retardant poly. The equipment room shall be separated from the regulated area, the shower room and the rest of the building by air tight walls and ceiling constructed of a minimum of 3 layers of 6 mil opaque fire-retardant poly. Damp wipe all surfaces of the equipment room after each shift change. Provide an additional loose layer of 6 mil fire retardant poly per shift change and remove this layer after each shift. If needed, provide a temporary electrical sub-panel equipped with GFCI in the equipment room to accommodate any equipment required in the regulated area.
4. The PDF shall be as follows: Clean room at the entrance followed by a shower room followed by an equipment room leading to the regulated area. Each doorway in the PDF shall be a minimum of 2 layers of 6 mil opaque fire-retardant poly.



1.9.5 WASTE/EQUIPMENT DECONTAMINATION FACILITY (W/EDF)

The Competent Person shall provide a W/EDF consisting of a wash room, holding room, and clean room for removal of waste, equipment and contaminated material from the regulated area. Personnel shall not enter or exit the W/EDF except in the event of an emergency. Clean debris and residue in the W/EDF daily. All surfaces in the W/EDF shall be wiped/hosed down after each shift and all debris shall be cleaned from the shower pan. The W/EDF shall consist of the following:

1. Wash Down Station: Provide an enclosed shower unit in the regulated area just outside the Wash Room as an equipment bag and container cleaning station.
2. Wash Room: Provide a wash room for cleaning of bagged or containerized asbestos containing waste materials passed from the regulated area. Construct the wash room using 50 x 100 mm (2" x 4") wood framing and 3 layers of 6 mil fire retardant poly. Locate the wash room so that packaged materials, after being wiped clean, can be passed to the Holding Room. Doorways in the wash room shall be constructed of 2 layers of 6 mil fire retardant poly.
3. Holding Room: Provide a holding room as a drop location for bagged materials passed from the wash room. Construct the holding room using 50 x 100 mm (2" x 4") wood framing and 3 layers of 6 mil fire retardant poly. The holding room shall be located so that bagged material cannot be passed from the wash room to the clean room unless it goes through the holding room. Doorways in the holding room shall be constructed of 2 layers of 6 mil fire retardant poly.
4. Clean Room: Provide a clean room to isolate the holding room from the exterior of the regulated area. Construct the clean room using 2 x 4 wood framing and 2 layers of 6 mil fire retardant poly. The clean room shall be located so as to provide access to the holding room from the building exterior. Doorways to the clean room shall be constructed of 2 layers of 6 mil fire retardant poly. When a negative pressure differential system is used, a rigid enclosure separation between the W/EDF clean room and the adjacent areas shall be provided.
5. The W/EDF shall be as follows: Wash Room leading to a Holding Room followed by a Clean Room leading to outside the regulated area. See diagram.



1.9.6 WASTE/EQUIPMENT DECONTAMINATION PROCEDURES

At the washdown station in the regulated area, thoroughly wet clean contaminated equipment and/or sealed polyethylene bags and pass into Wash Room after visual inspection. When passing anything into the Wash Room, close all doorways of the W/EDF, other than the doorway between the washdown station and the Wash Room. Keep all outside personnel clear of the W/EDF. Once inside the Wash Room, wet clean the equipment and/or bags. After cleaning and inspection, pass items into the Holding Room. Close all doorways except the doorway between the Holding Room and the Clean Room. Workers from the Clean Room/Exterior shall enter the Holding Room and remove the decontaminated/cleaned equipment/bags for removal and disposal. These personnel will not be required to wear PPE. At no time shall personnel from the clean side be allowed to enter the Wash Room.

PART 2 - PRODUCTS, MATERIALS AND EQUIPMENT

2.1 MATERIALS AND EQUIPMENT

2.1.1 GENERAL REQUIREMENTS

Prior to the start of work, the contractor shall provide and maintain a sufficient quantity of materials and equipment to assure continuous and efficient work throughout the duration of the project. Work shall not start unless the following items have been delivered to the site and the CPIH/CIH has submitted verification to the VA's representative.

- A. All materials shall be delivered in their original package, container or bundle bearing the name of the manufacturer and the brand name (where applicable).
- B. Store all materials subject to damage off the ground, away from wet or damp surfaces and under cover sufficient enough to prevent damage or contamination. Flammable and combustible materials cannot be stored inside buildings. Replacement materials shall be stored outside of the regulated area until abatement is completed.
- C. The Contractor shall not block or hinder use of buildings by patients, staff, and visitors to the VA in partially occupied buildings by placing materials/equipment in any unauthorized location.
- D. The Competent Person shall inspect for damaged, deteriorating or previously used materials. Such materials shall not be used and shall be removed from the worksite and disposed of properly.
- E. Polyethylene sheeting for walls in the regulated area shall be a minimum of 4-mils. For floors and all other uses, sheeting of at least 6-mil shall

be used in widths selected to minimize the frequency of joints. Fire retardant poly shall be used throughout.

- F. The method of attaching polyethylene sheeting shall be agreed upon in advance by the Contractor and the VA and selected to minimize damage to equipment and surfaces. Method of attachment may include any combination of moisture resistant duct tape furring strips, spray glue, staples, nails, screws, lumber and plywood for enclosures or other effective procedures capable of sealing polyethylene to dissimilar finished or unfinished surfaces under both wet and dry conditions.
- G. Polyethylene sheeting utilized for the PDF shall be opaque white or black in color, 6 mil fire retardant poly.
- H. Installation and plumbing hardware, showers, hoses, drain pans, sump pumps and waste water filtration system shall be provided by the Contractor.
- I. An adequate number of HEPA vacuums, scrapers, sprayers, nylon brushes, brooms, disposable mops, rags, sponges, staple guns, shovels, ladders and scaffolding of suitable height and length as well as meeting OSHA requirements, fall protection devices, water hose to reach all areas in the regulated area, airless spray equipment, and any other tools, materials or equipment required to conduct the abatement project. All electrically operated hand tools, equipment, electric cords shall be connected to GFCI protection.
- J. Special protection for objects in the regulated area shall be detailed (e.g., plywood over carpeting or hardwood floors to prevent damage from scaffolds, water and falling material).
- K. Disposal bags - 2 layers of 6 mil poly for asbestos waste shall be pre-printed with labels, markings and address as required by OSHA, EPA and DOT regulations.
- L. The VA shall be provided an advance copy of the MSDS as required for all hazardous chemicals under OSHA 29 CFR 1910.1200 - Hazard Communication in the pre-start meeting submittal. Chlorinated compounds shall not be used with any spray adhesive, mastic remover or other product. Appropriate encapsulant(s) shall be provided.
- M. OSHA DANGER demarcation signs, as many and as required by OSHA 29 CFR 1926.1101(k) (7) shall be provided and placed by the Competent Person. All other posters and notices required by Federal and State regulations shall be posted in the Clean Room.
- N. Adequate and appropriate PPE for the project and number of personnel/shifts shall be provided. All personal protective equipment issued must be based on a written hazard assessment conducted under 29 CFR 1910.132(d).

2.2 MONITORING, INSPECTION AND TESTING

2.2.1 GENERAL

- A. Perform throughout abatement work monitoring, inspection and testing inside and around the regulated area in accordance with the OSHA requirements and these specifications. OSHA requires that the employee exposure to asbestos must not exceed 0.1 fiber per cubic centimeter (f/cc) of air, averaged over an 8-hour work shift. The CPIH/CIH is responsible for and shall inspect and oversee the performance of the Contractor IH Technician. The IH Technician shall continuously inspect and monitor conditions inside the regulated area to ensure compliance with these specifications. In addition, the CPIH/CIH shall personally manage air sample collection, analysis, and evaluation for personnel, regulated

area, and adjacent area samples to satisfy OSHA requirements. Additional inspection and testing requirements are also indicated in other parts of this specification.

- B. The VA will employ an independent industrial hygienist (VPIH/CIH) consultant and/or use its own IH to perform various services on behalf of the VA. The VPIH/CIH will perform the necessary monitoring, inspection, testing, and other support services to ensure that VA patients, employees, and visitors will not be adversely affected by the abatement work, and that the abatement work proceeds in accordance with these specifications, that the abated areas or abated buildings have been successfully decontaminated. The work of the VPIH/CIH consultant in no way relieves the Contractor from their responsibility to perform the work in accordance with contract/specification requirements, to perform continuous inspection, monitoring and testing for the safety of their employees, and to perform other such services as specified. The cost of the VPIH/CIH and their services will be borne by the VA except for any repeat of final inspection and testing that may be required due to unsatisfactory initial results. Any repeated final inspections and/or testing, if required, will be paid for by the Contractor.
- C. If fibers counted by the VPIH/CIH during abatement work, either inside or outside the regulated area, utilizing the NIOSH 7400 air monitoring method, exceed the specified respective limits, the Contractor shall stop work. The Contractor may request confirmation of the results by analysis of the samples by TEM. Request must be in writing and submitted to the VA's representative. Cost for the confirmation of results will be borne by the Contractor for both the collection and analysis of samples and for the time delay that may/does result for this confirmation. Confirmation sampling and analysis will be the responsibility of the CPIH with review and approval of the VPIH/CIH. An agreement between the CPIH/CIH and the VPIH/CIH shall be reached on the exact details of the confirmation effort, in writing, including such things as the number of samples, location, collection, quality control on-site, analytical laboratory, interpretation of results and any follow-up actions. This written agreement shall be co-signed by the IH's and delivered to the VA's representative.

2.2.2 SCOPE OF SERVICES OF THE VPIH/CIH CONSULTANT

- A. The purpose of the work of the VPIH/CIH is to: assure quality; adherence to the specification; resolve problems; prevent the spread of contamination beyond the regulated area; and assure clearance at the end of the project. In addition, their work includes performing the final inspection and testing to determine whether the regulated area or building has been adequately decontaminated. All air monitoring is to be done utilizing PCM/TEM. The VPIH/CIH will perform the following tasks:
 1. Task 1: Establish background levels before abatement begins by collecting background samples. Retain samples for possible TEM analysis.
 2. Task 2: Perform continuous air monitoring, inspection, and testing outside the regulated area during actual abatement work to detect any faults in the regulated area isolation and any adverse impact on the surroundings from regulated area activities.
 3. Task 3: Perform unannounced visits to spot check overall compliance of work with contract/specifications. These visits may include any

- inspection, monitoring, and testing inside and outside the regulated area and all aspects of the operation except personnel monitoring.
4. Task 4: Provide support to the VA representative such as evaluation of submittals from the Contractor, resolution of conflicts, interpret data, etc.
 5. Task 5: Perform, in the presence of the VA representative, final inspection and testing of a decontaminated regulated area at the conclusion of the abatement to certify compliance with all regulations and VA requirements/specifications.
 6. Task 6: Issue certificate of decontamination for each regulated area and project report.
- B. All documentation, inspection results and testing results generated by the VPIH/CIH will be available to the Contractor for information and consideration. The Contractor shall cooperate with and support the VPIH/CIH for efficient and smooth performance of their work.
- C. The monitoring and inspection results of the VPIH/CIH will be used by the VA to issue any Stop Removal orders to the Contractor during abatement work and to accept or reject a regulated area or building as decontaminated.

2.2.3 MONITORING, INSPECTION AND TESTING BY CONTRACTOR CPIH/CIH

The Contractor's CPIH/CIH is responsible for managing all monitoring, inspections, and testing required by these specifications, as well as any and all regulatory requirements adopted by these specifications. The CPIH/CIH is responsible for the continuous monitoring of all subsystems and procedures which could affect the health and safety of the Contractor's personnel. Safety and health conditions and the provision of those conditions inside the regulated area for all persons entering the regulated area is the exclusive responsibility of the Contractor/Competent Person. The person performing the personnel and area air monitoring inside the regulated area shall be an IH Technician, who shall be trained and shall have specialized field experience in sampling and analysis. The IH Technician shall have successfully completed a NIOSH 582 Course or equivalent and provide documentation. The IH Technician shall participate in the AIHA Asbestos Analysis Registry or participate in the Proficiency Analytic Testing program of AIHA for fiber counting quality control assurance. The IH Technician shall also be an accredited EPA AHERA/State Contractor/Supervisor or Abatement Worker and Building Inspector. The IH Technician shall have participated in five abatement projects collecting personal and area samples as well as responsibility for documentation on substantially similar projects in size and scope. The analytic laboratory used by the Contractor to analyze the samples shall be AIHA accredited for asbestos PAT and approved by the VA prior to start of the project. A daily log shall be maintained by the CPIH/CIH or IH Technician, documenting all OSHA requirements for air personal monitoring for asbestos in 29 CFR 1926.1101(f), (g) and Appendix A. This log shall be made available to the VA representative and the VPIH/CIH upon request. The log will contain, at a minimum, information on personnel or area samples, other persons represented by the sample, the date of sample collection, start and stop times for sampling, sample volume, flow rate, and fibers/cc. The CPIH/CIH shall collect and analyze samples for each representative job being done in the regulated area, i.e., removal,

wetting, clean-up, and load-out. No fewer than two personal samples per shift shall be collected and one area sample per 1,000 square feet of regulated area where abatement is taking place and one sample per shift in the clean room area shall be collected. In addition to the continuous monitoring required, the CPIH/CIH will perform inspection and testing at the final stages of abatement for each regulated area as specified in the CPIH/CIH responsibilities. Additionally, the CPIH/CIH will monitor and record pressure readings within the containment daily with a minimum of two readings at the beginning and at the end of a shift, and submit the data in the daily report.

2.3 ASBESTOS HAZARD ABATEMENT PLAN

The Contractor shall have established an Asbestos Hazard Abatement Plan (AHAP) in printed form and loose-leaf folder consisting of simplified text, diagrams, sketches, and pictures that establish and explain clearly the procedures to be followed during all phases of the work by the Contractor's personnel. The AHAP must be modified as needed to address specific requirements of this project and the specifications. The AHAP shall be submitted for review and approval to the VA prior to the start of any abatement work. The minimum topics and areas to be covered by the AHAPs are:

- A. Minimum Personnel Qualifications
- B. Emergency Action Plan/Contingency Plans and Arrangements
- C. Security and Safety Procedures
- D. Respiratory Protection/Personal Protective Equipment Program and Training
- E. Medical Surveillance Program and Recordkeeping
- F. Regulated Area Requirements - Containment Barriers/Isolation of Regulated Area
- G. Decontamination Facilities and Entry/Exit Procedures (PDF and W/EDF)
- H. Negative Pressure Systems Requirements
- I. Monitoring, Inspections, and Testing
- J. Removal Procedures for ACM
- K. Removal of Contaminated Soil (if applicable)
- L. Encapsulation Procedures for ACM
- M. Disposal of ACM waste/equipment
- N. Regulated Area Decontamination/Clean-up
- O. Regulated Area Visual and Air Clearance
- P. Project Completion/Closeout

2.4 SUBMITTALS

2.4.1 PRE-START MEETING SUBMITTALS

Submit to the VA a minimum of 14 days prior to the pre-start meeting the following for review and approval. Meeting this requirement is a prerequisite for the pre-start meeting for this project:

- A. Submit a detailed work schedule for the entire project reflecting contract documents and the phasing/schedule requirements from the CPM chart.
- B. Submit a staff organization chart showing all personnel who will be working on the project and their capacity/function. Provide their qualifications, training, accreditations, and licenses, as appropriate. Provide a copy of the "Certificate of Worker's Acknowledgment" and the "Affidavit of Medical Surveillance and Respiratory Protection" for each person.

- C. Submit Asbestos Hazard Abatement Plan developed specifically for this project, incorporating the requirements of the specifications, prepared, signed and dated by the CPIH/CIH.
- D. Submit the specifics of the materials and equipment to be used for this project with manufacturer names, model numbers, performance characteristics, pictures/diagrams, and number available for the following:
 - 1. Supplied air system, negative air machines, HEPA vacuums, air monitoring pumps, calibration devices, pressure differential monitoring device and emergency power generating system.
 - 2. Waste water filtration system, shower system, containment barriers.
 - 3. Encapsulants, surfactants, hand held sprayers, airless sprayers, glovebags, and fire extinguishers.
 - 4. Respirators, protective clothing, personal protective equipment.
 - 5. Fire safety equipment to be used in the regulated area.
- E. Submit the name, location, and phone number of the approved landfill; proof/verification the landfill is approved for ACM disposal; the landfill's requirements for ACM waste; the type of vehicle to be used for transportation; and name, address, and phone number of subcontractors, if used. Proof of asbestos training for transportation personnel shall be provided.
- F. Submit required notifications and arrangements made with regulatory agencies having regulatory jurisdiction and the specific contingency/emergency arrangements made with local health, fire, ambulance, hospital authorities and any other notifications/arrangements.
- G. Submit the name, location and verification of the laboratory and/or personnel to be used for analysis of air and/or bulk samples. Personal air monitoring must be done in accordance with OSHA 29 CFR 1926.1101(f) and Appendix A. Area or clearance air monitoring shall be conducted in accordance with EPA AHERA protocols.
- H. Submit qualifications verification: Submit the following evidence of qualifications. Make sure that all references are current and verifiable by providing current phone numbers and documentation.
 - 1. Asbestos Abatement Company: Project experience within the past 3 years; listing projects first most similar to this project: Project Name; Type of Abatement; Duration; Cost; Reference Name/Phone Number; Final Clearance; Completion Date
 - 2. List of project(s) halted by owner, A/E, IH, regulatory agency in the last 3 years: Project Name; Reason; Date; Reference Name/Number; Resolution
 - 3. List asbestos regulatory citations (e.g., OSHA), notices of violations (e.g., Federal and state EPA), penalties, and legal actions taken against the company including and of the company's officers (including damages paid) in the last 3 years. Provide copies and all information needed for verification.
- I. Submit information on personnel: Provide a resume; address each item completely; copies of certificates, accreditations, and licenses. Submit an affidavit signed by the CPIH/CIH stating that all personnel submitted below have medical records in accordance with OSHA 29 CFR 1926.1101(m) and 29 CFR 1910.20 and that the company has implemented a medical surveillance program and written respiratory protection program, and maintains recordkeeping in accordance with the above regulations. Submit the phone number and doctor/clinic/hospital used for medical evaluations.
 - 1. CPIH/CIH and IH Technician: Name; years of abatement experience; list of projects similar to this one; certificates, licenses,

- accreditations for proof of AHERA/OSHA specialized asbestos training; professional affiliations; number of workers trained; samples of training materials; samples of AHAPs developed; medical opinion; and current respirator fit test.
2. Competent Person(s)/Supervisor(s): Number; names; social security numbers; years of abatement experience as Competent Person/Supervisor; list of similar projects in size/complexity as Competent Person/Supervisor; as a worker; certificates, licenses, accreditations; proof of AHERA/OSHA specialized asbestos training; maximum number of personnel supervised on a project; medical opinion (asbestos surveillance and respirator use); and current respirator fit test.
 3. Workers: Numbers; names; social security numbers; years of abatement experience; certificates, licenses, accreditations; training courses in asbestos abatement and respiratory protection; medical opinion (asbestos surveillance and respirator use); and current respirator fit test.
- J. Submit copies of State license for asbestos abatement; copy of insurance policy, including exclusions with a letter from agent stating in plain language the coverage provided and the fact that asbestos abatement activities are covered by the policy; copy of AHAPs incorporating the requirements of this specification; information on who provides your training, how often; who provides medical surveillance, how often; who performs and how is personal air monitoring of abatement workers conducted; a list of references of independent laboratories/IH's familiar with your air monitoring and standard operating procedures; and copies of monitoring results of the five referenced projects listed and analytical method(s) used.
- K. Rented equipment must be decontaminated prior to returning to the rental agency.
- L. Submit, before the start of work, the manufacturer's technical data for all types of encapsulants, all MSDS and application instructions.

2.4.2 SUBMITTALS DURING ABATEMENT

- A. The Competent Person shall maintain and submit a daily log at the regulated area documenting the dates and times of the following: purpose, attendees and summary of meetings; all personnel entering/exiting the regulated area; document and discuss the resolution of unusual events such as barrier breeching, equipment failures, emergencies, and any cause for stopping work; and representative air monitoring and results/TWA's/EL's. Submit this information daily to the VPIH/CIH.
- B. The CPIH/CIH shall document and maintain the inspection and approval of the regulated area preparation prior to start of work and daily during work.
 1. Removal of any poly barriers.
 2. Visual inspection/testing by the CPIH/CIH or IH Technician prior to application of lockdown encapsulant.
 3. Packaging and removal of ACM waste from regulated area.
 4. Disposal of ACM waste materials; copies of Waste Shipment Records/landfill receipts to the VA's representative on a weekly basis.

2.4.3 SUBMITTALS AT COMPLETION OF ABATEMENT

The CPIH/CIH shall submit a project report consisting of the daily log book requirements and documentation of events during the abatement project including Waste Shipment Records signed by the landfill's agent. It will also include information on the containment and transportation of waste from the containment with applicable Chain of Custody forms. The report shall include a certificate of completion, signed and dated by the CPIH/CIH, in accordance with Attachment #1. All clearance and perimeter area samples must be submitted. The VA Representative will retain the abatement report after completion of the project and provide copies of the abatement report to VAMC Office of Engineer and the Safety Office.

2.5 ENCAPSULANTS

2.5.1 TYPES OF ENCAPSULANTS

- A. The following four types of encapsulants, if used, must comply with performance requirements as stated in paragraph 2.6.2:
1. Removal encapsulant - used as a wetting agent to remove ACM.
 2. Bridging encapsulant - provides a tough, durable coating on ACM.
 3. Penetrating encapsulant - penetrates/encapsulates ACM at least 13 mm (1/2").
 4. Lockdown encapsulant - seals microscopic fibers on surfaces after ACM removal.

2.5.2 PERFORMANCE REQUIREMENTS

Encapsulants shall meet the latest requirements of EPA; shall not contain toxic or hazardous substances; or solvents; and shall comply with the following performance requirements:

- A. General Requirements for all Encapsulants:
1. ASTM E84: Flame spread of 25; smoke emission of 50.
 2. University of Pittsburgh Protocol: Combustion Toxicity; zero mortality.
 3. ASTM C732: Accelerated Aging Test; Life Expectancy - 20 years.
 4. ASTM E96: Permeability - minimum of 0.4 perms.
- B. Bridging/Penetrating Encapsulants:
1. ASTM E736: Cohesion/Adhesion Test - 24 kPa (50 lbs/ft²).
 2. ASTM E119: Fire Resistance - 3 hours (Classified by UL for use on fibrous/cementitious fireproofing).
 3. ASTM D2794: Gardner Impact Test; Impact Resistance - minimum 11.5 kg-mm (43 in/lb).
 4. ASTM D522: Mandrel Bend Test; Flexibility - no rupture or cracking.
- C. Lockdown Encapsulants:
1. ASTM E119: Fire resistance - 3 hours (tested with fireproofing over encapsulant applied directly to steel member).
 2. ASTM E736: Bond Strength - 48 kPa (100 lbs/ft²) (test compatibility with cementitious and fibrous fireproofing).
 3. In certain situations, encapsulants may have to be applied to hot pipes/equipment. The encapsulant must be able to withstand high temperatures without cracking or off-gassing any noxious vapors during application.

2.5.3 CERTIFICATES OF COMPLIANCE

The Contractor shall submit to the VA representative certification from the manufacturer indicating compliance with performance requirements for encapsulants when applied according to manufacturer recommendations.

PART 3 - EXECUTION

3.1 REGULATED AREA PREPARATIONS

3.1.1 SITE SECURITY

- A. Regulated area access is to be restricted only to authorized, trained/accredited and protected personnel. These may include the Contractor's employees, employees of Subcontractors, VA employees and representatives, State and local inspectors, and any other designated individuals. A list of authorized personnel shall be established prior to commencing the project and be posted in the clean room of the decontamination unit.
- B. Entry into the regulated area by unauthorized individuals shall be reported immediately to the Competent Person by anyone observing the entry. The Competent Person shall immediately require any unauthorized person to leave the regulated area and then notify the VA Contracting Officer or VA Representative using the most expeditious means.
- C. A log book shall be maintained in the clean room of the decontamination unit. Anyone who enters the regulated area must record their name, affiliation, time in, and time out for each entry.
- D. Access to the regulated area shall be through a single decontamination unit. All other access (doors, windows, hallways, etc.) shall be sealed or locked to prevent entry to or exit from the regulated area. The only exceptions for this requirement are the waste/equipment load-out area which shall be sealed except during the removal of containerized asbestos waste from the regulated area, and emergency exits. Emergency exits shall not be locked from the inside; however, they shall be sealed with poly sheeting and taped until needed. In any situation where exposure to high temperatures which may result in a flame hazard, fire retardant poly sheeting must be used.
- E. The Contractor's Competent Person shall control site security during abatement operations in order to isolate work in progress and protect adjacent personnel. A 24-hour security system shall be provided at the entrance to the regulated area to assure that all entrants are logged in/out and that only authorized personnel are allowed entrance.
- F. The Contractor will have the VA's assistance in notifying adjacent personnel of the presence, location and quantity of ACM in the regulated area and enforcement of restricted access by the VA's employees.
- G. The regulated area shall be locked during non-working hours and secured by VA Representative or Competent Person. The VA Police should be informed of asbestos abatement regulated areas to provide security checks during facility rounds and emergency response.

3.1.2. SIGNAGE AND POWER MANAGEMENT

- A. Post OSHA DANGER signs meeting the specifications of OSHA 29 CFR 1926.1101 at any location and approaches to the regulated area where airborne concentrations of asbestos may exceed the PEL. Signs shall be posted at a distance sufficiently far enough away from the regulated area to permit any personnel to read the sign and take the necessary measures to avoid exposure. Additional signs will be posted following construction of the regulated area enclosure.
- B. Shut down and lock out/tag out electric power to the regulated area. Provide temporary power and lighting. Insure safe installation including GFCI of temporary power sources and equipment by compliance with all applicable electrical code and OSHA requirements for temporary electrical systems. Electricity shall be provided by the VA.
- C. Shut down and lock out/tag out heating, cooling, and air conditioning system (HVAC) components that are in, supply or pass through the regulated area. Investigate the regulated area and agree on pre-abatement condition with the VA's representative. Seal all intake and exhaust vents in the regulated area with duct tape and 2 layers of 6-mil poly. Also, seal any seams in system components that pass through the regulated area. Remove all contaminated HVAC system filters and place in labeled 6-mil polyethylene disposal bags for staging and eventual disposal as asbestos waste.

3.1.3 NEGATIVE PRESSURE FILTRATION SYSTEM

The Contractor shall provide enough HEPA negative air machines to effect $> - 0.02''$ WCG pressure. The Competent Person shall determine the number of units needed for the regulated area by dividing the cubic feet in the regulated area by 15 and then dividing that result by the cubic feet per minute (CFM) for each unit to determine the number of units needed to effect $> - 0.02''$ WCG pressure. Provide a standby unit in the event of machine failure and/or emergency in an adjacent area. NIOSH has done extensive studies and has determined that negative air machines typically operate at ~50% efficiency. The contractor shall consider this in their determination of number of units needed to provide $> - 0.02''$ WCG pressure. The contractor shall use double the number of machines, based on their calculations, or submit proof their machines operate at stated capacities, at a 2" pressure drop across the filters.

3.1.3.1 DESIGN AND LAYOUT

- A. Before start of work submit the design and layout of the regulated area and the negative air machines. The submittal shall indicate the number of, location of and size of negative air machines. The point(s) of exhaust, air flow within the regulated area, anticipated negative pressure differential, and supporting calculations for sizing shall be provided. In addition, submit the following:
 - 1. Method of supplying power to the units and designation/location of the panels.

2. Description of testing method(s) for correct air volume and pressure differential.
3. If auxiliary power supply is to be provided for the negative air machines, provide a schematic diagram of the power supply and manufacturer's data on the generator and switch.

3.1.3.2 NEGATIVE AIR MACHINES (HEPA UNITS)

- A. Negative Air Machine Cabinet: The cabinet shall be constructed of steel or other durable material capable of withstanding potential damage from rough handling and transportation. The width of the cabinet shall be less than 30" in order to fit in standard doorways. The cabinet must be factory sealed to prevent asbestos fibers from being released during use, transport, or maintenance. Any access to and replacement of filters shall be from the inlet end. The unit must be on casters or wheels.
- B. Negative Air Machine Fan: The rating capacity of the fan must indicate the CFM under actual operating conditions. Manufacturer's typically use "free-air" (no resistance) conditions when rating fans. The fan must be a centrifugal type fan.
- C. Negative Air Machine Final Filter: The final filter shall be a HEPA filter. The filter media must be completely sealed on all edges within a structurally rigid frame. The filter shall align with a continuous flexible gasket material in the negative air machine housing to form an air tight seal. Each HEPA filter shall be certified by the manufacturer to have an efficiency of not less than 99.97%. Testing shall have been done in accordance with Military Standard MIL-STD-282 and Army Instruction Manual 136-300-175A. Each filter must bear a UL586 label to indicate ability to perform under specified conditions. Each filter shall be marked with the name of the manufacturer, serial number, air flow rating, efficiency and resistance, and the direction of test air flow.
- D. Negative Air Machine Pre-filters: The pre-filters, which protect the final HEPA filter by removing larger particles, are required to prolong the operating life of the HEPA filter. Two stages of pre-filtration are required. A first stage pre-filter shall be a low efficiency type for particles 10 µm or larger. A second stage pre-filter shall have a medium efficiency effective for particles down to 5 µm or larger. Pre-filters shall be installed either on or in the intake opening of the NAM and the second stage filter must be held in place with a special housing or clamps.
- E. Negative Air Machine Instrumentation: Each unit must be equipped with a gauge to measure the pressure drop across the filters and to indicate when filters have become loaded and need to be changed. A table indicating the cfm for various pressure readings on the gauge shall be affixed near the gauge for reference or the reading shall indicate at what point the filters shall be changed, noting cfm delivery. The unit must have an elapsed time meter to show total hours of operation.

- F. Negative Air Machine Safety and Warning Devices: An electrical/mechanical lockout must be provided to prevent the fan from being operated without a HEPA filter. Units must be equipped with an automatic shutdown device to stop the fan in the event of a rupture in the HEPA filter or blockage in the discharge of the fan. Warning lights are required to indicate normal operation; too high a pressure drop across filters; or too low of a pressure drop across filters.
- G. Negative Air Machine Electrical: All electrical components shall be approved by the National Electrical Manufacturer's Association (NEMA) and Underwriters Laboratories (UL). Each unit must be provided with overload protection and the motor, fan, fan housing, and cabinet must be grounded.
- H. It is essential that replacement HEPA filters be tested using an "in-line" testing method, to ensure the seal around the periphery was not damaged during replacement. Damage to the outer HEPA filter seal could allow contaminated air to bypass the HEPA filter and be discharged to an inappropriate location. Contractor will provide written documentation of test results for negative air machine units with HEPA filters changed by the contractor or documentation when changed and tested by the contractor filters

3.1.3.3 PRESSURE DIFFERENTIAL

The fully operational negative air system within the regulated area shall continuously maintain a pressure differential of -0.02" water column gauge. Before any disturbance of any asbestos material, this shall be demonstrated to the VA by use of a pressure differential meter/manometer as required by OSHA 29 CFR 1926.1101(e)(5)(i). The Competent Person shall be responsible for providing, maintaining, and documenting the negative pressure and air changes as required by OSHA and this specification.

3.1.3.4 MONITORING

The pressure differential shall be continuously monitored and recorded between the regulated area and the area outside the regulated area with a monitoring device that incorporates a strip chart recorder. The strip chart recorder shall become part of the project log and shall indicate at least -0.02" water column gauge for the duration of the project.

3.1.3.5 AUXILIARY GENERATOR

If the building is occupied during abatement, provide an auxiliary gasoline/diesel generator located outside the building in an area protected from the weather. In the event of a power failure of the general power grid and the VAMC emergency power grid, the generator must automatically start and supply power to a minimum of 50% of the negative air machines in operation.

3.1.3.6 SUPPLEMENTAL MAKE-UP AIR INLETS

Provide, as needed for proper air flow in the regulated area, in a location approved by the VA, openings in the plastic sheeting

to allow outside air to flow into the regulated area. Auxiliary makeup air inlets must be located as far from the negative air machines as possible, off the floor near the ceiling, and away from the barriers that separate the regulated area from the occupied clean areas. Cover the inlets with weighted flaps which will seal in the event of failure of the negative pressure system.

3.1.3.7 TESTING THE SYSTEM

The negative pressure system must be tested before any ACM is disturbed in any way. After the regulated area has been completely prepared, the decontamination units set up, and the negative air machines installed, start the units up one at a time. Demonstrate and document the operation and testing of the negative pressure system to the VA using smoke tubes and a negative pressure gauge. Verification and documentation of adequate negative pressure differential across each barrier must be done at the start of each work shift.

3.1.3.8 DEMONSTRATION OF THE NEGATIVE PRESSURE FILTRATION SYSTEM

The demonstration of the operation of the negative pressure system to the VA shall include, but not be limited to, the following:

- A. Plastic barriers and sheeting move lightly in toward the regulated area.
- B. Curtains of the decontamination units move in toward regulated area.
- C. There is a noticeable movement of air through the decontamination units. Use the smoke tube to demonstrate air movement from the clean room to the shower room to the equipment room to the regulated area.
- D. Use smoke tubes to demonstrate air is moving across all areas in which work is to be done. Use a differential pressure gauge to indicate a negative pressure of at least -0.02" across every barrier separating the regulated area from the rest of the building. Modify the system as necessary to meet the above requirements.

3.1.3.9 USE OF THE NEGATIVE PRESSURE FILTRATION SYSTEM DURING ABATEMENT OPERATIONS

- A. Start units before beginning any disturbance of ACM occurs. After work begins, the units shall run continuously, maintaining 4 actual air changes per hour at a negative pressure differential of -0.02" water column gauge, for the duration of the work until a final visual clearance and final air clearance has been successfully completed.
No negative air units shall be shut down at any time unless authorized by the VA Contracting Officer, verbally and in writing.
- B. Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure

has been established in the work area. After items have been pre-cleaned and decontaminated, they may be removed from the work area for storage until the completion of abatement in the work area.

- C. Abatement work shall begin at a location farthest from the units and proceed towards them. If an electric failure occurs, the Competent Person shall stop all abatement work and immediately begin wetting all exposed asbestos materials for the duration of the power outage. Abatement work shall not resume until power is restored and all units are operating properly again.
- D. The negative air machines shall continue to run after all work is completed and until a final visual clearance and a final air clearance has been successfully completed for that regulated area.

3.1.3.10 DISMANTLING THE SYSTEM

After completion of the final visual and final air clearance has been obtained by the VPIH/CIH, the units may be shut down. The unit exterior surfaces shall have been completely decontaminated; pre-filters are not to be removed and the units inlet/outlet sealed with 2 layers of 6 mil poly immediately after shut down. No filter removal shall occur at the VA site following successful completion of site clearance. OSHA/EPA/DOT asbestos shall be attached to the units.

3.1.4 CONTAINMENT BARRIERS AND COVERINGS IN THE REGULATED AREA

3.1.4.1 GENERAL

Seal off the perimeter to the regulated area to completely isolate the regulated area from adjacent spaces. All surfaces in the regulated area must be covered to prevent contamination and to facilitate clean-up. Should adjacent areas become contaminated as a result of the work, shall immediately stop work and clean up the contamination at no additional cost to the VA. Provide firestopping and identify all fire barrier penetrations due to abatement work as specified in Section 3.1.4.8; FIRESTOPPING.

3.1.4.2 PREPARATION PRIOR TO SEALING THE REGULATED AREA

Place all tools, scaffolding, materials and equipment needed for working in the regulated area prior to erecting any plastic sheeting. All uncontaminated removable furniture, equipment and/or supplies shall be removed by the VA from the regulated area before commencing work. Any objects remaining in the regulated area shall be completely covered with 2 layers of 6-mil fire retardant poly sheeting and secured with duct tape. Lock out and tag out any HVAC/electrical systems in the regulated area.

3.1.4.3 CONTROLLING ACCESS TO THE REGULATED AREA

Access to the regulated area is allowed only through the personnel decontamination facility (PDF). All other means of access shall be eliminated and OSHA DANGER demarcation signs posted as required by OSHA. If the regulated area is adjacent to, or within view of an occupied area, provide a visual barrier of 6 mil opaque fire-retardant poly to prevent building occupant observation. If the adjacent area is accessible to the public, the barrier must be solid and capable of withstanding the negative pressure.

3.1.4.4 CRITICAL BARRIERS

Completely separate any operations in the regulated area from adjacent areas using 2 layers of 6 mil fire retardant poly and duct tape. Individually seal with 2 layers of 6 mil poly and duct tape all HVAC openings into the regulated area. Individually seal all lighting fixtures, clocks, doors, windows, convectors, speakers, or any other objects/openings in the regulated area. Heat must be shut off any objects covered with poly.

3.1.4.5 PRIMARY BARRIERS

A. Cover the regulated area with two layers of 6 mil fire retardant poly on the floors and two layers of 4 mil, fire retardant poly on the walls, unless otherwise directed in writing by the VA representative. Floor layers must form a right angle with the wall and turn up the wall at least 300 mm (12"). Seams must overlap at least 1800 mm (6') and must be spray glued and taped. Install sheeting so that layers can be removed independently from each other. Carpeting shall be covered with three layers of 6 mil poly. Corrugated cardboard sheets must be placed between the bottom and middle layers of poly. Mechanically support and seal with duct tape and glue all wall layers.

B. If stairs and ramps are covered with 6 mil plastic, two layers must be used. Provide 19 mm (3/4") exterior grade plywood treads held in place with duct tape/glue on the plastic. Do not cover rungs or rails with any isolation materials.

3.1.4.6 SECONDARY BARRIERS

A loose layer of 6 mil shall be used as a drop cloth to protect the primary layers from debris generated during the abatement. This layer shall be replaced as needed during the work and at a minimum once per work day.

3.1.4.7 EXTENSION OF THE REGULATED AREA

If the enclosure of the regulated area is breached in any way that could allow contamination to occur, the affected area shall be included in the regulated area and constructed as per this section. Decontamination measures must be started immediately and continue until air monitoring indicates background levels are met.

3.1.4.8 FIRESTOPPING

- A. Through penetrations caused by cables, cable trays, pipes, sleeves, conduits, etc. must be firestopped with a fire-rated firestop system providing an air tight seal.
- B. Firestop materials that are not equal to the wall or ceiling penetrated shall be brought to the attention of the VA Representative. The contractor shall list all areas of penetration, the type of sealant used, and whether or not the location is fire rated. Any discovery of penetrations during abatement shall be brought to the attention of the VA representative immediately. All walls, floors and ceilings are considered fire rated unless otherwise determined by the VA Representative or Fire Marshall.
- C. Any visible openings whether or not caused by a penetration shall be reported by the Contractor to the VA Representative for a sealant system determination. Firestops shall meet ASTM E814 and UL 1479 requirements for the opening size, penetrant, and fire rating needed.

3.1.5 SANITARY FACILITIES

The Contractor shall provide sanitary facilities for abatement personnel and maintain them in a clean and sanitary condition throughout the abatement project.

3.1.6 PERSONAL PROTECTIVE EQUIPMENT

Provide whole body clothing, head coverings, gloves and foot coverings and any other personal protective equipment as determined by conducting the hazard assessment required by OSHA at 29 CFR 1910.132 (d). The Competent Person shall ensure the integrity of personal protective equipment worn for the duration of the project. Duct tape shall be used to secure all suit sleeves to wrists and to secure foot coverings at the ankle.

3.1.7 PRE-CLEANING

The VA will provide water for abatement purposes. The Contractor shall connect to the existing VA system. The service to the shower(s) shall be supplied with backflow prevention.

Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area. All workers performing pre-cleaning activities must don appropriate personal protective equipment (PPE), as specified throughout

this document and as approved in the Contractor's work plan. After items have been pre-cleaned and decontaminated, they may be removed from the work area for storage until the completion of abatement in the work area.

Pre-clean all movable objects within the regulated area using a HEPA filtered vacuum and/or wet cleaning methods as appropriate. After cleaning, these objects shall be removed from the regulated area and carefully stored in an uncontaminated location. Drapes, clothing, upholstered furniture and other fabric items should be disposed of as asbestos contaminated waste. Cleaning these asbestos contaminated items utilizing HEPA vacuum techniques and off-premises steam cleaning is very difficult and cannot guarantee decontamination. Carpeting will be disposed of prior to abatement if in the regulated area. If ACM floor tile is attached to the carpet while the Contractor is removing the carpet that section of the carpet will be disposed of as asbestos waste.

Pre-clean all fixed objects in the regulated area using HEPA filtered vacuums and/or wet cleaning techniques as appropriate. Careful attention must be paid to machinery behind grills or gratings where access may be difficult but contamination may be significant. Also, pay particular attention to wall, floor and ceiling penetration behind fixed items. After pre-cleaning, enclose fixed objects with 2 layers of 6-mil poly and seal securely in place with duct tape. Objects (e.g., permanent fixtures, shelves, electronic equipment, laboratory tables, sprinklers, alarm systems, closed circuit TV equipment and computer cables) which must remain in the regulated area and that require special ventilation or enclosure requirements should be designated here along with specified means of protection. Contact the manufacturer for special protection requirements.

Pre-clean all surfaces in the regulated area using HEPA filtered vacuums and/or wet cleaning methods as appropriate. Do not use any methods that would raise dust such as dry sweeping or vacuuming with equipment not equipped with HEPA filters. Do not disturb asbestos-containing materials during this pre-cleaning phase.

3.1.8 PRE-ABATEMENT ACTIVITIES

3.1.8.1 PRE-ABATEMENT MEETING

The VA representative, upon receipt, review, and substantial approval of all pre-abatement submittals and verification by the CPIH/CIH that all materials and equipment required for the project are on the site, will arrange for a pre-abatement meeting between the Contractor, the CPIH/CIH, Competent Person(s), the VA representative(s), and the VPIH/CIH. The purpose of the meeting is to discuss any aspect of the submittals needing clarification or amplification and to discuss any aspect of the project execution and the sequence of the operation. The Contractor shall be prepared to provide any supplemental information/documentation to the VA's representative regarding any submittals, documentation, materials or equipment. Upon satisfactory resolution of any outstanding issues, the VA's representative will issue a written order to proceed to the Contractor. No abatement work of any kind described

in the following provisions shall be initiated prior to the VA written order to proceed.

3.1.8.2 PRE-ABATEMENT CONSTRUCTION AND OPERATIONS

- A. Perform all preparatory work for the first regulated area in accordance with the approved work schedule and with this specification.
- B. Upon completion of all preparatory work, the CPIH/CIH will inspect the work and systems and will notify the VA's representative when the work is completed in accordance with this specification. The VA's representative may inspect the regulated area and the systems with the VPIH/CIH and may require that upon satisfactory inspection, the Contractor's employees perform all major aspects of the approved AHAP(s), especially worker protection, respiratory systems, contingency plans, decontamination procedures, and monitoring to demonstrate satisfactory operation. The operational systems for respiratory protection and the negative pressure system shall be demonstrated for proper performance.
- C. The CPIH/CIH shall document the pre-abatement activities described above and deliver a copy to the VA's representative.
- D. Upon satisfactory inspection of the installation of and operation of systems the VA's representative will notify the Contractor in writing to proceed with the asbestos abatement work in accordance with this specification and all applicable regulations.

3.1.8.3 PRE-ABATEMENT INSPECTIONS AND PREPARATIONS

Before any work begins on the construction of the regulated area, the Contractor will:

- A. Conduct a space-by-space inspection with an authorized VA representative and prepare a written inventory of all existing damage in those spaces where asbestos abatement will occur. Still or video photography may be used to supplement the written damage inventory. Document will be signed and certified as accurate by both parties.
- B. The VA Representative, the Contractor, and the VPIH/CIH must be aware of AEQA 10-95 indicating the failure to identify asbestos in the areas listed as well as common issues when preparing specifications and contract documents. This is especially critical when demolition is planned, because AHERA surveys are non-destructive, and ACM may remain undetected. A NESHAPS (destructive) ACM inspection should be conducted on all building structures that will be demolished. Ensure the following areas are inspected on the project: lay-in ceilings concealing ACM; ACM behind walls/windows from previous renovations; inside utility chases/walls; transite piping/ductwork/sheets; behind radiators; lab fume hoods; transite lab countertops; roofing materials; below window sills; water/sewer lines; electrical conduit coverings; crawlspaces (previous abatement contamination); flooring/mastic covered by carpeting/new flooring; exterior

insulated wall panels; on underground fuel tanks; and steam line trench coverings.

- C. Ensure that all furniture, machinery, equipment, curtains, drapes, blinds, and other movable objects required to be removed from the regulated area have been cleaned and removed or properly protected from contamination.
- D. If present and required, remove and dispose of carpeting from floors in the regulated area.
- E. Inspect existing firestopping in the regulated area. Correct as needed.

3.2 REMOVAL OF ACM

3.2.1 WETTING ACM

- A. Use amended water for the wetting of ACM prior to removal. The Competent Person shall assure the wetting of ACM meets the definition of "adequately wet" in the EPA NESHAP regulation and OSHA's "wet methods" for the duration of the project. A removal encapsulant may be used instead of amended water with written approval of the VA's representative.
- B. Amended Water: Provide water to which a surfactant has been added shall be used to wet the ACM and reduce the potential for fiber release during disturbance of ACM. The mixture must be equal to or greater than the wetting provided by water amended by a surfactant consisting one ounce of 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with 5 gallons (19L) of water.
- C. Removal Encapsulant: When authorized by VA, provide a penetrating encapsulant designed specifically for the removal of ACM. The material must, when used, result in adequate wetting of the ACM and retard fiber release during removal.

3.2.2 SECONDARY BARRIER AND WALKWAYS

- A. Install as a drop cloth a 6-mil poly sheet at the beginning of each work shift where removal is to be done during that shift. Completely cover floors and any walls within 10 feet (3 meters) of the area where work is to be done. Secure the secondary barrier with duct tape to prevent it from moving or debris from getting behind it. Remove the secondary barrier at the end of the shift or as work in the area is completed. Keep residue on the secondary barrier wetted. When removing, fold inward to prevent spillage and place in a disposal bag.
- B. Install walkways using 6 mil black poly between the regulated area and the decontamination facilities (PDF and W/EDF) to protect the primary layers from contamination and damage. Install the walkways at the beginning of each shift and remove at the end of each shift.

3.2.3 WET REMOVAL OF ACM

- A. Adequately and thoroughly wet the ACM to be removed prior to removal with amended water or when authorized by VA, removal encapsulant to reduce/prevent fiber release to the air. Adequate time (at a minimum two hours) must be allowed for the amended water or removal encapsulant to saturate the ACM. Abatement personnel must not disturb dry ACM. Use a fine spray of amended water or removal encapsulant. Saturate the material

sufficiently to wet to the substrate without causing excessive dripping. The material must be sprayed repeatedly/continuously during the removal process in order to maintain adequately wet conditions. Removal encapsulants must be applied in accordance with the manufacturer's written instructions. Perforate or carefully separate, using wet methods, an outer covering that is painted or jacketed in order to allow penetration and wetting of the material. Where necessary, carefully remove covering while wetting to minimize fiber release. **In no event shall dry removal occur except when authorized in writing by the VPIH/CIH and VA when a greater safety hazard (e.g., electricity) is present.**

- B. If ACM does not wet well with amended water due to composition, coating or jacketing, remove as follows:
1. Mist work area continuously with amended water whenever necessary to reduce airborne fiber levels.
 2. Remove saturated ACM in small sections. Do not allow material to dry out. As material is removed, bag material, while still wet into disposal bags. Twist the bag neck tightly, bend over (gooseneck) and seal with a minimum of three tight wraps of duct tape. Clean /decontaminate the outside of the bag of any residue and move to washdown station adjacent to W/EDF.
 3. Fireproofing or Architectural Finish on Scratch Coat: Spray with a fine mist of amended water or removal encapsulant. Allow time for saturation to the substrate. Do not over saturate causing excess dripping. Scrape material from substrate. Remove material in manageable quantities and control falling to staging or floor. If the falling distance is over 20 feet (6M), use a drop chute to contain material through descent. Remove residue remaining on the scratch coat after scraping is done using a stiff bristle hand brush. If a removal encapsulant is used, remove residue completely before the encapsulant dries. Periodically re-wet the substrate with amended water as needed to prevent drying of the material before the residue is removed from the substrate.
 4. Fireproofing or Architectural Finish on Wire Lath: Spray with a fine mist of amended water or removal encapsulant. Allow time to completely saturate the material. Do not over saturate causing excess dripping. If the surface has been painted or otherwise coated, cut small holes as needed and apply amended water or removal encapsulant from above. Cut saturated wire lath into 2' x 6' (50mm x 150mm) sections and cut hanger wires. Roll up complete with ACM, cover in burlap and hand place in disposal bag. Do not drop to floor. After removal of lath/ACM, remove any overspray on decking and structure using stiff bristle nylon brushes. Depending on hardness of overspray, scrapers may be needed for removal.
 5. Pipe/Tank/Vessel/Boiler Insulation: Remove the outer layer of wrap while spraying with amended water in order to saturate the ACM. Spray ACM with a fine mist of amended water or removal encapsulant. Allow time to saturate the material to the substrate. Cut bands holding pre-formed pipe insulation sections. Slit jacketing at the seams, remove and hand place in a disposal bag. Do not allow dropping to the floor. Remove molded fitting insulation/mud in large pieces and hand place in a disposal bag. Remove any residue on pipe or fitting with a stiff bristle nylon brush. In locations where pipe fitting insulation

is removed from fibrous glass or other non-asbestos insulated straight runs of pipe, remove fibrous material at least 6" from the point it contacts the ACM.

3.2.4 WET REMOVAL OF AMOSITE - NOT APPLICABLE

3.2.5 REMOVAL OF ACM/DIRT FLOORS AND OTHER SPECIAL PROCEDURES

A. MAJOR ABATEMENT ON DIRT FLOORS:

When working on dirt floors, remove all visible asbestos debris using wet methods after set-up of PDF, W/EDF, negative air systems as required. Perform work and decontaminate/clean-up; perform lockdown as needed and complete work as required in these specifications. The asbestos contaminated soil (ACS) shall be removed and/or enclosed.

Options for abatement of asbestos contaminated soil include: Removal of top 6 inches of soil; encapsulated the soil using shotcrete or other spray applied concrete materials. Considerations for which option to be used will be made by the VA representative. Factors which may affect which option to be used may include: access to the work area; height of the area (such as is there sufficient height to use concrete materials in the area, etc.) Soils covered with permanent barriers **MUST HAVE PERMANENT SIGNAGE INSTALLED TO WARN AGAINST PENETRATION ASSOCIATED WITH POTENTIAL DISTURBANCE OF ASBESTOS.**

1. Remove ACS as shown on drawings to a minimum depth of 6 using wet methods. After wetting with amended water to minimize dust, shovel dirt into disposal bags. The CPIH/CIH shall closely monitor work conditions and take appropriate action to protect workers from over exposure to asbestos and heat stress. The minimum number of air changes per hour shall be six using negative air machines. Use special vacuum truck equipped with HEPA filtration to remove soil
2. Enclosure of ACS using a concrete layer of 4" over the entire surface may also be done. Thoroughly dampen soil first with amended water before pouring concrete. Personnel shall be proficient in concrete finishing as well as asbestos trained.

B. Crawlspace/Pipe Tunnels:

When working in crawlspaces or pipe tunnels, remove all visible asbestos debris using wet methods (if possible) after set-up of PDF, W/EDF, and after establishing negative air systems as required. Perform work and decontaminate/clean-up; perform lockdown as needed and complete work as required in these specifications. The asbestos contaminated soil (ACS) shall be removed and/or enclosed. Clearance requirements include confirmation sampling of affected soil by Polarized Light Microscopy (PLM). Clearance sampling requirements are specified in Sections 3.6.4 and 3.6.5.

Options for abatement of asbestos contaminated soil include: Removal of top 6 inches of soil; encapsulated the soil using shotcrete or other spray applied concrete materials. Considerations for which option to be used will be made by the VA representative. Factors which may affect which option to be used may include: access to the work area; height of the area (such as is there sufficient height to use concrete materials in the area, etc.)

3.3 LOCKDOWN ENCAPSULATION

3.3.1 GENERAL

Lockdown encapsulation is an integral part of the ACM removal. At the conclusion of ACM removal and before removal of the primary barriers, the contractor shall encapsulate all surfaces with a bridging encapsulant.

3.3.2 DELIVERY AND STORAGE

Deliver materials to the job site in original, new and unopened containers bearing the manufacturer's name and label as well as the following information: name of material, manufacturer's stock number, date of manufacture, thinning instructions, application instructions and the MSDS for the material.

3.3.3 WORKER PROTECTION

Before beginning work with any material for which an MSDS has been submitted, provide workers with any required personal protective equipment. The required personal protective equipment shall be used whenever exposure to the material might occur. In addition to OSHA/specification requirements for respiratory protection, a paint pre-filter and an organic vapor cartridge, at a minimum, shall be used in addition to the HEPA filter when an organic solvent based encapsulant is used. The CPIH/CIH shall be responsible for provision of adequate respiratory protection. Note: Flammable and combustible encapsulants shall not be used, unless authorized in writing by the VA.

3.3.4 ENCAPSULATION OF SCRATCH COAT PLASTER OR PIPING

- A. Apply two coats of lockdown encapsulant to the scratch coat plaster or piping after all ACM has been removed. Apply in strict accordance with the manufacturer's instructions. Any deviation from the instructions must be approved by the VA's representative in writing prior to commencing the work.
- B. Apply the lockdown encapsulant with an airless sprayer at a pressure and using a nozzle orifice as recommended by the manufacturer. Apply the first coat while the while the scratch coat is still damp from the asbestos removal process, after passing the visual inspection. If the surface has been allowed to dry, wet wipe or HEPA vacuum prior to spraying with encapsulant. Apply a second coat over the first coat in strict conformance with the manufacturer's instructions. Color the lockdown encapsulant and contrast the color in the second coat so that visual confirmation of completeness and uniform coverage of each coat is possible. Adhere to the manufacturer's instructions for coloring. At the completion of the encapsulation, the surface must be a uniform third color produced by the mixture.

3.3.5 SEALING EXPOSED EDGES

Seal edges of ACM exposed by removal work which is inaccessible, such as a sleeve, wall penetration, etc., with two coats of bridging encapsulant. Prior to sealing, permit the exposed edges to dry completely to permit penetration of the bridging encapsulant. Apply in accordance with 3.3.4 (B).

3.4 DISPOSAL OF ACM WASTE MATERIALS

3.4.1 GENERAL

Dispose of waste ACM and debris which is packaged in accordance with these specifications, OSHA, EPA and DOT. The landfill requirements for packaging must also be met. Transport will be in compliance with 49 CFR 100-185 regulations. Disposal shall be done at an approved landfill. Disposal of non-friable ACM shall be done in accordance with applicable regulations.

3.4.2 PROCEDURES

- A. The VA must be notified at least 24 hours in advance of any waste removed from the containment.
- B. Asbestos waste shall be packaged and moved through the W/EDF into a covered transport container in accordance with procedures in this specification. Waste shall be double-bagged and wetted with amended water prior to disposal. Wetted waste can be very heavy. Bags shall not be overfilled. Bags shall be securely sealed to prevent accidental opening and/or leakage. The top shall be tightly twisted and goose necked prior to tightly sealing with at least three wraps of duct tape. Ensure that unauthorized persons do not have access to the waste material once it is outside the regulated area. All transport containers must be covered at all times when not in use. NESHAP signs must be on containers during loading and unloading. Material shall not be transported in open vehicles. If drums are used for packaging, the drums shall be labeled properly and shall not be re-used.
- C. Waste Load Out: Waste load out shall be done in accordance with the procedures in W/EDF Decontamination Procedures. Sealed waste bags shall be decontaminated on exterior surfaces by wet cleaning and/or HEPA vacuuming before being placed in the second waste bag and sealed, which then must also be wet wiped or HEPA vacuumed.
- D. Asbestos waste with sharp edged components, i.e., nails, screws, lath, strapping, tin sheeting, jacketing, metal mesh, etc., which might tear poly bags shall be wrapped securely in burlap before packaging and, if needed, use a poly lined fiber drum as the second container, prior to disposal.

3.5 PROJECT DECONTAMINATION

3.5.1 GENERAL

- A. The entire work related to project decontamination shall be performed under the close supervision and monitoring of the CPIH/CIH.
- B. If the asbestos abatement work is in an area which was contaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior to its removal and cleanings of the surfaces of the regulated area after the primary barrier removal.
- C. If the asbestos abatement work is in an area which was uncontaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior to its removal, thus preventing contamination of the building when the regulated area critical barriers are removed.

3.5.2 REGULATED AREA CLEARANCE

Clearance air testing and other requirements which must be met before release of the Contractor and re-occupancy of the regulated area space are specified in Final Testing Procedures.

3.5.3 WORK DESCRIPTION

Decontamination includes the clearance air testing in the regulated area and the decontamination and removal of the enclosures/facilities installed prior to the abatement work including primary/critical barriers, PDF and W/EDF facilities, and negative pressure systems.

3.5.4 PRE-DECONTAMINATION CONDITIONS

- A. Before decontamination starts, all ACM waste from the regulated area shall be collected and removed, and the loose 6 mil layer of poly removed while being adequately wetted with amended water and disposed of along with any gross debris generated by the work.
- B. At the start of decontamination, the following shall be in place:
 - 1. Primary barriers consisting of 2 layers of 6 mil poly on the floor and 4 mil poly on the walls.
 - 2. Critical barriers consisting of 2 layers of 6 mil poly which is the sole barrier between the regulated area and openings to the rest of the building or outside.
 - 4. Decontamination facilities for personnel and equipment in operating condition and the negative pressure system in operation.

3.5.5 FIRST CLEANING

Carry out a first cleaning of all surfaces of the regulated area including items of remaining poly sheeting, tools, scaffolding, ladders/staging by wet methods and/or HEPA vacuuming. Do not use dry dusting/sweeping/air blowing methods. Use each surface of a wetted cleaning cloth one time only and then dispose of as contaminated waste. Continue this cleaning until there is no visible residue from abated surfaces or poly or other surfaces. Remove all filters in the air handling system and dispose of as ACM waste in accordance with these specifications. The negative pressure system shall remain in operation during this time. Additional cleaning(s) may be needed as determined by the CPIH/VPIH/CIH.

3.5.6 PRE-CLEARANCE INSPECTION AND TESTING

The CPIH/CIH and VPIH/CIH will perform a thorough and detailed visual inspection at the end of the cleaning to determine whether there is any visible residue in the regulated area. If the visual inspection is acceptable, the CPIH/CIH will perform pre-clearance sampling using aggressive clearance as detailed in 40 CFR 763 Subpart E (AHERA) Appendix A (III) (B) (7) (d). If the sampling results show values below 0.01 f/cc, then the Contractor shall notify the VA's representative of the results with a brief report from the CPIH/CIH documenting the inspection and sampling results and a statement verifying that the regulated area is ready for lockdown encapsulation. The VA reserves the right to utilize their own VPIH/CIH to perform a pre-clearance inspection and testing for verification.

3.5.7 LOCKDOWN ENCAPSULATION OF ABATED SURFACES

With the express written permission of the VA's representative, perform lockdown encapsulation of all surfaces from which asbestos was abated in accordance with the procedures in this specification. Negative pressure shall be maintained in the regulated area during the lockdown application.

3.6 FINAL VISUAL INSPECTION AND AIR CLEARANCE TESTING

3.6.1 GENERAL

Notify the VA representative 24 hours in advance for the performance of the final visual inspection and testing. The final visual inspection and testing will be performed by the VPIH/CIH starting after the final cleaning.

3.6.2 FINAL VISUAL INSPECTION

Final visual inspection will include the entire regulated area, the PDF, all poly sheeting, seals over HVAC openings, doorways, windows, and any other openings. If any debris, residue, dust or any other suspect material is detected, the final cleaning shall be repeated at no cost to the VA. Dust/material samples may be collected and analyzed at no cost to the VA at the discretion of the VPIH/CIH to confirm visual findings. When the regulated area is visually clean the final testing can be done.

3.6.3 FINAL AIR CLEARANCE TESTING

- A. After an acceptable final visual inspection by the VPIH/CIH and VA Representative, the VPIH/CIH will perform the final clearance testing. Air samples will be collected and analyzed in accordance with procedures for AHERA in this specification. If work is less than 260 lf/160 sf/35 cf, 5 PCM samples shall be collected for clearance and a minimum of one field blank. If work is equal to or more than 260 lf/160 sf/35 cf, AHERA TEM sampling shall be performed for clearance. TEM analysis shall be done in accordance with procedures for EPA AHERA in this specification. If the release criteria are not met, the Contractor shall repeat the final cleaning and continue decontamination procedures until clearance is achieved. **All Additional inspection and testing costs will be borne by the Contractor.**
- B. If release criteria are met, proceed to perform the abatement closeout and to issue the certificate of completion in accordance with these specifications.

3.6.4 FINAL AIR CLEARANCE PROCEDURES

- A. Contractor's Release Criteria: Work in a regulated area is complete when the regulated area is visually clean and airborne fiber levels have been reduced to or below 0.01 f/cc as measured by the AHERA PCM protocol, or 70 AHERA structures per square millimeter (s/mm²) by AHERA TEM.
- B. Air Monitoring and Final Clearance Sampling: To determine if the elevated airborne fiber counts encountered during abatement operations have been reduced to the specified level, the VPIH/CIH will secure samples and analyze them according to the following procedures:
 1. Fibers Counted: "Fibers" referred to in this section shall be either all fibers regardless of composition as counted in the NIOSH 7400 PCM method or asbestos fibers counted using the AHERA TEM method.

2. Aggressive Sampling: All final air testing samples shall be collected using aggressive sampling techniques except where soil is not encapsulated or enclosed. Samples will be collected on 0.8 μ MCE filters for PCM analysis and 0.45 μ Polycarbonate filters for TEM. A minimum of 1200 Liters of using calibrated pumps shall be collected for clearance samples. Before pumps are started, initiate aggressive air mixing sampling as detailed in 40 CFR 763 Subpart E (AHERA) Appendix A (III)(B)(7)(d). Air samples will be collected in areas subject to normal air circulation away from corners, obstructed locations, and locations near windows, doors, or vents. After air sampling pumps have been shut off, circulating fans shall be shut off. The negative pressure system shall continue to operate.
3. Final clearance for soil that is not encapsulated, samples will be collected on 0.8 μ MCE filters for PCM analysis and 0.45 μ Polycarbonate filters for TEM. A minimum of 1200 Liters of using calibrated pumps shall be collected for clearance samples. Air clearance of work areas where contaminated soil has been removed is in addition to the requirement for clearance by bulk sample analysis discussed within these specifications. There will be no aggressive air sampling for the clearance of soil due to the fact that aggressive air sampling may overload the cassettes.
4. Random samples shall be collected from areas of soil which have been abated to ensure that the soil has been properly decontaminated. The total number of samples to be collected from the soil areas shall be; <1000 SF of soil - 3 samples; >1000 to <5000 SF of soil - 5 samples; and >5000 SF of soil - 7 samples. The soil samples shall be collected in a statistically random manner and shall be analyzed by PLM method. The clearance level to determine the soil clean is <1% asbestos by weight as analyzed by PLM method. If this level is achieved, the soil areas shall be considered clear. If the levels are >1% asbestos, the areas shall be re-cleaned until the sample results are <1%.

3.6.5 CLEARANCE SAMPLING USING PCM - LESS THAN 260LF/160SF:

- A. The VPIH/CIH will perform clearance samples as indicated by the specification.
- B. The NIOSH 7400 PCM method will be used for clearance sampling with a minimum collection volume of 1200 Liters of air. A minimum of 5 PCM clearance samples shall be collected. All samples must be equal to or less than 0.01 f/cc to clear the regulated area.
- C. Random samples shall be collected from areas of soil which have been abated to ensure that the soil has been properly decontaminated. The total number of samples to be collected from the soil areas shall be; <1000 SF of soil - 3 samples; >1000 to <5000 SF of soil - 5 samples; and >5000 SF of soil - 7 samples. The soil samples shall be collected in a statistically random manner and shall be analyzed by PLM method. The clearance level to determine the soil clean is <1% asbestos by weight as analyzed by PLM method. If this level is achieved, the soil areas shall be considered clear. If the levels are >1% asbestos, the areas shall be re-cleaned until the sample results are <1%.

3.6.6 CLEARANCE SAMPLING USING TEM - EQUAL TO OR MORE THAN 260LF/160SF: TEM

- A. Clearance requires 13 samples be collected; 5 inside the regulated area; 5 outside the regulated area; and 3 field blanks.

- B. The TEM method will be used for clearance sampling with a minimum collection volume of 1200 Liters of air. A minimum of 13 clearance samples shall be collected. All samples must be equal to or less than 70 AHERA structures per square millimeter (s/mm²) AHERA TEM.

3.6.7 LABORATORY TESTING OF PCM CLEARANCE SAMPLES

The services of an AIHA accredited laboratory will be employed by the VA to perform analysis for the PCM air samples. The accredited laboratory shall be successfully participating in the AIHA Proficiency Analytical Testing (PAT) program. Samples will be sent daily by the VPIH/CIH so that verbal/faxed reports can be received within 24 hours. A complete record, certified by the laboratory, of all air monitoring tests and results will be furnished to the VA's representative and the Contractor.

3.6.8 LABORATORY TESTING OF TEM SAMPLES

Samples shall be sent by the VPIH/CIH to a NIST accredited laboratory for analysis by TEM. The laboratory shall be successfully participating in the NIST Airborne Asbestos Analysis (TEM) program. Verbal/faxed results from the laboratory shall be available within 24 hours after receipt of the samples. A complete record, certified by the laboratory, of all TEM results shall be furnished to the VA's representative and the Contractor.

3.6.9 LABORATORY TESTING OF BULK SAMPLES

Samples shall be sent by the VPIH/CIH or CPIH/CIH to a NIST accredited laboratory for analysis by PLM. The laboratory shall be successfully participating in the NIST Bulk Asbestos Analysis (PLM) program. Verbal/faxed results from the laboratory shall be available within 24 hours after receipt of the samples. A complete record, certified by the laboratory, of all TEM results shall be furnished to the VA's representative and the Contractor.

3.7 ABATEMENT CLOSEOUT AND CERTIFICATE OF COMPLIANCE

3.7.1 COMPLETION OF ABATEMENT WORK

After thorough decontamination, seal negative air machines with 2 layers of 6 mil poly and duct tape to form a tight seal at the intake/outlet ends before removal from the regulated area. Complete asbestos abatement work upon meeting the regulated area visual and air clearance criteria and fulfilling the following:

- A. Remove all equipment and materials from the project area.
- B. Dispose of all packaged ACM waste as required.
- C. Repair or replace all interior finishes damaged during the abatement work, as required.
- D. Fulfill other project closeout requirements as required in this specification.

3.7.2 CERTIFICATE OF COMPLETION BY CONTRACTOR

The CPIH/CIH shall complete and sign the "Certificate of Completion" in accordance with Attachment 1 at the completion of the abatement and decontamination of the regulated area.

3.7.3 WORK SHIFTS

All work shall be done during administrative hours (8:00 AM to 4:30 PM) Monday -Friday excluding Federal Holidays. Any change in the work schedule must be approved in writing by the VA Representative.

3.7.4 RE-INSULATION

If required as part of the contract, replace all asbestos containing insulation/fire-proofing with suitable non-asbestos material. Provide MSDS's for all replacement materials in advance of installation for VA approval. Refer to Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION.

09-01-15
Renovate Tower of Building 1
VAMC, Sioux Falls, SD
VA Project #438-18-102

ATTACHMENT #1

CERTIFICATE OF COMPLETION

DATE: _____ VA Project #: _____

PROJECT NAME: _____ Abatement Contractor: _____

VAMC/ADDRESS: _____

1. I certify that I have personally inspected, monitored and supervised the abatement work of (specify regulated area or Building):
which took place from / / to / /
2. That throughout the work all applicable requirements/regulations and the VA's specifications were met.
3. That any person who entered the regulated area was protected with the appropriate personal protective equipment and respirator and that they followed the proper entry and exit procedures and the proper operating procedures for the duration of the work.
4. That all employees of the Abatement Contractor engaged in this work were trained in respiratory protection, were experienced with abatement work, had proper medical surveillance documentation, were fit-tested for their respirator, and were not exposed at any time during the work to asbestos without the benefit of appropriate respiratory protection.
5. That I performed and supervised all inspection and testing specified and required by applicable regulations and VA specifications.
6. That the conditions inside the regulated area were always maintained in a safe and healthy condition and the maximum fiber count never exceeded 0.5 f/cc, except as described below.
7. That all abatement work was done in accordance with OSHA requirements and the manufacturer's recommendations.

CPIH/CIH Signature/Date: _____

CPIH/CIH Print Name: _____

Abatement Contractor Signature/Date: _____

Abatement Contractor Print Name: _____

ATTACHMENT #2

CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME: _____ DATE: _____

PROJECT ADDRESS: _____

ABATEMENT CONTRACTOR'S NAME: _____

WORKING WITH ASBESTOS CAN BE HAZARDOUS TO YOUR HEALTH. INHALING ASBESTOS HAS BEEN LINKED WITH VARIOUS TYPES OF CANCERS. IF YOU SMOKE AND INHALE ASBESTOS FIBERS, YOUR CHANCES OF DEVELOPING LUNG CANCER IS GREATER THAN THAT OF THE NON-SMOKING PUBLIC.

Your employer's contract with the owner for the above project requires that: You must be supplied with the proper personal protective equipment including an adequate respirator and be trained in its use. You must be trained in safe and healthy work practices and in the use of the equipment found at an asbestos abatement project. You must receive/have a current medical examination for working with asbestos. These things shall be provided at no cost to you. By signing this certificate you are indicating to the owner that your employer has met these obligations.

RESPIRATORY PROTECTION: I have been trained in the proper use of respirators and have been informed of the type of respirator to be used on the above indicated project. I have a copy of the written Respiratory Protection Program issued by my employer. I have been provided for my exclusive use, at no cost, with a respirator to be used on the above indicated project.

TRAINING COURSE: I have been trained by a third party, State/EPA accredited trainer in the requirements for an AHERA/OSHA Asbestos Abatement Worker training course, 32 hours minimum duration. I currently have a valid State accreditation certificate. The topics covered in the course include, as a minimum, the following:

- Physical Characteristics and Background Information on Asbestos
- Potential Health Effects Related to Exposure to Asbestos
- Employee Personal Protective Equipment
- Establishment of a Respiratory Protection Program
- State of the Art Work Practices
- Personal Hygiene
- Additional Safety Hazards
- Medical Monitoring
- Air Monitoring
- Relevant Federal, State and Local Regulatory Requirements, Procedures, and Standards
- Asbestos Waste Disposal

MEDICAL EXAMINATION: I have had a medical examination within the past 12 months which was paid for by my employer. This examination included: health history, occupational history, pulmonary function test, and may have included a chest x-ray evaluation. The physician issued a positive written opinion after the examination.

Signature: _____

Printed Name: _____

09-01-15
Renovate Tower of Building 1
VAMC, Sioux Falls, SD
VA Project #438-18-102

Social Security Number:_____

Witness:_____

ATTACHMENT #3

AFFIDAVIT OF MEDICAL SURVEILLANCE, RESPIRATORY PROTECTION AND TRAINING/ACCREDITATION

VA PROJECT NAME AND NUMBER: _____

VA MEDICAL FACILITY: _____

ABATEMENT CONTRACTOR'S NAME AND ADDRESS: _____

1. I verify that the following individual

Name: _____ Social Security Number: _____

who is proposed to be employed in asbestos abatement work associated with the above project by the named Abatement Contractor, is included in a medical surveillance program in accordance with 29 CFR 1926.1101(m), and that complete records of the medical surveillance program as required by 29 CFR 1926.1101(m)(n) and 29 CFR 1910.20 are kept at the offices of the Abatement Contractor at the following address.

Address: _____

2. I verify that this individual has been trained, fit-tested and instructed in the use of all appropriate respiratory protection systems and that the person is capable of working in safe and healthy manner as expected and required in the expected work environment of this project.

3. I verify that this individual has been trained as required by 29 CFR 1926.1101(k). This individual has also obtained a valid State accreditation certificate. Documentation will be kept on-site.

4. I verify that I meet the minimum qualifications criteria of the VA specifications for a CPIH.

Signature of CPIH/CIH: _____ Date: _____

Printed Name of CPIH/CIH: _____

Signature of Contractor: _____ Date: _____

Printed Name of Contractor: _____

ATTACHMENT #4

ABATEMENT CONTRACTOR/COMPETENT PERSON(S) REVIEW AND ACCEPTANCE OF THE VA'S ASBESTOS SPECIFICATIONS

VA Project Location: _____

VA Project #: _____

VA Project Description: _____

This form shall be signed by the Asbestos Abatement Contractor Owner and the Asbestos Abatement Contractor's Competent Person(s) prior to any start of work at the VA related to this Specification. If the Asbestos Abatement Contractor's/Competent Person(s) has not signed this form, they shall not be allowed to work on-site.

I, the undersigned, have read VA's Asbestos Specification regarding the asbestos abatement requirements. I understand the requirements of the VA's Asbestos Specification and agree to follow these requirements as well as all required rules and regulations of OSHA/EPA/DOT and State/Local requirements. I have been given ample opportunity to read the VA's Asbestos Specification and have been given an opportunity to ask any questions regarding the content and have received a response related to those questions. I do not have any further questions regarding the content, intent and requirements of the VA's Asbestos Specification.

At the conclusion of the asbestos abatement, I will certify that all asbestos abatement work was done in accordance with the VA's Asbestos Specification and all ACM was removed properly and no fibrous residue remains on any abated surfaces.

Abatement Contractor Owner's Signature _____ Date _____

Abatement Contractor Competent Person(s) _____ Date _____

- - END- - - -

SECTION 02 82 13.13
GLOVEBAG ASBESTOS ABATEMENT

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PART 1 - GENERAL

1.1 SUMMARY OF THE WORK

1.1.1 CONTRACT DOCUMENTS AND RELATED REQUIREMENTS

Drawings, general provisions of the contract, including general and supplementary conditions and other Division 01 specifications, shall apply to the work of this section. The contract documents show the work to be done under the contract and related requirements and conditions impacting the project. Related requirements and conditions include applicable codes and regulations, notices and permits, existing site conditions and restrictions on use of the site, requirements for partial owner occupancy during the work, coordination with other work and the phasing of the work. In the event the Asbestos Abatement Contractor discovers a conflict in the contract documents and/or requirements or codes, the conflict must be brought to the immediate attention of the Contracting Officer for resolution. Whenever there is a conflict or overlap in the requirements, the most stringent shall apply. Any actions taken by the Contractor without obtaining guidance from the Contracting Officer shall become the sole risk and responsibility of the Asbestos Abatement Contractor. All costs incurred due to such action are also the responsibility of the Asbestos Abatement Contractor.

1.1.2 EXTENT OF WORK

- A. Below is a brief description of the estimated quantities of asbestos containing materials to be abated by the glovebag method. These quantities are for informational purposes only and are based on the best information available at the time of the specification preparation. The Contractor shall satisfy himself as the actual quantities to be abated. Nothing in this section may be interpreted as limiting the extent of work otherwise required by this contract and related documents.
- B. Removal, clean-up and disposal of ACM piping and fittings and asbestos contaminated elements in an appropriate regulated area in the following approximate quantities:

60 linear feet of 2" - 6" diameter pipe insulation

Inaccessible pipe chases located within the project may contain additional ACM pipe insulation; this includes vertical enclosed pipe chases, and a below floor level tunnel chase, with TSI debris. Tunnel is under concrete in parts of the project area and may contain concealed TSI pipes and/or elbows.

1.1.3 RELATED WORK

- A. Section 02 41 00, Demolition.
- B. Section 02 82 13.19, Asbestos Floor Tile and Mastic Abatement
- C. Section 02 82 13.31, Class II Asbestos Abatement
- D. Section 02 82 11, Traditional Asbestos Abatement

1.1.4 TASKS

The work tasks are summarized briefly as follows:

- A. Pre-abatement activities including pre-abatement meeting(s), inspection(s), notifications, permits, submittal approvals, work-site preparations, emergency procedures arrangements, and Asbestos Hazard Abatement Plans for glovebag asbestos abatement work.
- B. Abatement activities including removal, clean-up and disposal of ACM waste, recordkeeping, security, monitoring, and inspections.
- C. Cleaning and decontamination activities including final visual inspection, air monitoring and certification of decontamination.

1.1.5 ABATEMENT CONTRACTOR USE OF PREMISES

- A. The Contractor and Contractor's personnel shall cooperate fully with the VA representative/consultant to facilitate efficient use of buildings and areas within buildings. The Contractor shall perform the work in accordance with the VA specifications, drawings, phasing plan and in compliance with any/all applicable Federal, State and Local regulations and requirements.
- B. The Contractor shall use the existing facilities in the building strictly within the limits indicated in contract documents as well as the approved VA Design and Construction Procedures. VA Design and Construction Procedures drawings of partially occupied buildings will show the limits of regulated areas; the placement of decontamination facilities; the temporary location of bagged waste ACM; the path of transport to outside the building; and the temporary waste storage area for each building/regulated area. Any variation from the arrangements shown on drawings shall be secured in writing from the VA representative through the pre-abatement plan of action. The following limitations of use shall apply to existing facilities shown on drawings:

1.2 VARIATIONS IN QUANTITY

The quantities and locations of ACM as indicated on the drawings and the extent of work included in this section are estimated, which are limited by the physical constraints imposed by occupancy of the buildings and accessibility to ACM. Accordingly, minor variations (+/- 5%) in quantities of ACM within the regulated area are considered as having no impact on contract price and time requirements of this contract. Where additional work is required beyond the above variation, the contractor shall provide unit prices for newly discovered ACM and those prices shall be used for additional work required under the contractor.

1.3 STOP ASBESTOS REMOVAL

If the Contracting Officer; their field representative; (the facility Safety Officer/Manager or their designee, or the VA Professional Industrial Hygienist/ Certified Industrial Hygienist (VPIH/CIH) presents a verbal **Stop Asbestos Removal Order**, the Contractor/Personnel shall immediately stop all asbestos removal and maintain HEPA filtered negative pressure air flow in the containment and adequately wet any exposed ACM. If a verbal Stop Asbestos Removal Order is issued, the VA shall follow-up with a written order to the Contractor as soon as it is practicable. The Contractor shall not resume any asbestos removal activity until authorized to do so in writing by the VA Contracting Officer. A stop asbestos removal order may be issued at any time the VA Contracting

Officer determines abatement conditions/activities are not within VA specification, regulatory requirements or that an imminent hazard exists to human health or the environment. Work stoppage will continue until conditions have been corrected to the satisfaction of the VA. Standby time and costs for corrective actions will be borne by the Contractor, including the VPIH/CIH time. The occurrence of any of the following events shall be reported immediately by the Contractor's competent person to the VA Contracting Office or field representative using the most expeditious means (e.g., verbal or telephonic), followed up with written notification to the Contracting Officer as soon as practical. The Contractor shall immediately stop asbestos removal/disturbance activities and initiate fiber reduction activities:

- A. Airborne PCM analysis results equal to or greater than 0.01 f/cc outside a regulated area or >0.05 f/cc inside a regulated area;
- B. breach or break in regulated area containment barrier(s);
- C. less than -0.02" WCG pressure in the regulated area;
- D. serious injury/death at the site;
- E. fire/safety emergency at the site;
- F. respiratory protection system failure;
- G. power failure or loss of wetting agent; or
- H. any visible emissions observed outside the regulated area.

1.4 DEFINITIONS

1.4.1 GENERAL

Definitions and explanations here are neither complete nor exclusive of all terms used in the contract documents, but are general for the work to the extent they are not stated more explicitly in another element of the contract documents. Drawings must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated therein.

1.4.2 GLOSSARY

Abatement - Procedures to control fiber release from asbestos-containing materials. Includes removal, encapsulation, enclosure, demolition, and renovation activities related to asbestos containing materials (ACM).

Aerosol - Solid or liquid particulate suspended in air.

Adequately wet - Sufficiently mixed or penetrated with liquid to prevent the release of particulates. If visible emissions are observed coming from the ACM, then that material has not been adequately wetted.

Aggressive method - Removal or disturbance of building material by sanding, abrading, grinding, or other method that breaks, crumbles, or disintegrates intact ACM.

Aggressive sampling - EPA AHERA defined clearance sampling method using air moving equipment such as fans and leaf blowers to aggressively disturb and maintain in the air residual fibers after abatement.

AHERA - Asbestos Hazard Emergency Response Act. Asbestos regulations for schools issued in 1987.

Aircell - Pipe or duct insulation made of corrugated cardboard which contains asbestos.

Air monitoring - The process of measuring the fiber content of a known volume of air collected over a specified period of time. The NIOSH 7400 Method, Issue 2 is used to determine the fiber levels in air. For personal samples and clearance air testing using Phase Contrast Microscopy (PCM) analysis. NIOSH Method 7402 can be used when it is necessary to confirm

fibers counted by PCM as being asbestos. The AHERA TEM analysis may be used for background, area samples and clearance samples when required by this specification, or at the discretion of the VPIH/CIH as appropriate.

Air sample filter - The filter used to collect fibers which are then counted. The filter is made of mixed cellulose ester membrane for PCM (Phase Contrast Microscopy) and polycarbonate for TEM (Transmission Electron Microscopy)

Amended water - Water to which a surfactant (wetting agent) has been added to increase the penetrating ability of the liquid.

Asbestos - Includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated or altered. Asbestos also includes PACM, as defined below.

Asbestos Hazard Abatement Plan (AHAP) - Asbestos work procedures required to be submitted by the contractor before work begins.

Asbestos-containing material (ACM) - Any material containing more than one percent of asbestos.

Asbestos contaminated elements (ACE) - Building elements such as ceilings, walls, lights, or ductwork that are contaminated with asbestos.

Asbestos-contaminated soil (ACS) - Soil found in the work area or in adjacent areas such as crawlspaces or pipe tunnels which is contaminated with asbestos-containing material debris and cannot be easily separated from the material.

Asbestos-containing waste (ACW) material - Asbestos-containing material or asbestos contaminated objects requiring disposal.

Asbestos Project Monitor - Some states require that any person conducting asbestos abatement clearance inspections and clearance air sampling be licensed as an asbestos project monitor.

Asbestos waste decontamination facility - A system consisting of drum/bag washing facilities and a temporary storage area for cleaned containers of asbestos waste. Used as the exit for waste and equipment leaving the regulated area. In an emergency, it may be used to evacuate personnel.

Authorized person - Any person authorized by the VA, the Contractor, or government agency and required by work duties to be present in regulated areas.

Authorized visitor - Any person approved by the VA; the contractor; or any government agency representative having jurisdiction over the regulated area (e.g., OSHA, Federal and State EPA).

Barrier - Any surface that isolates the regulated area and inhibits fiber migration from the regulated area.

Containment Barrier - An airtight barrier consisting of walls, floors, and/or ceilings of sealed plastic sheeting which surrounds and seals the outer perimeter of the regulated area.

Critical Barrier - The barrier responsible for isolating the regulated area from adjacent spaces, typically constructed of plastic sheeting secured in place at openings such as doors, windows, or any other opening into the regulated area.

Primary Barrier - Plastic barriers placed over critical barriers and exposed directly to abatement work.

Secondary Barrier - Any additional plastic barriers used to isolate and provide protection from debris during abatement work.

Breathing zone - The hemisphere forward of the shoulders with a radius of about 150 - 225 mm (6 - 9 inches) from the worker's nose.

Bridging encapsulant - An encapsulant that forms a layer on the surface of the ACM.

Building/facility owner - The legal entity, including a lessee, which exercises control over management and recordkeeping functions relating to a building and/or facility in which asbestos activities take place.

Bulk testing - The collection and analysis of suspect asbestos containing materials.

Certified Industrial Hygienist (CIH) - A person certified in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene.

Class I asbestos work - Activities involving the removal of Thermal System Insulation (TSI) and surfacing ACM and Presumed Asbestos Containing Material (PACM).

Class II asbestos work - Activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic.

Clean room/Changing room - An uncontaminated room having facilities for the storage of employee's street clothing and uncontaminated materials and equipment.

Clearance sample - The final air sample taken after all asbestos work has been done and visually inspected. Performed by the VA's professional industrial hygiene consultant/Certified Industrial Hygienist (VPIH/CIH).

Closely resemble - The major workplace conditions which have contributed to the levels of historic asbestos exposure, are no more protective than conditions of the current workplace.

Competent person - In addition to the definition in 29 CFR 1926.32(f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f); in addition, for Class I and II work who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for supervisor.

Contractor's Professional Industrial Hygienist (CPIH/CIH) - The asbestos abatement contractor's industrial hygienist. The industrial hygienist must meet the qualification requirements of a PIH and may be a certified industrial hygienist (CIH).

Count - Refers to the fiber count or the average number of fibers greater than five microns in length with a length-to-width (aspect) ratio of at least 3 to 1, per cubic centimeter of air.

Crawlspace - An area which can be found either in or adjacent to the work area. This area has limited access and egress and may contain asbestos materials and/or asbestos contaminated soil.

Decontamination area/unit - An enclosed area adjacent to and connected to the regulated area and consisting of an equipment room, shower room, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos.

Demolition - The wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.

VA Total - means a building or substantial part of the building is completely removed, torn or knocked down, bulldozed, flattened, or razed, including removal of building debris.

Disposal bag - Typically 6 mil thick sift-proof, dustproof, leak-tight container used to package and transport asbestos waste from regulated

areas to the approved landfill. Each bag/container must be labeled/marked in accordance with EPA, OSHA and DOT requirements.

Disturbance - Activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM or PACM, no greater than the amount that can be contained in one standard sized glove bag or waste bag, in order to access a building component. In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or disposal bag and shall not exceed 60 inches in length or width.

Drum - A rigid, impermeable container made of cardboard fiber, plastic, or metal which can be sealed in order to be sift-proof, dustproof, and leak-tight.

Employee exposure - The exposure to airborne asbestos that would occur if the employee were not wearing respiratory protection equipment.

Encapsulant - A material that surrounds or embeds asbestos fibers in an adhesive matrix and prevents the release of fibers.

Encapsulation - Treating ACM with an encapsulant.

Enclosure - The construction of an air tight, impermeable, permanent barrier around ACM to control the release of asbestos fibers from the material and also eliminate access to the material.

Equipment room - A contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.

Fiber - A particulate form of asbestos, 5 microns or longer, with a length to width (aspect) ratio of at least 3 to 1.

Fibers per cubic centimeter (f/cc) - Abbreviation for fibers per cubic centimeter, used to describe the level of asbestos fibers in air.

Filter - Media used in respirators, vacuums, or other machines to remove particulate from air.

Firestopping - Material used to close the open parts of a structure in order to prevent a fire from spreading.

Friable asbestos containing material - Any material containing more than one (1) percent or asbestos as determined using the method specified in appendix A, Subpart F, 40 CFR 763, section 1, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

Glovebag - Not more than a 60 x 60 inch impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which materials and tools may be handled.

High efficiency particulate air (HEPA) filter - An ASHRAE MERV 17 filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.

HEPA vacuum - Vacuum collection equipment equipped with a HEPA filter system capable of collecting and retaining asbestos fibers.

Homogeneous area - An area of surfacing, thermal system insulation or miscellaneous ACM that is uniform in color, texture and date of application.

HVAC - Heating, Ventilation and Air Conditioning

Industrial hygienist (IH) - A professional qualified by education, training, and experience to anticipate, recognize, evaluate and develop controls for occupational health hazards. Meets definition requirements of the American Industrial Hygiene Association (AIHA).

Industrial hygienist technician (IH Technician) - A person working under the direction of an IH or CIH who has special training, experience,

certifications and licenses required for the industrial hygiene work assigned. Some states require that an industrial hygienist technician conducting asbestos abatement clearance inspection and clearance air sampling be licensed as an asbestos project monitor.

Intact - The ACM has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix.

Lockdown - Applying encapsulant, after a final visual inspection, on all abated surfaces at the conclusion of ACM removal prior to removal of critical barriers.

National Emission Standards for Hazardous Air Pollutants (NESHAP) - EPA's rule to control emissions of asbestos to the environment (40 CFR Part 61, Subpart M).

Negative initial exposure assessment - A demonstration by the employer which complies with the criteria in 29 CFR 1926.1101 (f)(2)(iii), that employee exposure during an operation is expected to be consistently below the PEL.

Negative pressure - Air pressure which is lower than the surrounding area, created by exhausting air from a sealed regulated area through HEPA equipped filtration units. OSHA requires maintaining -0.02" water column gauge inside the negative pressure enclosure.

Negative pressure respirator - A respirator in which the air pressure inside the facepiece is negative during inhalation relative to the air pressure outside the respirator facepiece.

Non-friable ACM - Material that contains more than 1 percent asbestos but cannot be crumbled, pulverized, or reduced to powder by hand pressure.

Organic vapor cartridge - The type of cartridge used on air purifying respirators to remove organic vapor hazardous air contaminants.

Outside air - The air outside buildings and structures, including, but not limited to, the air under a bridge or in an open ferry dock.

Owner/operator - Any person who owns, leases, operates, controls, or supervises the facility being demolished or renovated or any person who owns, leases, operates, controls, or supervises the demolition or renovation operation, or both.

Penetrating encapsulant - Encapsulant that is absorbed into the ACM matrix without leaving a surface layer.

Personal protective equipment (PPE) - equipment designed to protect user from injury and/or specific job hazard. Such equipment may include protective clothing, hard hats, safety glasses, and respirators.

Personal sampling/monitoring - Representative air samples obtained in the breathing zone for one or more workers within the regulated area using a filter cassette and a calibrated air sampling pump to determine asbestos exposure.

Permissible exposure limit (PEL) - The level of exposure OSHA allows for an 8 hour time weighted average. For asbestos fibers, the eight (8) hour time weighted average PEL is 0.1 fibers per cubic centimeter (0.1 f/cc) of air and the 30-minute Excursion Limit is 1.0 fibers per cubic centimeter (1 f/cc).

Pipe tunnel - An area, typically located adjacent to mechanical spaces or boiler rooms in which the pipes servicing the heating system in the building are routed to allow the pipes to access heating elements. These areas may contain asbestos pipe insulation, asbestos fittings, or asbestos-contaminated soil.

Polarized light microscopy (PLM) - Light microscopy using dispersion staining techniques and refractive indices to identify and quantify the type(s) of asbestos present in a bulk sample.

Polyethylene sheeting - Strong plastic barrier material 4 to 6 mils thick, semi-transparent, flame retardant per NFPA 241.

Positive/negative fit check - A method of verifying the seal of a facepiece respirator by temporarily occluding the filters and breathing in (inhaling) and then temporarily occluding the exhalation valve and breathing out (exhaling) while checking for inward or outward leakage of the respirator respectively.

Presumed ACM (PACM) - Thermal system insulation, surfacing, and flooring material installed in buildings prior to 1981. If the building owner has actual knowledge, or should have known through the exercise of due diligence that other materials are ACM, they too must be treated as PACM. The designation of PACM may be rebutted pursuant to 29 CFR 1926.1101 (b).

Professional IH - An IH who meets the definition requirements of AIHA; meets the definition requirements of OSHA as a "Competent Person" at 29 CFR 1926.1101 (b); has completed two specialized EPA approved courses on management and supervision of asbestos abatement projects; has formal training in respiratory protection and waste disposal; and has a minimum of four projects of similar complexity with this project of which at least three projects serving as the supervisory IH. The PIH may be either the VA's PIH (VPIH) or Contractor's PIH (CPIH/CIH).

Project designer - A person who has successfully completed the training requirements for an asbestos abatement project designer as required by 40 CFR 763 Appendix C, Part I; (B) (5).

Assigned Protection factor - A value assigned by OSHA/NIOSH to indicate the expected protection provided by each respirator class, when the respirator is properly selected and worn correctly. The number indicates the reduction of exposure level from outside to inside the respirator facepiece.

Qualitative fit test (QLFT) - A fit test using a challenge material that can be sensed by the wearer if leakage in the respirator occurs.

Quantitative fit test (QNFT) - A fit test using a challenge material which is quantified outside and inside the respirator thus allowing the determination of the actual fit factor.

Regulated area - An area established by the employer to demarcate where Class I, II, III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work may accumulate; and a work area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed the PEL.

Regulated ACM (RACM) - Friable ACM; Category I non-friable ACM that has become friable; Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading or; Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of the demolition or renovation operation.

Removal - All operations where ACM, PACM and/or RACM is taken out or stripped from structures or substrates, including demolition operations.

Renovation - Altering a facility or one or more facility components in any way, including the stripping or removal of asbestos from a facility component which does not involve demolition activity.

Repair - Overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM or PACM attached to structures or substrates.

Shower room - The portion of the PDF where personnel shower before leaving the regulated area.

Supplied air respirator (SAR) - A respiratory protection system that supplies minimum Grade D respirable air per ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989.

Surfacing ACM - A material containing more than 1 percent asbestos that is sprayed, troweled on or otherwise applied to surfaces for acoustical, fireproofing and other purposes.

Surfactant - A chemical added to water to decrease water's surface tension thus making it more penetrating into ACM.

Thermal system ACM - A material containing more than 1 percent asbestos applied to pipes, fittings, boilers, breeching, tanks, ducts, or other structural components to prevent heat loss or gain.

Transmission electron microscopy (TEM) - A microscopy method that can identify and count asbestos fibers.

VA Professional Industrial Hygienist (VPIH/CIH) - The Department of Veterans Affairs Professional Industrial Hygienist must meet the qualifications of a PIH, and may be a Certified Industrial Hygienist (CIH).

VA Representative - The VA official responsible for on-going project work.

Visible emissions - Any emissions, which are visually detectable without the aid of instruments, coming from ACM/PACM/RACM/ACS or ACM waste material.

Waste/Equipment decontamination facility (W/EDF) - The area in which equipment is decontaminated before removal from the regulated area.

Waste generator - Any owner or operator whose act or process produces asbestos-containing waste material.

Waste shipment record - The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos-containing waste material.

Wet cleaning - The process of thoroughly eliminating, by wet methods, any asbestos contamination from surfaces or objects.

1.4.3 REFERENCED STANDARDS ORGANIZATIONS

The following acronyms or abbreviations as referenced in contract/specification documents are defined to mean the associated names. Names and addresses may be subject to change.

- A. VA Department of Veterans Affairs
810 Vermont Avenue, NW
Washington, DC 20420

- B. AIHA American Industrial Hygiene Association
2700 Prosperity Avenue, Suite 250
Fairfax, VA 22031
703-849-8888

- C. ANSI American National Standards Institute
1430 Broadway
New York, NY 10018
212-354-3300

- D. ASTM American Society for Testing and Materials
1916 Race St.
Philadelphia, PA 19103
215-299-5400
- E. CFR Code of Federal Regulations
Government Printing Office
Washington, DC 20420
- F. CGA Compressed Gas Association
1235 Jefferson Davis Highway
Arlington, VA 22202
703-979-0900
- G. CS Commercial Standard of the National Institute of Standards and
Technology (NIST)
U. S. Department of Commerce
Government Printing Office
Washington, DC 20420
- H. EPA Environmental Protection Agency
401 M St., SW
Washington, DC 20460
202-382-3949
- I. MIL-STD Military Standards/Standardization Division
Office of the Assistant Secretary of Defense
Washington, DC 20420
- J. NIST National Institute for Standards and Technology
U. S. Department of Commerce
Gaithersburg, MD 20234
301-921-1000
- K. NEC National Electrical Code (by NFPA)
- L. NEMA National Electrical Manufacturer's Association
2101 L Street, N.W.
Washington, DC 20037
- M. NFPA National Fire Protection Association
1 Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101
800-344-3555
- N. NIOSH National Institutes for Occupational Safety and Health
4676 Columbia Parkway
Cincinnati, OH 45226
513-533-8236
- O. OSHA Occupational Safety and Health Administration
U.S. Department of Labor
Government Printing Office
Washington, DC 20402

P. UL Underwriters Laboratory
333 Pfingsten Rd.
Northbrook, IL 60062
312-272-8800

Q. South Dakota Dept. of Environment and Natural Resources
523 East Capitol
Pierre, SD 57501
605-773-3153

1.5 APPLICABLE CODES AND REGULATIONS

1.5.1 GENERAL APPLICABILITY OF CODES, REGULATIONS, AND STANDARDS

- A. All work under this contract shall be done in strict accordance with all applicable Federal, State, and local regulations, standards and codes governing asbestos abatement, and any other trade work done in conjunction with the abatement. All applicable codes, regulations and standards are adopted into this specification and will have the same force and effect as this specification.
- B. The most recent edition of any relevant regulation, standard, document or code shall be in effect. Where conflict among the requirements or with these specification exists, the most stringent requirement(s) shall be utilized.
- C. Copies of all standards, regulations, codes and other applicable documents, including this specification and those listed in Section 1.5 shall be available at the worksite in the clean change area of the worker decontamination system.

1.5.2 ASBESTOS ABATEMENT CONTRACTOR RESPONSIBILITY

The Asbestos Abatement Contractor (Contractor) shall assume full responsibility and liability for compliance with all applicable Federal, State and Local regulations related to any and all aspects of the asbestos abatement project. The Contractor is responsible for providing and maintaining training, accreditations, medical exams, medical records, personal protective equipment (PPE) including respiratory protection including respirator fit testing, as required by applicable Federal, State and Local regulations. The Contractor shall hold the VA and VPIH/CIH consultants harmless for any Contractor's failure to comply with any applicable work, packaging, transporting, disposal, safety, health, or environmental requirement on the part of himself, his employees, or his subcontractors. The Contractor will incur all costs of the CPIH/CIH, including all sampling/analytical costs to assure compliance with OSHA/EPA/State requirements related to failure to comply with the regulations applicable to the work.

1.5.3 FEDERAL REQUIREMENTS

Federal requirements which govern some aspect of asbestos abatement include, but are not limited to, the following regulations.

- A. Occupational Safety and Health Administration (**OSHA**)
 - 1. Title 29 CFR 1926.1101 - Construction Standard for Asbestos
 - 2. Title 29 CFR 1910 Subpart I - Personal Protective Equipment
 - 3. Title 29 CFR 1910.134 - Respiratory Protection
 - 4. Title 29 CFR 1926 - Construction Industry Standards

5. Title 29 CFR 1910.1020 - Access to Employee Exposure and Medical Records
6. Title 29 CFR 1910.1200 - Hazard Communication
7. Title 29 CFR 1910 Subpart K - Medical and First Aid
- B. Environmental Protection Agency (**EPA**)
 1. 40 CFR 61 Subpart A and M (Revised Subpart B) - National Emission Standard for Hazardous Air Pollutants - Asbestos.
 2. 40 CFR 763.80 - Asbestos Hazard Emergency Response Act (AHERA)
- C. Department of Transportation (**DOT**)

Title 49 CFR 100 - 185 - Transportation

1.5.4 STATE REQUIREMENTS:

State requirements that apply to the asbestos abatement work, disposal, clearance, etc., include, but are not limited to, the following:

South Dakota Dept. of Environment and Natural Resources
Asbestos Waste Management Program
523 East Capitol
Pierre, SD 57501
605-773-3153

South Dakota Codified Law 34.44
Administrative Rules of South Dakota 74.36.08
Administrative Rules of South Dakota 74.31

1.5.5 LOCAL REQUIREMENTS

If local requirements are more stringent than federal or state standards, the local standards are to be followed.

1.5.6 STANDARDS

- A. Standards which govern asbestos abatement activities include, but are not limited to, the following:
 1. American National Standards Institute (ANSI) Z9.2-79 - Fundamentals Governing the Design and Operation of Local Exhaust Systems and ANSI Z88.2 - Practices for Respiratory Protection.
 2. Underwriters Laboratories (UL) 586-90 - UL Standard for Safety of HEPA filter Units, 7th Edition.
- B. Standards which govern encapsulation work include, but are not limited to, the following:
 1. American Society for Testing and Materials (ASTM)
- C. Standards which govern the fire and safety concerns in abatement work include, but are not limited to, the following:
 1. National Fire Protection Association (NFPA) 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.
 2. NFPA 701 - Standard Methods for Fire Tests for Flame Resistant Textiles and Film.
 3. NFPA 101 - Life Safety Code

1.5.7 EPA GUIDANCE DOCUMENTS

- A. EPA guidance documents which discuss asbestos abatement work activities are listed below. These documents are made part of this section by reference. EPA publications can be ordered from (800) 424-9065.
- B. Guidance for Controlling ACM in Buildings (Purple Book) EPA 560/5-85-024

- C. Asbestos Waste Management Guidance EPA 530-SW-85-007.
- D. A Guide to Respiratory Protection for the Asbestos Abatement Industry EPA-560-OPTS-86-001
- E. Guide to Managing Asbestos in Place (Green Book) TS 799 20T July 1990

1.5.8 NOTICES

- A. State and Local agencies: Send written notification as required by state and local regulations including the local fire department prior to beginning any work on ACM as follows:

South Dakota Dept. of Environment and Natural Resources
Asbestos Waste Management Program
523 East Capitol
Pierre, SD 57501
Asbestos Coordinator
Fax - 605-773-6035

- B. Copies of notifications shall be submitted to the VA for the facility's records in the same time frame notification are given to EPA, State, and Local authorities.

1.5.9 PERMITS/LICENSES

The contractor shall apply for and have all required permits and licenses to perform asbestos abatement work as required by Federal, State, and Local regulations.

1.5.10 POSTING AND FILING OF REGULATIONS

Maintain two (2) copies of applicable federal, state, and local regulations. Post one copy of each at the regulated area where workers will have daily access to the regulations and keep another copy in the Contractor's office.

1.5.11 VA RESPONSIBILITIES

Prior to commencement of work:

- A. Notify occupants adjacent to regulated areas of project dates and requirements for relocation, if needed. Arrangements must be made prior to starting work for relocation of desks, files, equipment, and personal possessions to avoid unauthorized access into the regulated area. **Note: Notification of adjacent personnel is required by OSHA in 29 CFR 1926.1101 (k) to prevent unnecessary or unauthorized access to the regulated area.**
- B. Submit to the Contractor results of background air sampling; including location of samples, person who collected the samples, equipment utilized, calibration data and method of analysis. During abatement, submit to the Contractor, results of bulk material analysis and air sampling data collected during the course of the abatement. This information shall not release the Contractor from any responsibility for OSHA compliance.

1.5.12 EMERGENCY ACTION PLAN AND ARRANGEMENTS

- A. An Emergency Action Plan shall be developed by prior to commencing abatement activities and shall be agreed to by the Contractor and the VA. The Plan shall meet the requirements of 29 CFR 1910.38 (a); (b).
- B. Emergency procedures shall be in written form and prominently posted in the clean room and equipment room of the decontamination unit. Everyone, prior to entering the regulated area, must read and sign these procedures to acknowledge understanding of the regulated area layout, location of emergency exits and emergency procedures.
- C. Emergency planning shall include written notification of police, fire, and emergency medical personnel of planned abatement activities; work schedule; layout of regulated area; and access to the regulated area, particularly barriers that may affect response capabilities.
- D. Emergency planning shall include consideration of fire, explosion, hazardous atmospheres, electrical hazards, slips/trips and falls, confined spaces, and heat stress illness. Written procedures for response to emergency situations shall be developed and employee training in procedures shall be provided.
- E. Employees shall be trained in regulated area/site evacuation procedures in the event of workplace emergencies.
 - 1. For non-life-threatening situations - employees injured or otherwise incapacitated shall decontaminate following normal procedures with assistance from fellow workers, if necessary, before exiting the regulated area to obtain proper medical treatment.
 - 2. For life-threatening injury or illness, worker decontamination shall take least priority after measures to stabilize the injured worker, remove them from the regulated area, and secure proper medical treatment.
- F. Telephone numbers of any/all emergency response personnel shall be prominently posted in the clean room, along with the location of the nearest telephone.
- G. The Contractor shall provide verification of first aid/CPR training for personnel responsible for providing first aid/CPR. OSHA requires medical assistance within 3-4 minutes of a life-threatening injury/illness. Bloodborne Pathogen training shall also be verified for those personnel required to provide first aid/CPR.
- H. The Emergency Action Plan shall provide for a Contingency Plan in the event that an incident occurs that may require the modification of the Asbestos Hazard Abatement Plans during abatement. Such incidents include, but are not limited to, fire; accident; power failure; negative pressure failure; and supplied air system failure. The Contractor shall detail procedures to be followed in the event of an incident assuring that asbestos abatement work is stopped and wetting is continued until correction of the problem.

1.5.14 PRE-CONSTRUCTION MEETING

Prior to commencing the work, the Contractor shall meet with the VPCIH to present and review, as appropriate, the items following this paragraph. The Contractor's Competent Person(s) who will be on-site shall participate in the pre-start meeting. The pre-start meeting is to discuss and determine procedures to be used during the project. At this meeting, the Contractor shall provide:

- A. Proof of Contractor licensing.

- B. Proof the Competent Person is trained and accredited and approved for working in this State. Verification of the experience of the Competent Person shall also be presented.
- C. A list of all workers who will participate in the project, including experience and verification of training and accreditation.
- D. A list of and verification of training for all personnel who have current first-aid/CPR training. A minimum of one person per shift must have adequate training.
- E. Current medical written opinions for all personnel working on-site meeting the requirements of 29 CFR 1926.1101 (m).
- F. Current fit-tests for all personnel wearing respirators on-site meeting the requirements of 29 CFR 1926.1101 (h) and Appendix C.
- G. A copy of the Contractor's Asbestos Hazard Abatement Plan. In these procedures, the following information must be detailed, specific for this project. A copy of the Contractor's Asbestos Hazard Abatement Plan (AHAP) for Class I Glovebag Asbestos Abatement. In these procedures, the following information must be detailed, specific for this project.
 - 1. Regulated area preparation procedures;
 - 2. Notification requirements procedure of Contractor as required in 29 CFR 1926.1101 (d);
 - 3. If required, decontamination area set-up/layout and decontamination procedures for employees;
 - 4. Glovebag abatement methods/procedures and equipment to be used; and
 - 5. Personal protective equipment to be used.
- H. At this meeting the Contractor shall provide all submittals as required.
- I. Procedures for handling, packaging and disposal of asbestos waste.
- J. Emergency Action Plan and Contingency Plan Procedures.

1.6 PROJECT COORDINATION

The following are the minimum administrative and supervisory personnel necessary for coordination of the work.

1.6.1 PERSONNEL

- A. Administrative and supervisory personnel shall consist of a qualified Competent Person(s) as defined by OSHA in the Construction Standards and the Asbestos Construction Standard; Contractor Professional Industrial Hygienist and Industrial Hygiene Technicians. These employees are the Contractor's representatives responsible for compliance with these specifications and all other applicable requirements.
- B. Non-supervisory personnel shall consist of an adequate number of qualified personnel to meet the schedule requirements of the project. Personnel shall meet required qualifications. Personnel utilized on-site shall be pre-approved by the VA representative. A request for approval shall be submitted for any person to be employed during the project giving the person's name; social security number; qualifications; accreditation card with color picture; Certificate of Worker's Acknowledgment; and Affidavit of Medical Surveillance and Respiratory Protection and current Respirator Fit Test.
- C. Minimum qualifications for Contractor and assigned personnel are:
 - 1. The Contractor has conducted within the last three (3) years, three (3) projects of similar complexity and dollar value as this project; has not been cited and penalized for serious violations of federal (and state as applicable) EPA and OSHA asbestos regulations in the past three (3) years; has adequate liability/occurrence insurance for

- asbestos work as required by the state; is licensed in applicable states; has adequate and qualified personnel available to complete the work; has comprehensive Asbestos Hazard Abatement Plans (AHAPs) for asbestos work; and has adequate materials, equipment and supplies to perform the work.
2. The Competent Person has four (4) years of abatement experience of which two (2) years were as the Competent Person on the project; meets the OSHA definition of a Competent Person; has been the Competent Person on two (2) projects of similar size and complexity as this project within the past three (3) years; has completed EPA AHERA/OSHA/State/Local training requirements/accreditation(s) and refreshers; and has all required OSHA documentation related to medical and respiratory protection.
 3. The Contractor Professional Industrial Hygienist/CIH (CPIH/CIH) shall have five (5) years of monitoring experience and supervision of asbestos abatement projects; has participated as senior IH on five (5) abatement projects, three (3) of which are similar in size and complexity as this project; has developed at least one complete Asbestos Hazard Abatement Plan for asbestos abatement; has trained abatement personnel for three (3) years; has specialized EPA AHERA/OSHA training in asbestos abatement management, respiratory protection, waste disposal and asbestos inspection; has completed the NIOSH 582 Course or equivalent, Contractor/Supervisor course; and has appropriate medical/respiratory protection records/documentation.
 4. The Abatement Personnel shall have completed the EPA AHERA/OSHA abatement worker course; have training on the Asbestos Hazard Abatement Plans of the Contractor; has one year of asbestos abatement experience within the past three (3) years of similar size and complexity; has applicable medical and respiratory protection documentation; has certificate of training/current refresher and State accreditation/license.

All personnel should be in compliance with OSHA construction safety training as applicable and submit certification.

1.7 RESPIRATORY PROTECTION

1.7.1 GENERAL - RESPIRATORY PROTECTION PROGRAM

The Contractor shall develop and implement a written Respiratory Protection Program (RPP) which is in compliance with the January 8, 1998 OSHA requirements found at 29 CFR 1926.1101 and 29 CFR 1910 Subpart I;134. ANSI Standard Z88.2-1992 provides excellent guidance for developing a respiratory protection program. All respirators used must be NIOSH approved for asbestos abatement activities. The written RPP shall, at a minimum, contain the basic requirements found at 29 CFR 1910.134 (c) (1) (i - ix) - Respiratory Protection Program.

1.7.2 RESPIRATORY PROTECTION PROGRAM COORDINATOR

The Respiratory Protection Program Coordinator (RPPC) must be identified and shall have two (2) years experience coordinating RPP of similar size and complexity. The RPPC must submit a signed statement attesting to the fact that the program meets the above requirements.

1.7.3 SELECTION AND USE OF RESPIRATORS

The procedure for the selection and use of respirators must be submitted to the VA as part of the Contractor's qualifications. The procedure must be written clearly enough for workers to understand. A copy of the Respiratory Protection Program must be available in the clean room of the decontamination unit for reference by employees or authorized visitors.

1.7.4 MINIMUM RESPIRATORY PROTECTION

Minimum respiratory protection shall be a full face powered air purifying respirator when fiber levels are maintained consistently at or below 0.5 f/cc. A higher level of respiratory protection may be provided or required, depending on fiber levels. Respirator selection shall meet the requirements of 29 CFR 1926.1101 (h); Table 1, except as indicated in this paragraph. Abatement personnel must have a respirator for their exclusive use.

1.7.5 MEDICAL WRITTEN OPINION

No employee shall be allowed to wear a respirator unless a physician or other licensed health care professional has provided a written determination they are medically qualified to wear the class of respirator to be used on the project while wearing whole body impermeable garments and subjected to heat or cold stress.

1.7.6 RESPIRATOR FIT TEST

All personnel wearing respirators shall have a current quantitative fit test which was conducted in accordance with 29 CFR 1910.134 (f) and Appendix A. Fit tests shall be done for PAPR's which have been put into a failure mode.

1.7.7 RESPIRATOR FIT CHECK

The Competent Person shall assure that the positive/negative pressure user seal check is done each time the respirator is donned by an employee. Head coverings must cover respirator head straps. Any situation that prevents an effective facepiece to face seal as evidenced by failure of a user seal check shall preclude that person from wearing a respirator inside the regulated area until resolution of the problem.

1.7.8 MAINTENANCE AND CARE OF RESPIRATORS

The Respiratory Protection Program Coordinator shall submit evidence and documentation showing compliance with 29 CFR 1910.134 (h) maintenance and care of respirators.

1.8 WORKER PROTECTION

1.8.1 TRAINING OF ABATEMENT PERSONNEL

Prior to beginning any abatement activity, all personnel shall be trained in accordance with OSHA 29 CFR 1926.1101 (k)(9) and any additional State/Local requirements. Training must include, at a minimum, the elements listed at 29 CFR 1926.1101 (k)(9)(viii). Training shall have been conducted by a third party, EPA/State approved trainer meeting the requirements of EPA 40 CFR 763 Appendix C (AHERA MAP). Initial training

certificates and current refresher and accreditation proof must be submitted for each person working at the site.

1.8.2 MEDICAL EXAMINATIONS

Medical examinations meeting the requirements of 29 CFR 1926.1101 (m) shall be provided for all personnel working in the regulated area, regardless of exposure levels. A current physician's written opinion as required by 29 CFR 1926.1101 (m)(4) shall be provided for each person and shall include in the medical opinion the person has been evaluated for working in a heat and cold stress environment while wearing personal protective equipment (PPE) and is able to perform the work without risk of material health impairment.

1.8.3 PERSONAL PROTECTIVE EQUIPMENT

Provide whole body clothing, head coverings, foot coverings and any other personal protective equipment as determined by conducting the hazard assessment required by OSHA at 29 CFR 1910.132 (d). The Competent Person shall ensure the integrity of personal protective equipment worn for the duration of the project. Duct tape shall be used to secure all suit sleeves to wrists and to secure foot coverings at the ankle.

1.8.4 REGULATED AREA ENTRY PROCEDURE

The Competent Person shall ensure that each time workers enter the regulated area; they remove ALL street clothes in the clean room of the decontamination unit and put on new disposable coveralls, head coverings, a clean respirator, and then proceed through the shower room to the equipment room where they put on non-disposable required personal protective equipment.

1.8.5 DECONTAMINATION PROCEDURE

The Competent Person shall require all personnel to adhere to following decontamination procedures whenever they leave the regulated area.

- A. When exiting the regulated area, remove disposable coveralls, and ALL other clothes, disposable head coverings, and foot coverings or boots in the equipment room.
- B. Still wearing the respirator and completely naked, proceed to the shower. Showering is MANDATORY. Care must be taken to follow reasonable procedures in removing the respirator to avoid inhaling asbestos fibers while showering. The following procedure is required as a minimum:
 1. Thoroughly wet body including hair and face. If using a PAPR hold blower above head to keep filters dry.
 2. With respirator still in place, thoroughly decontaminate body, hair, respirator face piece, and all other parts of the respirator except the blower and battery pack on a PAPR. Pay particular attention to cleaning the seal between the face and respirator facepiece and under the respirator straps.
 3. Take a deep breath, hold it and/or exhale slowly, completely wetting hair, face, and respirator. While still holding breath, remove the respirator and hold it away from the face before starting to breathe.
- C. Carefully decontaminate the facepiece of the respirator inside and out. If using a PAPR, shut down using the following sequence: a) first cap inlets to filters; b) turn blower off to keep debris collected on the inlet side of the filter from dislodging and contaminating the outside of

the unit; c) thoroughly decontaminate blower and hoses; d) carefully decontaminate battery pack with a wet rag being cautious of getting water in the battery pack thus preventing destruction. **(THIS PROCEDURE IS NOT A SUBSTITUTE FOR RESPIRATOR CLEANING!)**

- D. Shower and wash body completely with soap and water. Rinse thoroughly.
- E. Rinse shower room walls and floor to drain prior to exiting.
- F. Proceed from shower to clean room; dry off and change into street clothes or into new disposable work clothing.

1.8.6 REGULATED AREA REQUIREMENTS

The Competent Person shall meet all requirements of 29 CFR 1926.1101 (o) and assure that all requirements for Class I glovebag regulated areas at 29 CFR 1926.1101 (e) are met. All personnel in the regulated area shall not be allowed to eat, drink, smoke, chew tobacco or gum, apply cosmetics, or in any way interfere with the fit of their respirator.

1.9 DECONTAMINATION FACILITIES

1.9.1 DESCRIPTION

Provide each regulated area with separate personnel decontamination facilities (PDF) and waste/equipment decontamination facilities (W/EDF). Ensure that the PDF are the only means of ingress and egress to the regulated area and that all equipment, bagged waste, and other material exit the regulated area only through the W/EDF.

1.9.2 GENERAL REQUIREMENTS

All personnel entering or exiting a regulated area must go through the PDF and shall follow the requirements at 29 CFR 1926.1101 (j) (1) and these specifications. All waste, equipment and contaminated materials must exit the regulated area through the W/EDF and be decontaminated in accordance with these specifications. Walls and ceilings of the PDF and W/EDF must be constructed of a minimum of 3 layers of 6 mil opaque fire retardant polyethylene sheeting and be securely attached to existing building components and/or an adequate temporary framework. A minimum of 3 layers of 6 mil poly shall also be used to cover the floor under the PDF and W/EDF units. Construct doors so that they overlap and secure to adjacent surfaces. Weight inner doorway sheets with layers of duct tape so that they close quickly after release. Put arrows on sheets so they show direction of travel and overlap. If the building adjacent area is occupied, construct a solid barrier on the occupied side(s) to protect the sheeting and reduce potential for non-authorized personnel entering the regulated area.

1.9.3 TEMPORARY FACILITIES TO THE PDF AND W/EDF

The Competent Person shall provide temporary water service connections to the PDF and W/EDF. Backflow prevention must be provided at the point of connection to the VA system. Water supply must be of adequate pressure and meet requirements of 29 CFR 1910.141(d) (3). Provide adequate temporary overhead electric power with ground fault circuit interruption (GFCI) protection. Provide a sub-panel equipped with GFCI protection for all temporary power in the clean room. Provide adequate lighting to provide a minimum of 50 foot candles in the PDF and W/EDF. Provide temporary heat, if needed, to maintain 70°F throughout the PDF and W/EDF.

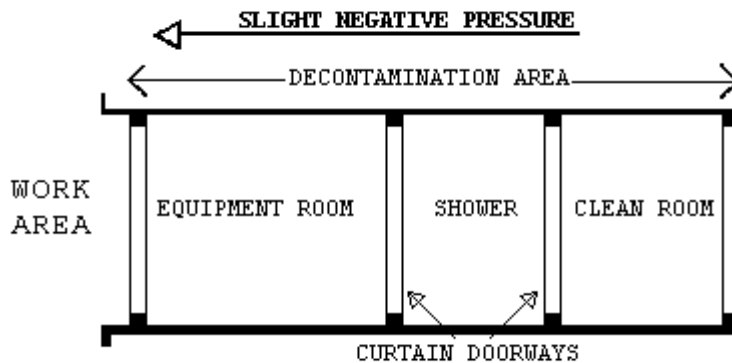
1.9.4 PERSONNEL DECONTAMINATION FACILITY (PDF)

The Competent Person shall provide a PDF consisting of shower room which is contiguous to a clean room and equipment room. The PDF must be sized to accommodate the number of personnel scheduled for the project. The shower room, located in the center of the PDF, shall be fitted with as many portable showers as necessary to insure all employees can complete the entire decontamination procedure within 15 minutes. The PDF shall be constructed of opaque poly for privacy. The PDF shall be constructed to eliminate any parallel routes of egress without showering.

1. Clean Room: The clean room must be physically and visually separated from the rest of the building to protect the privacy of personnel changing clothes. The clean room shall be constructed of at least 3 layers of 6 mil opaque fire retardant poly to provide an air tight room. Provide a minimum of 2 - 900 mm (3 foot) wide 6 mil poly opaque fire retardant doorways. One doorway shall be the entry from outside the PDF and the second doorway shall be to the shower room of the PDF. The floor of the clean room shall be maintained in a clean, dry condition. Shower overflow shall not be allowed into the clean room. Provide 1 storage locker per person. A portable fire extinguisher, minimum 10 pounds capacity, Type ABC, shall be provided in accordance with OSHA and NFPA Standard 10. All persons entering the regulated area shall remove all street clothing in the clean room and dress in disposable protective clothing and respiratory protection. Any person entering the clean room does so either from the outside with street clothing on or is coming from the shower room completely naked and thoroughly washed. Females required to enter the regulated area shall be ensured of their privacy throughout the entry/exit process by posting guards at both entry points to the PDF so no male can enter or exit the PDF during her stay in the PDF.
2. Shower Room: The Competent Person shall assure that the shower room is a completely water tight compartment to be used for the movement of all personnel from the clean room to the equipment room and for the showering of all personnel going from the equipment room to the clean room. Each shower shall be constructed so water runs down the walls of the shower and into a drip pan. Install a freely draining smooth floor on top of the shower pan. The shower room shall be separated from the rest of the building and from the clean room and equipment room using air tight walls made from at least 3 layers of 6 mil opaque fire retardant poly. The shower shall be equipped with a shower head and controls, hot and cold water, drainage, soap dish and continuous supply of soap, and shall be maintained in a sanitary condition throughout its use. The controls shall be arranged so an individual can shower without assistance. Provide a flexible hose shower head, hose bibs and all other items shown on Shower Schematic. Waste water will be pumped to a drain after being filtered through a minimum of a 100 micron sock in the shower drain; a 20 micron filter; and a final 5 micron filter. Filters will be changed a minimum of once per day or more often as needed. Filter changes must be done in the shower to prevent loss of contaminated water. Hose down all shower surfaces after each shift and clean any debris from the shower pan. Residue is to be disposed of as asbestos waste.
3. Equipment Room: The Competent Person shall provide an equipment room which shall be an air tight compartment for the storage of work

equipment/tools, reusable personal protective equipment, except for a respirator and for use as a gross decontamination area for personnel exiting the regulated area. The equipment room shall be separated from the regulated area by a minimum 3 foot wide door made with 2 layers of 6 mil opaque fire retardant poly. The equipment room shall be separated from the regulated area, the shower room and the rest of the building by air tight walls and ceiling constructed of a minimum of 3 layers of 6 mil opaque fire retardant poly. Damp wipe all surfaces of the equipment room after each shift change. Provide an additional loose layer of 6 mil fire retardant poly per shift change and remove this layer after each shift. If needed, provide a temporary electrical sub-panel equipped with GFCI in the equipment room to accommodate any equipment required in the regulated area.

4. The PDF shall be as follows: Clean room at the entrance followed by a shower room followed by an equipment room leading to the regulated area. Each doorway in the PDF shall be a minimum of 2 layers of 6 mil opaque fire retardant poly.

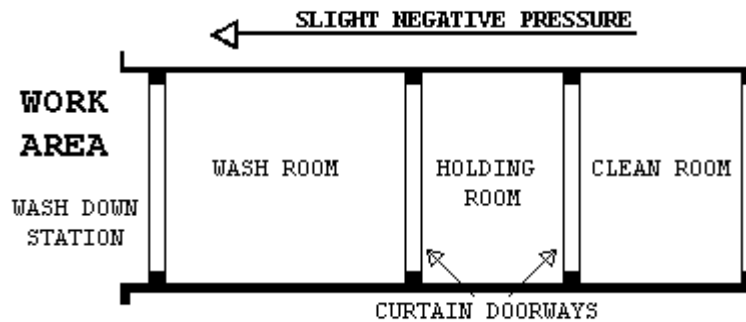


1.9.5 WASTE/EQUIPMENT DECONTAMINATION FACILITY (W/EDF)

The Competent Person shall provide a W/EDF consisting of a wash room, holding room, and clean room for removal of waste, equipment and contaminated material from the regulated area. Personnel shall not enter or exit the W/EDF except in the event of an emergency. Clean debris and residue in the W/EDF daily. All surfaces in the W/EDF shall be wiped/hosed down after each shift and all debris shall be cleaned from the shower pan. The W/EDF shall consist of the following:

1. Wash Down Station: Provide an enclosed shower unit in the regulated area just outside the Wash Room as an equipment bag and container cleaning station.
2. Wash Room: Provide a wash room for cleaning of bagged or containerized asbestos containing waste materials passed from the regulated area. Construct the wash room using 50 x 100 mm (2" x 4") wood framing and 3 layers of 6 mil fire retardant poly. Locate the wash room so that packaged materials, after being wiped clean, can be passed to the Holding Room. Doorways in the wash room shall be constructed of 2 layers of 6 mil fire retardant poly.
3. Holding Room: Provide a holding room as a drop location for bagged materials passed from the wash room. Construct the holding room using 50 x 100 mm (2" x 4") wood framing and 3 layers of 6 mil fire retardant

- poly. The holding room shall be located so that bagged material cannot be passed from the wash room to the clean room unless it goes through the holding room. Doorways in the holding room shall be constructed of 2 layers of 6 mil fire retardant poly.
4. Clean Room: Provide a clean room to isolate the holding room from the exterior of the regulated area. Construct the clean room using 2 x 4 wood framing and 2 layers of 6 mil fire retardant poly. The clean room shall be located so as to provide access to the holding room from the building exterior. Doorways to the clean room shall be constructed of 2 layers of 6 mil fire retardant poly. When a negative pressure differential system is used, a rigid enclosure separation between the W/EDF clean room and the adjacent areas shall be provided.
 5. The W/EDF shall be as follows: Wash Room leading to a Holding Room followed by a Clean Room leading to outside the regulated area. See diagram.



1.9.6 WASTE/EQUIPMENT DECONTAMINATION PROCEDURES

At the washdown station in the regulated area, thoroughly wet wipe/clean contaminated equipment and/or sealed polyethylene bags and pass into Wash Room after visual inspection. When passing anything into the Wash Room, close all doorways of the W/EDF, other than the doorway between the washdown station and the Wash Room. Keep all outside personnel clear of the W/EDF. Once inside the Wash Room, wet clean the equipment and/or bags. After cleaning and inspection, pass items into the Holding Room. Close all doorways except the doorway between the Holding Room and the Clean Room. Workers from the Clean Room/Exterior shall enter the Holding Room and remove the decontaminated/cleaned equipment/bags for removal and disposal. These personnel will not be required to wear PPE. At no time shall personnel from the clean side be allowed to enter the Wash Room.

PART 2 - PRODUCTS, MATERIALS AND EQUIPMENT

2.1 MATERIALS AND EQUIPMENT

2.1.1 GENERAL REQUIREMENTS (ALL ABATEMENT PROJECTS)

Prior to the start of work, the contractor shall provide and maintain a sufficient quantity of materials and equipment to assure continuous and efficient work throughout the duration of the project. Work shall not start unless the following items have been delivered to the site and the CPIH/CIH has submitted verification to the VA's representative.

- A. All materials shall be delivered in their original package, container or bundle bearing the name of the manufacturer and the brand name (where applicable).
- B. Store all materials subject to damage off the ground, away from wet or damp surfaces and under cover sufficient enough to prevent damage or contamination. Flammable and combustible materials cannot be stored inside buildings. Replacement materials shall be stored outside of the regulated area until abatement is completed.
- C. The Contractor shall not block or hinder use of buildings by patients, staff, and visitors to the VA in partially occupied buildings by placing materials/equipment in any unauthorized location.
- D. The Competent Person shall inspect for damaged, deteriorating or previously used materials. Such materials shall not be used and shall be removed from the worksite and disposed of properly.
- E. Polyethylene sheeting for walls in the regulated area shall be a minimum of 4-mils. For floors and all other uses, sheeting of at least 6-mils shall be used in widths selected to minimize the frequency of joints. Fire retardant poly shall be used throughout.
- F. The method of attaching polyethylene sheeting shall be agreed upon in advance by the Contractor and the VA and selected to minimize damage to equipment and surfaces. Method of attachment may include any combination of moisture resistant duct tape furring strips, spray glue, staples, nails, screws, lumber and plywood for enclosures or other effective procedures capable of sealing polyethylene to dissimilar finished or unfinished surfaces under both wet and dry conditions.
- G. Polyethylene sheeting utilized for the PDF shall be opaque white or black in color, 6 mil fire retardant poly.
- H. Installation and plumbing hardware, showers, hoses, drain pans, sump pumps and waste water filtration system shall be provided by the Contractor.
- I. An adequate number of HEPA vacuums, scrapers, sprayers, nylon brushes, brooms, disposable mops, rags, sponges, staple guns, shovels, ladders and scaffolding of suitable height and length as well as meeting OSHA requirements, fall protection devices, water hose to reach all areas in the regulated area, airless spray equipment, and any other tools, materials or equipment required to conduct the abatement project. All electrically operated hand tools, equipment, electric cords shall be connected to GFCI protection.
- J. Special protection for objects in the regulated area shall be detailed (e.g., plywood over carpeting or hardwood floors to prevent damage from scaffolds, water and falling material).
- K. Disposal bags - 2 layers of 6 mil poly for asbestos waste shall be pre-printed with labels, markings and address as required by OSHA, EPA and DOT regulations.
- L. The VA shall be provided an advance copy of the MSDS as required for all hazardous chemicals under OSHA 29 CFR 1910.1200 - Hazard Communication in the pre-project submittal. Chlorinated compounds shall not be used with any spray adhesive, mastic remover or other product. Appropriate encapsulant(s) shall be provided.
- M. OSHA DANGER demarcation signs, as many and as required by OSHA 29 CFR 1926.1101(k) (7) shall be provided and placed by the Competent Person. All other posters and notices required by Federal and State regulations shall be posted in the Clean Room.
- N. Adequate and appropriate PPE for the project and number of personnel/shifts shall be provided. All personal protective equipment

issued must be based on a written hazard assessment conducted under 29 CFR 1910.132(d).

2.2 CONTAINMENT BARRIERS AND COVERINGS IN THE REGULATED AREA

2.2.1 GENERAL

Using critical barriers, seal off the perimeter to the regulated area to completely isolate the regulated area from adjacent spaces. All horizontal surfaces in the regulated area must be covered with 2 layers of 6 mil fire retardant poly to prevent contamination and to facilitate clean-up. Should adjacent areas become contaminated, immediately stop work and clean up the contamination at no additional cost to the Government. Provide firestopping and identify all fire barrier penetrations due to abatement work as specified in Section 2.2.8; FIRESTOPPING.

2.2.2 PREPARATION PRIOR TO SEALING THE REGULATED AREA

- A. Place all tools, scaffolding, materials and equipment needed for working in the regulated area prior to erecting any plastic sheeting. Remove all uncontaminated removable furniture, equipment and/or supplies from the regulated area before commencing work, or completely cover with 2 layers of 6-mil fire retardant poly sheeting and secure with duct tape. Lock out and tag out any HVAC systems in the regulated area.

2.2.3 CONTROLLING ACCESS TO THE REGULATED AREA

- A. Access to the regulated area is allowed only through the personnel decontamination facility (PDF), if required. All other means of access shall be eliminated and OSHA Danger demarcation signs posted as required by OSHA. If the regulated area is adjacent to or within view of an occupied area, provide a visual barrier of 6 mil opaque fire retardant poly sheeting to prevent building occupant observation. If the adjacent area is accessible to the public, the barrier must be solid.

2.2.4 CRITICAL BARRIERS

- A. Completely separate any openings into the regulated area from adjacent areas using fire retardant poly at least 6 mils thick and duct tape. Individually seal with 2 layers of 6 mil poly and duct tape all HVAC openings into the regulated area. Individually seal all lighting fixtures, clocks, doors, windows, convectors, speakers, or any other objects in the regulated area. Heat must be shut off any objects covered with poly.

2.2.5 SECONDARY BARRIERS

- A. A loose layer of 6 mil fire retardant poly shall be used as a drop cloth to protect the floor/horizontal surfaces from debris generated during the glovebag abatement. This layer shall be replaced as needed during the work.

2.2.6 EXTENSION OF THE REGULATED AREA

- A. If the enclosure of the regulated area is breached in any way that could allow contamination to occur, the affected area shall be included in the regulated area and constructed as per this section. If the affected area cannot be added to the regulated area, decontamination measures must be

started immediately and continue until air monitoring indicates background levels are met.

2.2.7 FIRESTOPPING

- A. Through penetrations caused by cables, cable trays, pipes, sleeves must be firestopped with a fire-rated firestop system providing an air tight seal.
- B. Firestop materials that are not equal to the wall or ceiling penetrated shall be brought to the attention of the VA Representative. The Contractor shall list all areas of penetration, the type of sealant used, and whether or not the location is fire rated. Any discovery of penetrations during abatement shall be brought to the attention of the VA Representative immediately. All walls, floors and ceilings are considered fire rated unless otherwise determined by the VA Representative or Fire Marshall.
- C. Any visible openings whether or not caused by a penetration shall be reported by the Contractor to the VA Representative for a sealant system determination. Firestops shall meet ASTM E814 and UL 1479 requirements for the opening size, penetrant, and fire rating needed.

2.3 MONITORING, INSPECTION AND TESTING

2.3.1 GENERAL

- A. Perform throughout abatement work monitoring, inspection and testing inside and around the regulated area in accordance with the OSHA requirements and these specifications. OSHA requires that the Employee exposure to asbestos must not exceed 0.1 fibers per cubic centimeter (f/cc) of air, averaged over an 8-hour work shift. The CPIH/CIH is responsible for and shall inspect and oversee the performance of the Contractor IH Technician. The IH Technician shall continuously inspect and monitor conditions inside the regulated area to ensure compliance with these specifications. In addition, the CPIH/CIH shall personally manage air sample collection, analysis, and evaluation for personnel, regulated area, and adjacent area samples to satisfy OSHA requirements. Additional inspection and testing requirements are also indicated in other parts of this specification.
- B. The VA will employ an independent industrial hygienist (VPIH/CIH) consultant and/or use its own IH to perform various services on behalf of the VA. The VPIH/CIH will perform the necessary monitoring, inspection, testing, and other support services to ensure that VA patients, employees, and visitors will not be adversely affected by the abatement work, and that the abatement work proceeds in accordance with these specifications, that the abated areas or abated buildings have been successfully decontaminated. The work of the VPIH/CIH consultant in no way relieves the Contractor from their responsibility to perform the work in accordance with contract/specification requirements, to perform continuous inspection, monitoring and testing for the safety of their employees, and to perform other such services as specified. The cost of the VPIH/CIH and their services will be borne by the VA except for any repeat of final inspection and testing that may be required due to unsatisfactory initial results. Any repeated final inspections and/or testing, if required, will be paid for by the Contractor.
- C. If fibers counted by the VPIH/CIH during abatement work, either inside or outside the regulated area, utilizing the NIOSH 7400 air monitoring method, exceed the specified respective limits, the Contractor shall stop

work. The Contractor may request confirmation of the results by analysis of the samples by TEM. Request must be in writing and submitted to the VA's representative. Cost for the confirmation of results will be borne by the Contractor for both the collection and analysis of samples and for the time delay that may/does result for this confirmation. Confirmation sampling and analysis will be the responsibility of the CPIH/CIH with review and approval of the VPIH/CIH. An agreement between the CPIH/CIH and the VPIH/CIH shall be reached on the exact details of the confirmation effort, in writing, including such things as the number of samples, location, collection, quality control on-site, analytical laboratory, interpretation of results and any follow-up actions. This written agreement shall be co-signed by the IH's and delivered to the VA's representative.

2.3.2 SCOPE OF SERVICES OF THE VPIH/CIH CONSULTANT

- A. The purpose of the work of the VPIH/CIH is to: Assure quality; resolve problems; and prevent the spread of contamination beyond the regulated area. In addition, their work includes performing the final inspection and testing to determine whether the regulated area or building has been adequately decontaminated. All air monitoring is to be done utilizing PCM/TEM. The VPIH/CIH will perform the following tasks:
1. Task 1: Establish background levels before abatement begins by collecting background samples. Retain samples for possible TEM analysis.//
 2. Task 2: Perform continuous air monitoring, inspection, and testing outside the regulated area during actual abatement work to detect any faults in the regulated area isolation and any adverse impact on the surroundings from regulated area activities.//
 3. Task 3: Perform unannounced visits to spot check overall compliance of work with contract/specifications. These visits may include any inspection, monitoring, and testing inside and outside the regulated area and all aspects of the operation except personnel monitoring.
 4. Task 4: Provide support to the VA representative such as evaluation of submittals from the Contractor, resolution of unforeseen developments, etc.
 5. Task 5: Perform, in the presence of the VA representative, final inspection and testing of a decontaminated regulated area or building at the conclusion of the abatement and clean-up work to certify compliance with all regulations and the VA requirements/specifications.
 6. Task 6: Issue certificate of decontamination for each regulated area or building and project report.
- B. All data, inspection results and testing results generated by the VPIH/CIH will be available to the Contractor for information and consideration. The Contractor shall cooperate with and support the VPIH/CIH for efficient and smooth performance of their work.
- C. The monitoring and inspection results of the VPIH/CIH will be used by the VA to issue any Stop Removal orders to the Contractor during abatement work and to accept or reject a regulated area or building as decontaminated.

2.3.3 MONITORING, INSPECTION AND TESTING BY ABATEMENT CONTRACTOR CPIH/CIH

The Contractor's CPIH/CIH is responsible for managing all monitoring, inspections, and testing required by these specifications, as well as any and all regulatory requirements adopted by these specifications. The CPIH/CIH is responsible for the continuous monitoring of all subsystems and procedures which could affect the health and safety of the Contractor's personnel. Safety and health conditions and the provision of those conditions inside the regulated area for all persons entering the regulated area is the exclusive responsibility of the Contractor/Competent Person. The person performing the personnel and area air monitoring inside the regulated area shall be an IH Technician, who shall be trained and shall have specialized field experience in sampling and analysis. The IH Technician shall have successfully completed a NIOSH 582 Course or equivalent and provide documentation. The IH Technician shall participate in the AIHA Asbestos Analysis Registry or participate in the Proficiency Analytic Testing program of AIHA for fiber counting quality control assurance. The IH Technician shall also be an accredited EPA AHERA/State Contractor/Supervisor (or Abatement Worker) and Building Inspector. The IH Technician shall have participated in five abatement projects collecting personal and area samples as well as responsibility for documentation on substantially similar projects in size and scope. The analytic laboratory used by the Contractor to analyze the samples shall be AIHA accredited for asbestos PAT and approved by the VA prior to start of the project. A daily log shall be maintained by the CPIH/CIH or IH Technician, documenting all OSHA requirements for air personal monitoring for asbestos in 29 CFR 1926.1101(f), (g) and Appendix A. This log shall be made available to the VA representative and the VPIH/CIH upon request. The log will contain, at a minimum, information on personnel or area samples, other persons represented by the sample, the date of sample collection, start and stop times for sampling, sample volume, flow rate, and fibers/cc. The CPIH/CIH shall collect and analyze samples for each representative job being done in the regulated area, i.e., removal, wetting, clean-up, and load-out. No fewer than two personal samples per shift shall be collected and one area sample per 1,000 square feet of regulated area where abatement is taking place and one sample per shift in the clean room area shall be collected. In addition to the continuous monitoring required, the CPIH/CIH will perform inspection and testing at the final stages of abatement for each regulated area as specified in the CPIH/CIH responsibilities. Additionally, the CPIH/CIH will monitor and record pressure readings within the containment daily with a minimum of two readings at the beginning and at the end of a shift, and submit the data in the daily report.

2.4 ASBESTOS HAZARD ABATEMENT PLAN

The Contractor shall have established Asbestos Hazard Abatement Plan (AHAP) in printed form and loose leaf folder consisting of simplified text, diagrams, sketches, and pictures that establish and explain clearly the ways and procedures to be followed during all phases of the work by the Contractor's personnel. The AHAP must be modified as needed to address specific requirements of the project. The AHAP shall be submitted for review and approval prior to the start of any abatement work. The minimum topics and areas to be covered by the AHAP(s) are:

A. Minimum Personnel Qualifications

- B. Contingency Plans and Arrangements
- C. Security and Safety Procedures
- D. Respiratory Protection/Personal Protective Equipment Program and Training
- E. Medical Surveillance Program and Recordkeeping
- F. Regulated Area Requirements for Glovebag Abatement
- G. Decontamination Facilities and Entry/Exit Procedures (PDF and W/EDF)
- H. Monitoring, Inspections, and Testing
- I. Removal Procedures for Piping ACM Using the Glovebag Method
- J. Disposal of ACM waste
- K. Regulated Area Decontamination/Clean-up
- L. Regulated Area Visual and Air Clearance
- M. Project Completion/Closeout

2.5 SUBMITTALS

2.5.1 PRE-START MEETING SUBMITTALS

Submit to the VA a minimum of 14 days prior to the pre-start meeting the following for review and approval. Meeting this requirement is a prerequisite for the pre-start meeting for this project:

- A. Submit a detailed work schedule for the entire project reflecting contract documents and the phasing/schedule requirements from the CPM chart.
- B. Submit a staff organization chart showing all personnel who will be working on the project and their capacity/function. Provide their qualifications, training, accreditations, and licenses, as appropriate. Provide a copy of the "Certificate of Worker's Acknowledgment" and the "Affidavit of Medical Surveillance and Respiratory Protection" for each person.
- C. Submit Asbestos Hazard Abatement Plan developed specifically for this project, incorporating the requirements of the specifications, prepared, signed and dated by the CPIH/CIH.
- D. Submit the specifics of the materials and equipment to be used for this project with manufacturer names, model numbers, performance characteristics, pictures/diagrams, and number available for the following:
 - 1. Supplied air system, negative air machines, HEPA vacuums, air monitoring pumps, calibration devices, pressure differential monitoring device and emergency power generating system.
 - 2. Waste water filtration system, shower system, containment barriers.
 - 3. Encapsulants, surfactants, hand held sprayers, airless sprayers, glovebags, and fire extinguishers.
 - 4. Respirators, protective clothing, personal protective equipment.
 - 5. Fire safety equipment to be used in the regulated area.
- E. Submit the name, location, and phone number of the approved landfill; proof/verification the landfill is approved for ACM disposal; the landfill's requirements for ACM waste; the type of vehicle to be used for transportation; and name, address, and phone number of subcontractor, if used. Proof of asbestos training for transportation personnel shall be provided.
- F. Submit required notifications and arrangements made with regulatory agencies having regulatory jurisdiction and the specific contingency/emergency arrangements made with local health, fire, ambulance, hospital authorities and any other notifications/arrangements.
- G. Submit the name, location and verification of the laboratory and/or personnel to be used for analysis of air and/or bulk samples. Personal air monitoring must be done in accordance with OSHA 29 CFR 1926.1101(f)

- and Appendix A. And area or clearance air monitoring in accordance with EPA AHERA protocols.
- H. Submit qualifications verification: Submit the following evidence of qualifications. Make sure that all references are current and verifiable by providing current phone numbers and documentation.
1. Asbestos Abatement Company: Project experience within the past 3 years; listing projects first most similar to this project: Project Name; Type of Abatement; Duration; Cost; Reference Name/Phone Number; Final Clearance; and Completion Date
 2. List of project(s) halted by owner, A/E, IH, regulatory agency in the last 3 years: Project Name; Reason; Date; Reference Name/Number; and Resolution.
 3. List asbestos regulatory citations (e.g., OSHA), notices of violations (e.g., Federal and state EPA), penalties, and legal actions taken against the company including and of the company's officers (including damages paid) in the last 3 years. Provide copies and all information needed for verification.
- I. Submit information on personnel: Provide a resume; address each item completely; copies of certificates, accreditations, and licenses. Submit an affidavit signed by the CPIH/CIH stating that all personnel submitted below have medical records in accordance with OSHA 29 CFR 1926.1101(m) and 29 CFR 1910.20 and that the company has implemented a medical surveillance program and written respiratory protection program, and maintains recordkeeping in accordance with the above regulations. Submit the phone number and doctor/clinic/hospital used for medical evaluations.
1. CPIH/CIH and IH Technician: Name; years of abatement experience; list of projects similar to this one; certificates, licenses, accreditations for proof of AHERA/OSHA specialized asbestos training; professional affiliations; number of workers trained; samples of training materials; samples of AHAP(s) developed; medical opinion; and current respirator fit test.
 2. Competent Person(s)/Supervisor(s): Number; names; social security numbers; years of abatement experience as Competent Person/Supervisor; list of similar projects in size/complexity as Competent Person/Supervisor; as a worker; certificates, licenses, accreditations; proof of AHERA/OSHA specialized asbestos training; maximum number of personnel supervised on a project; medical opinion (asbestos surveillance and respirator use); and current respirator fit test.
 3. Workers: Numbers; names; social security numbers; years of abatement experience; certificates, licenses, accreditations; training courses in asbestos abatement and respiratory protection; medical opinion (asbestos surveillance and respirator use); and current respirator fit test.
- J. Submit copies of State license for asbestos abatement; copy of insurance policy, including exclusions with a letter from agent stating in plain language the coverage provided and the fact that asbestos abatement activities are covered by the policy; copy of AHAP(s) incorporating the requirements of this specification; information on who provides your training, how often; who provides medical surveillance, how often; who performs and how is personal air monitoring of abatement workers conducted; a list of references of independent laboratories/IH's familiar with your air monitoring and Asbestos Hazard Abatement Plans; copies of monitoring results of the five referenced projects listed and analytical method(s) used.

- K. Rented equipment must be decontaminated prior to returning to the rental agency.
- L. Submit, before the start of work, the manufacturer's technical data for all types of encapsulants, all MSDS, and application instructions.

2.5.2 SUBMITTALS DURING ABATEMENT

- A. The Competent Person shall maintain and submit a daily log at the regulated area documenting the dates and times of the following: purpose, attendees and summary of meetings; all personnel entering/exiting the regulated area; document and discuss the resolution of unusual events such as barrier breaching, equipment failures, emergencies, and any cause for stopping work; representative air monitoring and results/TWAs/ELs. Submit this information daily to the VPIH/CIH.
- B. The CPIH/CIH shall document and maintain the inspection and approval of the regulated area preparation prior to start of work and daily during work.
 - 1. Removal of any poly barriers.
 - 2. Visual inspection/testing by the CPIH/CIH or IH Technician prior to application of lockdown encapsulant.
 - 3. Packaging and removal of ACM waste from regulated area.
 - 4. Disposal of ACM waste materials; copies of Waste Shipment Records/landfill receipts to the VA's representative on a weekly basis.

2.5.3 SUBMITTALS AT COMPLETION OF ABATEMENT

The CPIH/CIH shall submit a project report consisting of the daily log book requirements and documentation of events during the abatement project including Waste Shipment Records signed by the landfill's agent. It will also include information on the containment and transportation of waste from the containment with applicable Chain of Custody forms. The report shall include a certificate of completion, signed and dated by the CPIH/CIH, in accordance with Attachment #1. All clearance and perimeter area samples must be submitted. The VA Representative will retain the abatement report after completion of the project and provide copies of the abatement report to VAMC Office of Engineer and the Safety Office.

2.6 ENCAPSULANTS

2.6.1 TYPES OF ENCAPSULANTS

- A. The following four types of encapsulants must comply with performance requirements as stated in paragraph 2.6.2:
 - 1. Removal encapsulant - used as a wetting agent to remove ACM.
 - 2. Bridging encapsulant - provides a tough, durable coating on ACM.
 - 3. Penetrating encapsulant - penetrates/encapsulates ACM at least 13 mm (1/2").
 - 4. Lockdown encapsulant - seals microscopic fibers on surfaces after ACM removal.

2.6.2 PERFORMANCE REQUIREMENTS

Encapsulants shall meet the latest requirements of EPA; shall not contain toxic or hazardous substances; or solvents; and shall comply with the following performance requirements:

- A. General Requirements for all Encapsulants:
 - 1. ASTM E84: Flame spread of 25; smoke emission of 50.

2. University of Pittsburgh Protocol: Combustion Toxicity; zero mortality.
 3. ASTM C732: Accelerated Aging Test; Life Expectancy - 20 years.
 4. ASTM E96: Permeability - minimum of 0.4 perms.
- B. Bridging/Penetrating Encapsulants:
1. ASTM E736: Cohesion/Adhesion Test - 24 kPa (50 lbs/ft²).
 2. ASTM E119: Fire Resistance - 3 hours (Classified by UL for use on fibrous/cementitious fireproofing).
 3. ASTM D2794: Gardner Impact Test; Impact Resistance - minimum 11.5 kg-mm (43 in/lb).
 4. ASTM D522: Mandrel Bend Test; Flexibility - no rupture or cracking.
- C. Lockdown Encapsulants:
1. ASTM E119: Fire resistance - 3 hours (tested with fireproofing over encapsulant applied directly to steel member).
 2. ASTM E736: Bond Strength - 48 kPa (100 lbs/ft²) (test compatibility with cementitious and fibrous fireproofing).
 3. In certain situations, encapsulants may have to be applied to hot pipes/equipment. The encapsulant must be able to withstand high temperatures without cracking or off-gassing any noxious vapors during application.

2.7 CERTIFICATES OF COMPLIANCE

The Contractor shall submit to the VA representative certification from the manufacturer indicating compliance with performance requirements for encapsulants when applied according to manufacturer recommendations.

2.8 RECYCLABLE PROTECTIVE CLOTHING

If recyclable clothing is provided, all requirements of EPA, DOT and OSHA shall be met.

PART 3 - EXECUTION

3.1 REGULATED AREA PREPARATIONS

3.1.1 SITE SECURITY

- A. Regulated area access is to be restricted only to authorized, trained/accredited and protected personnel. These may include the Contractor's employees, employees of Subcontractors, VA employees and representatives, State and local inspectors, and any other designated individuals. A list of authorized personnel shall be established prior to commencing the project and be posted in the clean room of the decontamination unit.
- B. Entry into the regulated area by unauthorized individuals shall be reported immediately to the Competent Person by anyone observing the entry. The Competent Person shall immediately require any unauthorized person to leave the regulated area and then notify the VA Contracting Officer or VA Representative using the most expeditious means.
- C. A log book shall be maintained in the clean room of the decontamination unit. Anyone who enters the regulated area must record their name, affiliation, time in, and time out for each entry.
- D. Access to the regulated area shall be through a single decontamination unit. All other access (doors, windows, hallways,

etc.) shall be sealed or locked to prevent entry to or exit from the regulated area. The only exceptions for this requirement are the waste/equipment load-out area which shall be sealed except during the removal of containerized asbestos waste from the regulated area, and emergency exits. Emergency exits shall not be locked from the inside; however, they shall be sealed with poly sheeting and taped until needed. In any situation where exposure to high temperatures which may result in a flame hazard, fire retardant poly sheeting must be used.

- E. The Contractor's Competent Person shall control site security during abatement operations in order to isolate work in progress and protect adjacent personnel. A 24 hour security system shall be provided at the entrance to the regulated area to assure that all entrants are logged in/out and that only authorized personnel are allowed entrance.
- F. The Contractor will have the VA's assistance in notifying adjacent personnel of the presence, location and quantity of ACM in the regulated area and enforcement of restricted access by the VA's employees.
- G. The regulated area shall be locked during non-working hours and secured by VA Representative or Competent Person. The VA Police should be informed of asbestos abatement regulated areas to provide security checks during facility rounds and emergency response.

3.1.2 OSHA DANGER SIGNS

Post OSHA DANGER signs meeting the specifications of OSHA 29 CFR 1926.1101 at any location and approaches to the regulated area where airborne concentrations of asbestos may exceed ambient background levels. Signs shall be posted at a distance sufficiently far enough away from the regulated area to permit any personnel to read the sign and take the necessary measures to avoid exposure. Additional signs will be posted following construction of the regulated area enclosure.

3.1.3.1 SHUT DOWN - LOCK OUT ELECTRICAL

Shut down and lock out/tag out electric power to the regulated area. Provide temporary power and lighting. Insure safe installation including GFCI of temporary power sources and equipment by compliance with all applicable electrical code requirements and OSHA requirements for temporary electrical systems. Electricity shall be provided by the VA.

3.1.3.2 SHUT DOWN - LOCK OUT HVAC

Shut down and lock out/tag out heating, cooling, and air conditioning system (HVAC) components that are in, supply or pass through the regulated area. Investigate the regulated area and agree on pre-abatement condition with the VA's representative. Seal all intake and exhaust vents in the regulated area with duct tape and 2 layers of 6-mil poly. Also, seal any seams in system components that pass through the regulated area. Remove all contaminated HVAC system filters and place in labeled 6-mil poly disposal bags for disposal as asbestos waste.

3.1.4 CONTAINMENT BARRIERS AND COVERINGS FOR THE REGULATED AREA

3.1.4.1 GENERAL

Seal off any openings at the perimeter of the regulated area with critical barriers to completely isolate the regulated area and to contain all airborne asbestos contamination created by the abatement activities. Should the adjacent area past the regulated area become contaminated due to improper work activities, the Contractor shall suspend work inside the regulated area, continue wetting, and clean the adjacent areas in accordance with procedures described in these specifications. Any and all costs associated with the adjacent area cleanup shall not be borne by the VA.

3.1.4.2 PREPARATION PRIOR TO SEALING OFF

Place all materials, equipment and supplies necessary to isolate the regulated area inside the regulated area. Remove all movable material/equipment as described above and secure all unmovable material/equipment as described above. Properly secured material/equipment shall be considered to be outside the regulated area.

3.1.4.3 CONTROLLING ACCESS TO THE REGULATED AREA

Access to the regulated area is allowed only through the personnel decontamination facility (PDF). All other means of access shall be eliminated and OSHA DANGER demarcation signs posted as required by OSHA. If the regulated area is adjacent to, or within view of an occupied area, provide a visual barrier of 6 mil opaque fire retardant poly to prevent building occupant observation. If the adjacent area is accessible to the public, the barrier must be solid and capable of withstanding the negative pressure.

3.1.4.4 CRITICAL BARRIERS

The regulated area must be completely separated from the adjacent area(s) and the outside by at least 2 layers of 6 mil fire retardant poly and duct tape/spray adhesive. Individually seal all supply and exhaust ventilation openings, lighting fixtures, clocks, doorways, windows, convectors, speakers, and other openings into the regulated area with 2 layers of 6 mil fire retardant poly, and taped securely in place with duct tape/spray adhesive. Critical barriers must remain in place until all work and clearances have been completed. Light fixtures shall not be operational during abatement. Auxiliary lighting shall be provided. If needed, provide plywood squares 6" x 6" x 3/8" (150mm x 150mm x 18mm) held in place with one 6d smooth masonry/galvanized nail driven through the center of the plywood square and duct tape on the poly so as to clamp the poly to the wall/surface. Locate plywood squares at each end, corner, and 4' (1200mm) maximum on centers.

3.1.4.5 EXTENSION OF THE REGULATED AREA

If the regulated area barrier is breached in any manner that could allow the passage of asbestos fibers or debris, the Competent Person shall immediately stop work, continue wetting, and proceed to extend the regulated area to enclose the affected area as per procedures described in this specification. If the affected area cannot be enclosed, decontamination measures and cleanup shall start immediately. All

personnel shall be isolated from the affected area until decontamination/cleanup is completed as verified by visual inspection and air monitoring. Air monitoring at completion must indicate background levels.

3.1.4.6 FLOOR BARRIERS:

All floors within 10' of glovebag work shall be covered with 2 layers of 6 mil fire retardant poly.

3.1.5 SANITARY FACILITIES

The Contractor shall provide sanitary facilities for abatement personnel and maintain them in a clean and sanitary condition throughout the abatement project.

3.1.6 PRE-CLEANING

3.1.6.1 PRE-CLEANING MOVABLE OBJECTS

The VA will provide water for abatement purposes. The Contractor shall connect to the existing VA system. The service to the shower(s) shall be supplied with backflow prevention.

Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area. PPE must be donned by all workers performing pre-cleaning activities. After items have been pre-cleaned and decontaminated, they may be removed from the work area for storage until the completion of abatement in the work area.

Pre-clean all movable objects within the regulated area using a HEPA filtered vacuum and/or wet cleaning methods as appropriate. After cleaning, these objects shall be removed from the regulated area and carefully stored in an uncontaminated location.

3.1.6.2 PRE-CLEANING FIXED OBJECTS

Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area.

Pre-clean all fixed objects in the regulated area using HEPA filtered vacuums and/or wet cleaning techniques as appropriate. Careful attention must be paid to machinery behind grills or gratings where access may be difficult but contamination may be significant. Also, pay particular attention to wall, floor and ceiling penetration behind fixed items. After pre-cleaning, enclose fixed objects with 2 layers of 6-mil poly and seal securely in place with duct tape. Objects (e.g., permanent fixtures, shelves, electronic equipment, laboratory tables, sprinklers, alarm systems, closed circuit TV equipment and computer cables) which must remain in the regulated area and that require special ventilation or enclosure requirements should be designated here along with specified means of protection. Contact the manufacturer for special protection requirements.

3.1.6.3 PRE-CLEANING SURFACES IN THE REGULATED AREA

Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area.

Pre-clean all surfaces in the regulated area using HEPA filtered vacuums and/or wet cleaning methods as appropriate. Do not use any methods that would raise dust such as dry sweeping or vacuuming with equipment not equipped with HEPA filters. Do not disturb asbestos-containing materials during this pre-cleaning phase.

3.1.7 PRE-ABATEMENT ACTIVITIES

3.1.7.1 PRE-ABATEMENT MEETING

The VA representative, upon receipt, review, and substantial approval of all pre-abatement submittals and verification by the CPIH/CIH that all materials and equipment required for the project are on the site, will arrange for a pre-abatement meeting between the Contractor, the CPIH/CIH, Competent Person(s), the VA representative(s), and the VPIH/CIH. The purpose of the meeting is to discuss any aspect of the submittals needing clarification or amplification and to discuss any aspect of the project execution and the sequence of the operation. The Contractor shall be prepared to provide any supplemental information/documentation to the VA's representative regarding any submittals, documentation, materials or equipment. Upon satisfactory resolution of any outstanding issues, the VA's representative will issue a written order to proceed to the Contractor. No abatement work of any kind described in the following provisions shall be initiated prior to the VA written order to proceed.

3.1.7.2 PRE-ABATEMENT INSPECTIONS AND PREPARATIONS

Before any work begins on the construction of the regulated area, the Contractor will:

- A. Conduct a space-by-space inspection with an authorized VA representative and prepare a written inventory of all existing damage in those spaces where asbestos abatement will occur. Still or video photography may be used to supplement the written damage inventory. Document will be signed and certified as accurate by both parties.
- B. The VA Representative, the Contractor, and the VPIH/CIH must be aware of AEQA 10-95 indicating the failure to identify asbestos in the areas listed as well as common issues when preparing specifications and contract documents. This is especially critical when demolition is planned, because AHERA surveys are non-destructive, and ACM may remain undetected. A NESHAPS (destructive) ACM inspection should be conducted on all building structures that will be demolished. Ensure the following areas are inspected on the project: Lay-in ceilings concealing ACM; ACM behind walls/windows from previous renovations; inside utility chases/walls; transite piping/ductwork/sheets; behind radiators; lab fume hoods; transite lab countertops; roofing materials; below window sills; water/sewer lines; electrical conduit coverings; crawl spaces (previous abatement contamination); flooring/mastic covered by carpeting/new flooring; exterior insulated wall panels; on underground fuel tanks; and steam line trench coverings.

- C. Ensure that all furniture, machinery, equipment, curtains, drapes, blinds, and other movable objects required to be removed from the regulated area have been cleaned and removed or properly protected from contamination.
- D. If present and required, remove and dispose of carpeting from floors in the regulated area.
- E. Inspect existing firestopping in the regulated area. Correct as needed.

3.1.7.3 PRE-ABATEMENT CONSTRUCTION AND OPERATIONS

- A. Perform all preparatory work for the first regulated area in accordance with the approved work schedule and with this specification.
- B. Upon completion of all preparatory work, the CPIH/CIH will inspect the work and systems and will notify the VA's representative when the work is completed in accordance with this specification. The VA's representative may inspect the regulated area and the systems with the VPIH/CIH and may require that upon satisfactory inspection, the Contractor's employees perform all major aspects of the approved AHAP(s), especially worker protection, respiratory systems, contingency plans, decontamination procedures, and monitoring to demonstrate satisfactory operation.
- C. The CPIH/CIH shall document the pre-abatement activities described above and deliver a copy to the VA's representative.
- D. Upon satisfactory inspection of the installation of and operation of systems the VA's representative will notify the Contractor in writing to proceed with the asbestos abatement work in accordance with this specification.

3.2 REMOVAL OF PIPING ACM

3.2.1 WETTING MATERIALS

- A. Use amended water for the wetting of ACM prior to removal. The Competent Person shall assure the wetting of ACM meets the definition of "adequately wet" in the EPA NESHAP's regulation and OSHA's "wet methods" for the duration of the project. A removal encapsulant may be used instead of amended water with written approval of the VA's representative.
- B. Amended Water: Provide water to which a surfactant has been added shall be used to wet the ACM and reduce the potential for fiber release during disturbance of ACM. The mixture must be equal to or greater than the wetting provided by water amended by a surfactant consisting one ounce of 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with 5 gallons (19L) of water.
- C. Removal Encapsulant: Provide a penetrating encapsulant designed specifically for the removal of ACM. The material must, when used, result in adequate wetting of the ACM and retard fiber release during disturbance equal to or greater than the amended water described above in B.

3.2.2 SECONDARY BARRIER AND WALKWAYS

- A. Install as a drop cloth a 6 mil poly sheet at the beginning of each work shift where removal is to be done during that shift. Completely cover floors and any walls within 10 feet (3 meters) of the area where work is to be done. Secure the secondary barrier with duct tape to prevent it from moving or debris from getting behind it. Remove the secondary barrier at

the end of the shift or as work in the area is completed. Keep residue on the secondary barrier wetted. When removing, fold inward to prevent spillage and place in a disposal bag.

- B. Install walkways using 6 mil black poly between the regulated area and the decontamination facilities (PDF and W/EDF) to protect the primary layers from contamination and damage. Install the walkways at the beginning of each shift and remove at the end of each shift.

3.2.3 WET REMOVAL OF ACM

- A. Using acceptable glovebag procedures, adequately and thoroughly wet the ACM to be removed prior to removal with amended water or when authorized by VA, removal encapsulant to reduce/prevent fiber release to the air. Adequate time (at a minimum two hours) must be allowed for the amended water or removal encapsulant to saturate the ACM. Abatement personnel must not disturb dry ACM. Use a fine spray of amended water or removal encapsulant. Saturate the material sufficiently to wet to the substrate without causing excessive dripping. The material must be sprayed repeatedly/continuously during the removal process in order to maintain adequately wet conditions. Removal encapsulants must be applied in accordance with the manufacturer's written instructions. Perforate or carefully separate, using wet methods, an outer covering that is painted or jacketed in order to allow penetration and wetting of the material. Where necessary, carefully remove covering while wetting to minimize fiber release. **In no event shall dry removal occur except when authorized in writing by the VPIH/CIH and VA when a greater safety hazard (e.g., electricity) is present**

3.3 GLOVEBAG REMOVAL PROCEDURES

3.3.1 GENERAL

All applicable OSHA requirements and glovebag manufacturer's recommendations shall be met during glove bagging operations. In cases where live steam lines are present, the lines must be shut down prior to any work being performed on the system. **No abatement work shall be conducted on live, pressurized steam lines.** The Contractor may choose to use a High Temperature Glovebag in which a temperature rating ranges from 300°F to 700°F on steam lines that have recently been shut down and remain at high temperature for some time. In the case where a glovebag is not feasible, the Contractor will need to build a full negative pressure containment of sufficient size and follow all regulations as it pertains to removal.

1. Mix the surfactant with water in the garden sprayer, following the manufacturer's directions.
2. Have each employee put on a HEPA filtered respirator approved for asbestos and check the fit using the positive/negative fit check.
3. Have each employee put on a disposable full-body suit. Remember, the hood goes over the respirator straps.
4. Check closely the integrity of the glove bag to be used. Check all seams, gloves, sleeves, and glove openings. OSHA requires the bottom of the bag to be seamless.
5. Check the pipe where the work will be performed. If it is damaged (broken lagging, hanging, etc.), wrap the entire length of the pipe in poly sheeting and "candy stripe" it with duct tape.
6. Attach glovebag with required tools per manufacturer's instructions.

7. Using the smoke tube and aspirator bulb, test 10% of glovebags by placing the tube into the water porthole (two-inch opening to glove bag), and fill the bag with smoke and squeeze it. If leaks are found, they should be taped closed using duct tape and the bag should be retested with smoke.
8. Insert the wand from the water sprayer through the water porthole.
9. Insert the hose end from a HEPA vacuum into the upper portion of the glove bag.
10. Wet and remove the pipe insulation.
11. If the section of pipe is covered with an aluminum jacket, remove it first using the wire cutters to cut any bands and the tin snips to remove the aluminum. It is important to fold the sharp edges in to prevent cutting the bag when placing it in the bottom.
12. When the work is complete, spray the upper portion of the bag and clean-push all residue into the bottom of the bag with the other waste material. Be very thorough. Use adequate water.
13. Put all tools, after washing them off in the bag, in one of the sleeves of glove bag and turn it inside out, drawing it outside of the bag. Twist the sleeve tightly several times to seal it and tape it several tight turns with duct tape. Cut through the middle of the duct tape and remove the sleeve. Put the sleeve in the next glove bag or put it in a bucket of water to decontaminate the tools after cutting the sleeve open.
14. Turn on the HEPA vacuum and collapse the bag completely. Remove the vacuum nozzle, seal the hole with duct tape, twist the bag tightly several times in the middle, and tape it to keep the material in the bottom during removal of the glove bag from the pipe.
15. Slip a disposal bag over the glove bag (still attached to the pipe). Remove the tape securing the ends, and slit open the top of the glove bag and carefully fold it down into the disposal bag. Double bag and gooseneck waste materials.

3.3.2 NEGATIVE PRESSURE GLOVEBAG PROCEDURE

1. In addition to the above requirements, the HEPA vacuum shall be run continuously during the glovebag procedure until completion at which time the glovebag will be collapsed by the HEPA vacuum prior to removal from the pipe/component.
2. The HEPA vacuum shall be attached and operated as needed to prevent collapse of the glovebag during the removal process.

3.4 LOCKDOWN ENCAPSULATION

3.4.1 GENERAL

Lockdown encapsulation is an integral part of the ACM removal. At the conclusion of ACM removal and before removal of the primary barriers, all piping surfaces shall be encapsulated with a bridging encapsulant.

3.4.2 SEALING EXPOSED EDGES

Seal edges of ACM exposed by removal work with two coats of encapsulant. Prior to sealing, permit the exposed edges to dry completely to permit penetration of the encapsulant.

3.5 DISPOSAL OF ACM WASTE MATERIALS

3.5.1 GENERAL

Dispose of waste ACM and debris which is packaged in accordance with these specifications, OSHA, EPA and DOT. The landfill requirements for packaging must also be met. Transport will be in compliance with 49 CFR 100-185 regulations. Disposal shall be done at an approved landfill. Disposal of non-friable ACM shall be done in accordance with applicable regulations.

3.5.2 PROCEDURES

- A. The VA must be notified at least 24 hours in advance of any waste removed from the containment
- B. Asbestos waste shall be packaged and moved through the W/EDF into a covered transport container in accordance with procedures in this specification. Waste shall be double-bagged and wetted with amended water prior to disposal. Wetted waste can be very heavy. Bags shall not be overfilled. Bags shall be securely sealed to prevent accidental opening and/or leakage. The top shall be tightly twisted and goose necked prior to tightly sealing with at least three wraps of duct tape. Ensure that unauthorized persons do not have access to the waste material once it is outside the regulated area. All transport containers must be covered at all times when not in use. NESHAP's signs must be on containers during loading and unloading. Material shall not be transported in open vehicles. If drums are used for packaging, the drums shall be labeled properly and shall not be re-used.
- C. Waste Load Out: Waste load out shall be done in accordance with the procedures in W/EDF Decontamination Procedures. Sealed waste bags shall be decontaminated on exterior surfaces by wet cleaning and/or HEPA vacuuming before being placed in the second waste bag and sealed, which then must also be wet wiped or HEPA vacuumed..
- D. Asbestos waste with sharp edged components, i.e., nails, screws, lath, strapping, tin sheeting, jacketing, metal mesh, etc., which might tear poly bags shall be wrapped securely in burlap before packaging and, if needed, use a poly lined fiber drum as the second container, prior to disposal.

3.6 PROJECT DECONTAMINATION

3.6.1 GENERAL

- A. The entire work related to project decontamination shall be performed under the close supervision and monitoring of the CPIH/CIH.
- B. If the asbestos abatement work is in an area which was contaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior to its removal and cleanings of the surfaces of the regulated area after the primary barrier removal.
- C. If the asbestos abatement work is in an area which was uncontaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior to its removal, thus preventing contamination of the building when the regulated area critical barriers are removed.

3.6.2 REGULATED AREA CLEARANCE

Air testing and other requirements which must be met before release of the Contractor and re-occupancy of the regulated area space are specified in Final Testing Procedures.

3.6.3 WORK DESCRIPTION

Decontamination includes the clearance air testing in the regulated area and the decontamination and removal of the enclosures/facilities installed prior to the abatement work including primary/critical barriers, PDF and W/EDF facilities, and negative pressure systems.

3.6.4 PRE-DECONTAMINATION CONDITIONS

- A. Before decontamination starts, all ACM waste from the regulated area shall be removed, all waste collected and removed, and the secondary barrier of poly removed and disposed of along with any gross debris generated by the work.
- B. At the start of decontamination, the following shall be in place:
 1. Critical barriers over all openings consisting of two layers of 6 mil poly which is the sole barrier between the regulated area and the rest of the building or outside.
 2. Decontamination facilities, if required for personnel and equipment in operating condition.

3.6.5 FIRST CLEANING

Carry out a first cleaning of all surfaces of the regulated area including items of remaining poly sheeting, tools, scaffolding, ladders/staging by wet methods and/or HEPA vacuuming. Do not use dry dusting/sweeping/air blowing methods. Use each surface of a wetted cleaning cloth one time only and then dispose of as contaminated waste. Continue this cleaning until there is no visible residue from abated surfaces or poly or other surfaces. Remove all filters in the air handling system and dispose of as ACM waste in accordance with these specifications. The negative pressure system shall remain in operation during this time. Additional cleaning(s) may be needed as determined by the CPIH/VPIH/CIH.

3.6.6 PRE-CLEARANCE INSPECTION AND TESTING

The CPIH/CIH and VPIH/CIH will perform a thorough and detailed visual inspection at the end of the cleaning to determine whether there is any visible residue in the regulated area. If the visual inspection is acceptable, the CPIH/CIH will perform pre-clearance sampling using aggressive clearance as detailed in 40 CFR 763 Subpart E (AHERA) Appendix A (III)(B)(7)(d). If the sampling results show values below 0.01 f/cc, then the Contractor shall notify the VA's representative of the results with a brief report from the CPIH/CIH documenting the inspection and sampling results and a statement verifying that the regulated area is ready for lockdown encapsulation. The VA reserves the right to utilize their own VPIH/CIH to perform a pre-clearance inspection and testing for verification.

3.6.7 LOCKDOWN ENCAPSULATION OF ABATED SURFACES

With the express written permission of the VA's representative, perform lockdown encapsulation of all surfaces from which asbestos was abated in accordance with the procedures in this specification.

3.7 FINAL VISUAL INSPECTIONS AND AIR CLEARANCE TESTING

3.7.1 GENERAL

Notify the VA representative 24 hours in advance for the performance of the final visual inspection and testing. The final visual inspection and testing will be performed by the VPIH/CIH after the final cleaning.

3.7.2 FINAL VISUAL INSPECTION

Final visual inspection will include the entire regulated area, the PDF, all poly sheeting, seals over HVAC openings, doorways, windows, and any other openings. If any debris, residue, dust or any other suspect material is detected, the final cleaning shall be repeated at no cost to the VA. Dust/material samples may be collected and analyzed at no cost to the VA at the discretion of the VPIH/CIH to confirm visual findings. When the regulated area is visually clean the final testing can be done.

3.7.3 FINAL AIR CLEARANCE TESTING

- A. After an acceptable final visual inspection by the VPIH/CIH and VA Representative, the VPIH/CIH will perform the final clearance testing. Air samples will be collected and analyzed in accordance with procedures for AHERA in this specification. If work is less than 260 lf/160 sf/35 cf, 5 PCM samples shall be collected for clearance and a minimum of one field blank. If work is equal to or more than 260 lf/160 sf/35 cf, AHERA TEM sampling shall be performed for clearance. TEM analysis shall be done in accordance with procedures for EPA AHERA in this specification. If the release criteria are not met, the Contractor shall repeat the final cleaning and continue decontamination procedures until clearance is achieved. All additional inspection and testing costs will be borne by the Contractor.
- B. If release criteria are met, proceed to perform the abatement closeout and to issue the certificate of completion in accordance with these specifications.

3.7.4 FINAL AIR CLEARANCE PROCEDURES

- A. Contractor's Release Criteria: Work in a regulated area is complete when the regulated area is visually clean and airborne fiber levels have been reduced to or below 0.01 f/cc as measured by the AHERA PCM protocol, or 70 AHERA structures per square millimeter (s/mm²) by AHERA TEM.
- B. Air Monitoring and Final Clearance Sampling: To determine if the elevated airborne fiber counts encountered during abatement operations have been reduced to the specified level, the VPIH/CIH will secure samples and analyze them according to the following procedures:
 1. Fibers Counted: "Fibers" referred to in this section shall be either all fibers regardless of composition as counted in the NIOSH 7400 PCM method or asbestos fibers counted using the AHERA TEM method.
 2. Aggressive Sampling: All final air testing samples shall be collected using aggressive sampling techniques except where soil is not encapsulated or enclosed. Samples will be collected on 0.8 μ MCE filters

for PCM analysis and 0.45 μ Polycarbonate filters for TEM. A minimum of 1200 Liters of using calibrated pumps shall be collected for clearance samples. Before pumps are started, initiate aggressive air mixing sampling as detailed in 40 CFR 763 Subpart E (AHERA) Appendix A (III)(B)(7)(d). Air samples will be collected in areas subject to normal air circulation away from corners, obstructed locations, and locations near windows, doors, or vents. After air sampling pumps have been shut off, circulating fans shall be shut off. The negative pressure system shall continue to operate.

3.7.5 CLEARANCE SAMPLING USING PCM

- A. The VPIH/CIH will perform clearance samples as indicated by the specification.
- B. The NIOSH 7400 PCM method will be used for clearance sampling with a minimum collection volume of 1200 Liters of air. A minimum of 5 PCM clearance samples shall be collected. All samples must be equal to or less than 0.01 f/cc to clear the regulated area.

3.7.6 CLEARANCE SAMPLING USING TEM

- A. Clearance requires 13 samples be collected; 5 inside the regulated area; 5 outside the regulated area; and 3 field blanks.
- B. The TEM method will be used for clearance sampling with a minimum collection volume of 1200 Liters of air. A minimum of 13 clearance samples shall be collected. All samples must be equal to or less than 70 AHERA structures per square millimeter (s/mm²) AHERA TEM.

3.7.7 LABORATORY TESTING OF PCM SAMPLES

The services of an AIHA accredited laboratory will be employed by the VA to perform analysis for the PCM air samples. The accredited laboratory shall be successfully participating in the AIHA Proficiency Analytical Testing (PAT) program. Samples will be sent daily by the VPIH/CIH so that verbal/faxed reports can be received within 24 hours. A complete record, certified by the laboratory, of all air monitoring tests and results will be furnished to the VA's representative and the Contractor.

3.7.8 LABORATORY TESTING OF TEM SAMPLES

Samples shall be sent by the VPIH/CIH to a NIST accredited laboratory for analysis by TEM. The laboratory shall be successfully participating in the NIST Airborne Asbestos Analysis (TEM) program. Verbal/faxed results from the laboratory shall be available within 24 hours after receipt of the samples. A complete record, certified by the laboratory, of all TEM results shall be furnished to the VA's representative and the Contractor

3.8 ABATEMENT CLOSEOUT AND CERTIFICATE OF COMPLIANCE

3.8.1 COMPLETION OF ABATEMENT WORK

After thorough decontamination, seal negative air machines with 2 layers of 6 mil poly and duct tape to form a tight seal at the intake/outlet ends before removal from the regulated area. Complete asbestos abatement work upon meeting the regulated area visual and air clearance criteria and fulfilling the following:

- A. Remove all equipment, materials, and debris from the project area.

- B. Package and dispose of all asbestos waste as required. Dispose of waste ACM and debris which is packaged in accordance with these specifications, OSHA, EPA and DOT. The landfill requirements for packaging must also be met. Transport will be in compliance with 49 CFR 100-185 regulations.
- C. Repair or replace all interior finishes damaged during the abatement work.
- D. The VA will be notified of any waste removed from the containment prior to 24 hours.
- E. Fulfill other project closeout requirements as specified elsewhere in this specification.

3.8.2 CERTIFICATE OF COMPLETION BY CONTRACTOR

The CPIH/CIH shall complete and sign the "Certificate of Completion" in accordance with Attachment 1 at the completion of the abatement and decontamination of the regulated area.

3.8.3 WORK SHIFTS

All work shall be done during administrative hours (8:00 AM to 4:30 PM) Monday - Friday excluding Federal Holidays. Any change in the work schedule must be approved in writing by the VA Representative.

3.8.4 RE-INSULATION

If required as part of the contract, replace all asbestos containing insulation with suitable non-asbestos material. Provide MSDS for all replacement materials. Refer to Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION.

ATTACHMENT #1

CERTIFICATE OF COMPLETION

DATE: _____ VA Project #: _____

PROJECT NAME: _____ Abatement Contractor: _____

VAMC/ADDRESS: _____

1. I certify that I have personally inspected, monitored and supervised the abatement work of (specify regulated area or Building):
which took place from / / to / /
2. That throughout the work all applicable requirements/regulations and the VA's specifications were met.
3. That any person who entered the regulated area was protected with the appropriate personal protective equipment and respirator and that they followed the proper entry and exit procedures and the proper operating procedures for the duration of the work.
4. That all employees of the Abatement Contractor engaged in this work were trained in respiratory protection, were experienced with abatement work, had proper medical surveillance documentation, were fit-tested for their respirator, and were not exposed at any time during the work to asbestos without the benefit of appropriate respiratory protection.
5. That I performed and supervised all inspection and testing specified and required by applicable regulations and VA specifications.
6. That the conditions inside the regulated area were always maintained in a safe and healthy condition and the maximum fiber count never exceeded 0.5 f/cc, except as described below.
7. That all glovebag work was done in accordance with OSHA requirements and the manufacturer's recommendations.

CPIH/CIH Signature/Date: _____

CPIH/CIH Print Name: _____

Abatement Contractor Signature/Date:

Abatement Contractor Print Name: _____

ATTACHMENT #2

CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME: _____ DATE: _____

PROJECT ADDRESS: _____

ABATEMENT CONTRACTOR'S NAME: _____

WORKING WITH ASBESTOS CAN BE HAZARDOUS TO YOUR HEALTH. INHALING ASBESTOS HAS BEEN LINKED WITH VARIOUS TYPES OF CANCERS. IF YOU SMOKE AND INHALE ASBESTOS FIBERS, YOUR CHANCES OF DEVELOPING LUNG CANCER IS GREATER THAN THAT OF THE NON-SMOKING PUBLIC.

Your employer's contract with the owner for the above project requires that: You must be supplied with the proper personal protective equipment including an adequate respirator and be trained in its use. You must be trained in safe and healthy work practices and in the use of the equipment found at an asbestos abatement project. You must receive/have a current medical examination for working with asbestos. These things shall be provided at no cost to you. By signing this certificate you are indicating to the owner that your employer has met these obligations.

RESPIRATORY PROTECTION: I have been trained in the proper use of respirators and have been informed of the type of respirator to be used on the above indicated project. I have a copy of the written Respiratory Protection Program issued by my employer. I have been provided for my exclusive use, at no cost, with a respirator to be used on the above indicated project.

TRAINING COURSE: I have been trained by a third party, State/EPA accredited trainer in the requirements for an AHERA/OSHA Asbestos Abatement Worker training course, 32 hours minimum duration. I currently have a valid State accreditation certificate. The topics covered in the course include, as a minimum, the following:

- Physical Characteristics and Background Information on Asbestos
- Potential Health Effects Related to Exposure to Asbestos
- Employee Personal Protective Equipment
- Establishment of a Respiratory Protection Program
- State of the Art Work Practices
- Personal Hygiene
- Additional Safety Hazards
- Medical Monitoring
- Air Monitoring
- Relevant Federal, State and Local Regulatory Requirements, Procedures, and Standards
- Asbestos Waste Disposal

MEDICAL EXAMINATION: I have had a medical examination within the past 12 months which was paid for by my employer. This examination included: health history, occupational history, pulmonary function test, and may have included a chest x-ray evaluation. The physician issued a positive written opinion after the examination.

Signature: _____

Printed Name: _____

Social Security Number: _____

09-01-15
Renovate Tower of Building 1
VAMC, Sioux Falls, SD
VA Project #438-18-102

Witness: _____

ATTACHMENT #3

AFFIDAVIT OF MEDICAL SURVEILLANCE, RESPIRATORY PROTECTION AND TRAINING/ACCREDITATION

VA PROJECT NAME AND NUMBER: _____

VA MEDICAL FACILITY: _____

ABATEMENT CONTRACTOR'S NAME AND ADDRESS: _____

1. I verify that the following individual

Name: _____ Social Security Number: _____

who is proposed to be employed in asbestos abatement work associated with the above project by the named Abatement Contractor, is included in a medical surveillance program in accordance with 29 CFR 1926.1101(m), and that complete records of the medical surveillance program as required by 29 CFR 1926.1101(m)(n) and 29 CFR 1910.20 are kept at the offices of the Abatement Contractor at the following address.

Address: _____

2. I verify that this individual has been trained, fit-tested and instructed in the use of all appropriate respiratory protection systems and that the person is capable of working in safe and healthy manner as expected and required in the expected work environment of this project.

3. I verify that this individual has been trained as required by 29 CFR 1926.1101(k). This individual has also obtained a valid State accreditation certificate. Documentation will be kept on-site.

4. I verify that I meet the minimum qualifications criteria of the VA specifications for a CPIH.

Signature of CPIH/CIH: _____ Date: _____

Printed Name of CPIH/CIH: _____

Signature of Contractor: _____ Date: _____

Printed Name of Contractor: _____

ATTACHMENT #4

ABATEMENT CONTRACTOR/COMPETENT PERSON(S) REVIEW AND ACCEPTANCE OF THE VA'S ASBESTOS SPECIFICATIONS

VA Project Location:_____

VA Project #:_____

VA Project Description:_____

This form shall be signed by the Asbestos Abatement Contractor Owner and the Asbestos Abatement Contractor's Competent Person(s) prior to any start of work at the VA related to this Specification. If the Asbestos Abatement Contractor's/Competent Person(s) has not signed this form, they shall not be allowed to work on-site.

I, the undersigned, have read VA's Asbestos Specification regarding the asbestos abatement requirements. I understand the requirements of the VA's Asbestos Specification and agree to follow these requirements as well as all required rules and regulations of OSHA/EPA/DOT and State/Local requirements. I have been given ample opportunity to read the VA's Asbestos Specification and have been given an opportunity to ask any questions regarding the content and have received a response related to those questions. I do not have any further questions regarding the content, intent and requirements of the VA's Asbestos Specification.

At the conclusion of the asbestos abatement, I will certify that all asbestos abatement work was done in accordance with the VA's Asbestos Specification and all ACM was removed properly and no fibrous residue remains on any abated surfaces.

Abatement Contractor Owner's Signature_____Date_____

Abatement Contractor Competent Person(s)_____Date_____

- - END- - - -

SECTION 02 82 13.19
ASBESTOS FLOOR TILE AND MASTIC ABATEMENT

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PART 1 - GENERAL

1.1 SUMMARY OF THE WORK

1.1.1 CONTRACT DOCUMENTS AND RELATED REQUIREMENTS

Drawings, general provisions of the contract, including general and supplementary conditions and other Division 01 specifications, shall apply to the work of this section. The contract documents show the work to be done under the contract and related requirements and conditions impacting the project. Related requirements and conditions include applicable codes and regulations, notices and permits, existing site conditions and restrictions on use of the site, requirements for partial owner occupancy during the work, coordination with other work and the phasing of the work. In the event the Asbestos Abatement Contractor discovers a conflict in the contract documents and/or requirements or codes, the conflict must be brought to the immediate attention of the Contracting Officer for resolution. Whenever there is a conflict or overlap in the requirements, the most stringent shall apply. Any actions taken by the Contractor without obtaining guidance from the Contracting Officer shall become the sole risk and responsibility of the Asbestos Abatement Contractor. All costs incurred due to such action are also the responsibility of the Asbestos Abatement Contractor.

1.1.2 EXTENT OF WORK

- A. Below is a brief description of the estimated quantities of asbestos flooring materials to be abated. These quantities are for informational purposes only and are based on the best information available at the time of the specification preparation. The Contractor shall satisfy himself as the actual quantities to be abated. Nothing in this section may be interpreted as limiting the extent of work otherwise required by this contract and related documents.
- B. Removal, clean-up and disposal of ACM flooring in an appropriate regulated area in the following approximate quantities:

7000 square feet (SF) of flooring and mastic (6000 SF is under carpet)

1.1.3 RELATED WORK

- A. Section 02 41 00, DEMOLITION.
- B. Section 02 82 11, TRADITIONAL ASBESTOS ABATEMENT.
- C. Section 02 82 13.13, GLOVEBAG ASBESTOS ABATEMENT.
- D. Section 02 82 13.31, CLASS II ASBESTOS ABATEMENT.

1.1.4 TASKS

The work tasks are summarized briefly as follows:

- A. Pre-abatement activities including pre-abatement meeting(s), inspection(s), notifications, permits, submittal approvals, regulated area preparations, emergency procedures arrangements, and Asbestos Hazard Abatement Plans for asbestos abatement work.
- B. Abatement activities including removal, clean-up and disposal of ACM waste, recordkeeping, security, monitoring, and inspections.

- C. Cleaning and decontamination activities including final visual inspection, air monitoring and certification of decontamination.

1.1.5 ABATEMENT CONTRACTOR USE OF PREMISES

- A. The Contractor and Contractor's personnel shall cooperate fully with the VA representative/consultant to facilitate efficient use of buildings and areas within buildings. The Contractor shall perform the work in accordance with the VA specifications, drawings, phasing plan and in compliance with any/all applicable Federal, State and Local regulations and requirements.
- B. The Contractor shall use the existing facilities in the building strictly within the limits indicated in contract documents as well as the approved VA Design Construction Procedure. VA Design Construction Procedure drawings of partially occupied buildings will show the limits of regulated areas; the placement of decontamination facilities; the temporary location of bagged waste ACM; the path of transport to outside the building; and the temporary waste storage area for each building/regulated area. Any variation from the arrangements shown on drawings shall be secured in writing from the VA representative through the pre-abatement plan of action. The following limitations of use shall apply to existing facilities shown on drawings:

1.2 VARIATIONS IN QUANTITY

The quantities and locations of ACM as indicated on the drawings and the extent of work included in this section are estimated which are limited by the physical constraints imposed by occupancy of the buildings and accessibility to ACM. Accordingly, minor variations (+/- 5%) in quantities of ACM within the regulated area are considered as having no impact on contract price and time requirements of this contract. Where additional work is required beyond the above variation, the contractor shall provide unit prices for newly discovered ACM and those prices shall be used for additional work required under the contractor.

1.3 STOP ASBESTOS REMOVAL

If the Contracting Officer; their field representative; (the facility Safety Officer/Manager or their designee, or the VA Professional Industrial Hygienist/Certified Industrial Hygienist (VPIH/CIH) presents a verbal **Stop Asbestos Removal Order**, the Contractor/Personnel shall immediately stop all asbestos removal and maintain HEPA filtered negative pressure air flow in the containment and adequately wet any exposed ACM. If a verbal Stop Asbestos Removal Order is issued, the VA shall follow-up with a written order to the Contractor as soon as it is practicable. The Contractor shall not resume any asbestos removal activity until authorized to do so in writing by the VA Contracting Officer. A stop asbestos removal order may be issued at any time the VA Contracting Officer determines abatement conditions/activities are not within VA specification, regulatory requirements or that an imminent hazard exists to human health or the environment. Work stoppage will continue until conditions have been corrected to the satisfaction of the VA. Standby time and costs for corrective actions will be borne by the Contractor, including the VPIH/CIH time. The occurrence of any of the following events shall be reported immediately by the Contractor's competent person to the

VA Contracting Office or field representative using the most expeditious means (e.g., verbal or telephonic), followed up with written notification to the Contracting Officer as soon as practical. The Contractor shall immediately stop asbestos removal/disturbance activities and initiate fiber reduction activities:

- A. Airborne PCM analysis results equal to or greater than 0.01 f/cc outside a regulated area or >0.05 f/cc inside a regulated area;
- B. breach or break in regulated area containment barrier(s);
- C. less than -0.02" WCG pressure in the regulated area;
- D. serious injury/death at the site;
- E. fire/safety emergency at the site;
- F. respiratory protection system failure;
- G. power failure or loss of wetting agent; or
- H. any visible emissions observed outside the regulated area.

1.4 DEFINITIONS

1.4.1 GENERAL

Definitions and explanations here are neither complete nor exclusive of all terms used in the contract documents, but are general for the work to the extent they are not stated more explicitly in another element of the contract documents. Drawings must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated therein.

1.4.2 GLOSSARY

Abatement - Procedures to control fiber release from asbestos-containing materials. Includes removal, encapsulation, enclosure, demolition, and renovation activities related to asbestos containing materials (ACM).

Aerosol - Solid or liquid particulate suspended in air.

Adequately wet - Sufficiently mixed or penetrated with liquid to prevent the release of particulates. If visible emissions are observed coming from the ACM, then that material has not been adequately wetted.

Aggressive method - Removal or disturbance of building material by sanding, abrading, grinding, or other method that breaks, crumbles, or disintegrates intact ACM.

Aggressive sampling - EPA AHERA defined clearance sampling method using air moving equipment such as fans and leaf blowers to aggressively disturb and maintain in the air residual fibers after abatement.

AHERA - Asbestos Hazard Emergency Response Act. Asbestos regulations for schools issued in 1987.

Aircell - Pipe or duct insulation made of corrugated cardboard which contains asbestos.

Air monitoring - The process of measuring the fiber content of a known volume of air collected over a specified period of time. The NIOSH 7400 Method, Issue 2 is used to determine the fiber levels in air. For personal samples and clearance air testing using Phase Contrast Microscopy (PCM) analysis. NIOSH Method 7402 can be used when it is necessary to confirm fibers counted by PCM as being asbestos. The AHERA TEM analysis may be used for background, area samples and clearance samples when required by this specification, or at the discretion of the VPIH/CIH as appropriate.

Air sample filter - The filter used to collect fibers which are then counted. The filter is made of mixed cellulose ester membrane for PCM

(Phase Contrast Microscopy) and polycarbonate for TEM (Transmission Electron Microscopy)

Amended water - Water to which a surfactant (wetting agent) has been added to increase the penetrating ability of the liquid.

Asbestos - Includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated or altered. Asbestos also includes PACM, as defined below.

Asbestos Hazard Abatement Plan (AHAP) - Asbestos work procedures required to be submitted by the contractor before work begins.

Asbestos-containing material (ACM) - Any material containing more than one percent of asbestos.

Asbestos contaminated elements (ACE) - Building elements such as ceilings, walls, lights, or ductwork that are contaminated with asbestos.

Asbestos-contaminated soil (ACS) - Soil found in the work area or in adjacent areas such as crawlspaces or pipe tunnels which is contaminated with asbestos-containing material debris and cannot be easily separated from the material.

Asbestos-containing waste (ACW) material - Asbestos-containing material or asbestos contaminated objects requiring disposal.

Asbestos Project Monitor - Some states require that any person conducting asbestos abatement clearance inspections and clearance air sampling be licensed as an asbestos project monitor.

Asbestos waste decontamination facility - A system consisting of drum/bag washing facilities and a temporary storage area for cleaned containers of asbestos waste. Used as the exit for waste and equipment leaving the regulated area. In an emergency, it may be used to evacuate personnel.

Authorized person - Any person authorized by the VA, the Contractor, or government agency and required by work duties to be present in regulated areas.

Authorized visitor - Any person approved by the VA; the contractor; or any government agency representative having jurisdiction over the regulated area (e.g., OSHA, Federal and State EPA0..

Barrier - Any surface that isolates the regulated area and inhibits fiber migration from the regulated area.

Containment Barrier - An airtight barrier consisting of walls, floors, and/or ceilings of sealed plastic sheeting which surrounds and seals the outer perimeter of the regulated area.

Critical Barrier - The barrier responsible for isolating the regulated area from adjacent spaces, typically constructed of plastic sheeting secured in place at openings such as doors, windows, or any other opening into the regulated area.

Primary Barrier - Plastic barriers placed over critical barriers and exposed directly to abatement work.

Secondary Barrier - Any additional plastic barriers used to isolate and provide protection from debris during abatement work.

Breathing zone - The hemisphere forward of the shoulders with a radius of about 150 - 225 mm (6 - 9 inches) from the worker's nose.

Bridging encapsulant - An encapsulant that forms a layer on the surface of the ACM.

Building/facility owner - The legal entity, including a lessee, which exercises control over management and recordkeeping functions relating to a building and/or facility in which asbestos activities take place.

Bulk testing - The collection and analysis of suspect asbestos containing materials.

Certified Industrial Hygienist (CIH) - A person certified in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene.

Class I asbestos work - Activities involving the removal of Thermal System Insulation (TSI) and surfacing ACM and Presumed Asbestos Containing Material (PACM).

Class II asbestos work - Activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic.

Clean room/Changing room - An uncontaminated room having facilities for the storage of employee's street clothing and uncontaminated materials and equipment.

Clearance sample - The final air sample taken after all asbestos work has been done and visually inspected. Performed by the VA's professional industrial hygiene consultant/Certified Industrial Hygienist (VPIH/CIH).

Closely resemble - The major workplace conditions which have contributed to the levels of historic asbestos exposure, are no more protective than conditions of the current workplace.

Competent person - In addition to the definition in 29 CFR 1926.32(f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f); in addition, for Class I and II work who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for supervisor.

Contractor's Professional Industrial Hygienist (CPIH/CIH) - The asbestos abatement contractor's industrial hygienist. The industrial hygienist must meet the qualification requirements of a PIH and may be a certified industrial hygienist (CIH).

Count - Refers to the fiber count or the average number of fibers greater than five microns in length with a length-to-width (aspect) ratio of at least 3 to 1, per cubic centimeter of air.

Crawlspace - An area which can be found either in or adjacent to the work area. This area has limited access and egress and may contain asbestos materials and/or asbestos contaminated soil.

Decontamination area/unit - An enclosed area adjacent to and connected to the regulated area and consisting of an equipment room, shower room, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos.

Demolition - The wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.

VA Total - means a building or substantial part of the building is completely removed, torn or knocked down, bulldozed, flattened, or razed, including removal of building debris.

Disposal bag - Typically 6 mil thick sift-proof, dustproof, leak-tight container used to package and transport asbestos waste from regulated areas to the approved landfill. Each bag/container must be labeled/marked in accordance with EPA, OSHA and DOT requirements.

Disturbance - Activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM or PACM, no greater than the amount that can be contained in one standard sized glove bag or waste bag in order to access a building component. In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or disposal bag which shall not exceed 60 inches in length or width.

Drum - A rigid, impermeable container made of cardboard fiber, plastic, or metal which can be sealed in order to be sift-proof, dustproof, and leak-tight.

Employee exposure - The exposure to airborne asbestos that would occur if the employee were not wearing respiratory protection equipment.

Encapsulant - A material that surrounds or embeds asbestos fibers in an adhesive matrix and prevents the release of fibers.

Encapsulation - Treating ACM with an encapsulant.

Enclosure - The construction of an air tight, impermeable, permanent barrier around ACM to control the release of asbestos fibers from the material and also eliminate access to the material.

Equipment room - A contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.

Fiber - A particulate form of asbestos, 5 microns or longer, with a length to width (aspect) ratio of at least 3 to 1.

Fibers per cubic centimeter (f/cc) - Abbreviation for fibers per cubic centimeter, used to describe the level of asbestos fibers in air.

Filter - Media used in respirators, vacuums, or other machines to remove particulate from air.

Firestopping - Material used to close the open parts of a structure in order to prevent a fire from spreading.

Friable asbestos containing material - Any material containing more than one (1) percent or asbestos as determined using the method specified in appendix A, Subpart F, 40 CFR 763, section 1, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

Glovebag - Not more than a 60 x 60 inch impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which materials and tools may be handled.

High efficiency particulate air (HEPA) filter - An ASHRAE MERV 17 filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.

HEPA vacuum - Vacuum collection equipment equipped with a HEPA filter system capable of collecting and retaining asbestos fibers.

Homogeneous area - An area of surfacing, thermal system insulation or miscellaneous ACM that is uniform in color, texture and date of application.

HVAC - Heating, Ventilation and Air Conditioning

Industrial hygienist (IH) - A professional qualified by education, training, and experience to anticipate, recognize, evaluate and develop controls for occupational health hazards. Meets definition requirements of the American Industrial Hygiene Association (AIHA).

Industrial hygienist technician (IH Technician) - A person working under the direction of an IH or CIH who has special training, experience, certifications and licenses required for the industrial hygiene work

assigned. Some states require that an industrial hygienist technician conducting asbestos abatement clearance inspection and clearance air sampling be licensed as an asbestos project monitor.

Intact - The ACM has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix.

Lockdown - Applying encapsulant, after a final visual inspection, on all abated surfaces at the conclusion of ACM removal prior to removal of critical barriers.

National Emission Standards for Hazardous Air Pollutants (NESHAP) - EPA's rule to control emissions of asbestos to the environment (40 CFR Part 61, Subpart M).

Negative initial exposure assessment - A demonstration by the employer which complies with the criteria in 29 CFR 1926.1101 (f)(2)(iii), that employee exposure during an operation is expected to be consistently below the PELs.

Negative pressure - Air pressure which is lower than the surrounding area, created by exhausting air from a sealed regulated area through HEPA equipped filtration units. OSHA requires maintaining -0.02" water column gauge inside the negative pressure enclosure.

Negative pressure respirator - A respirator in which the air pressure inside the facepiece is negative during inhalation relative to the air pressure outside the respirator facepiece.

Non-friable ACM - Material that contains more than 1 percent asbestos but cannot be crumbled, pulverized, or reduced to powder by hand pressure.

Organic vapor cartridge - The type of cartridge used on air purifying respirators to remove organic vapor hazardous air contaminants.

Outside air - The air outside buildings and structures, including, but not limited to, the air under a bridge or in an open ferry dock.

Owner/operator - Any person who owns, leases, operates, controls, or supervises the facility being demolished or renovated or any person who owns, leases, operates, controls, or supervises the demolition or renovation operation, or both.

Penetrating encapsulant - Encapsulant that is absorbed into the ACM matrix without leaving a surface layer.

Personal protective equipment (PPE) - equipment designed to protect user from injury and/or specific job hazard. Such equipment may include protective clothing, hard hats, safety glasses, and respirators.

Personal sampling/monitoring - Representative air samples obtained in the breathing zone for one or workers within the regulated area using a filter cassette and a calibrated air sampling pump to determine asbestos exposure.

Permissible exposure limit (PEL) - The level of exposure OSHA allows for an 8 hour time weighted average. For asbestos fibers, the eight (8) hour time weighted average PEL is 0.1 fibers per cubic centimeter (0.1 f/cc) of air and the 30-minute Excursion Limit is 1.0 fibers per cubic centimeter (1 f/cc).

Pipe Tunnel - An area, typically located adjacent to mechanical spaces or boiler rooms in which the pipes servicing the heating system in the building are routed to allow the pipes to access heating elements. These areas may contain asbestos pipe insulation, asbestos fittings, or asbestos-contaminated soil.

Polarized light microscopy (PLM) - Light microscopy using dispersion staining techniques and refractive indices to identify and quantify the type(s) of asbestos present in a bulk sample.

Polyethylene sheeting - Strong plastic barrier material 4 to 6 mils thick, semi-transparent, flame retardant per NFPA 241.

Positive/negative fit check - A method of verifying the seal of a facepiece respirator by temporarily occluding the filters and breathing in (inhaling) and then temporarily occluding the exhalation valve and breathing out (exhaling) while checking for inward or outward leakage of the respirator respectively.

Presumed ACM (PACM) - Thermal system insulation, surfacing, and flooring material installed in buildings prior to 1981. If the building owner has actual knowledge, or should have known through the exercise of due diligence that other materials are ACM, they too must be treated as PACM. The designation of PACM may be rebutted pursuant to 29 CFR 1926.1101 (b).

Professional IH - An IH who meets the definition requirements of AIHA; meets the definition requirements of OSHA as a "Competent Person" at 29 CFR 1926.1101 (b); has completed two specialized EPA approved courses on management and supervision of asbestos abatement projects; has formal training in respiratory protection and waste disposal; and has a minimum of four projects of similar complexity with this project of which at least three projects serving as the supervisory IH. The PIH may be either the VA's PIH (VPIH) of Contractor's PIH (CPIH/CIH).

Project designer - A person who has successfully completed the training requirements for an asbestos abatement project designer as required by 40 CFR 763 Appendix C, Part I; (B) (5).

Assigned Protection factor - A value assigned by OSHA/NIOSH to indicate the expected protection provided by each respirator class, when the respirator is properly selected and worn correctly. The number indicates the reduction of exposure level from outside to inside the respirator facepiece.

Qualitative fit test (QLFT) - A fit test using a challenge material that can be sensed by the wearer if leakage in the respirator occurs.

Quantitative fit test (QNFT) - A fit test using a challenge material which is quantified outside and inside the respirator thus allowing the determination of the actual fit factor.

Regulated area - An area established by the employer to demarcate where Class I, II, and III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work may accumulate; and a work area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed the PEL.

Regulated ACM (RACM) - Friable ACM; Category I non-friable ACM that has become friable; Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading or; Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of the demolition or renovation operation.

Removal - All operations where ACM, PACM and/or RACM is taken out or stripped from structures or substrates, including demolition operations.

Renovation - Altering a facility or one or more facility components in any way, including the stripping or removal of asbestos from a facility component which does not involve demolition activity.

Repair - Overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM or PACM attached to structures or substrates.

Shower room - The portion of the PDF where personnel shower before leaving the regulated area.

Supplied air respirator (SAR) - A respiratory protection system that supplies minimum Grade D respirable air per ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989.

Surfacing ACM - A material containing more than 1 percent asbestos that is sprayed, troweled on or otherwise applied to surfaces for acoustical, fireproofing and other purposes.

Surfactant - A chemical added to water to decrease water's surface tension thus making it more penetrating into ACM.

Thermal system ACM - A material containing more than 1 percent asbestos applied to pipes, fittings, boilers, breeching, tanks, ducts, or other structural components to prevent heat loss or gain.

Transmission electron microscopy (TEM) - A microscopy method that can identify and count asbestos fibers.

VA Professional Industrial Hygienist (VPIH/CIH) - The Department of Veterans Affairs Professional Industrial Hygienist must meet the qualifications of a PIH, and may be a Certified Industrial Hygienist (CIH).

VA Representative - The VA official responsible for on-going project work.

Visible emissions - Any emissions, which are visually detectable without the aid of instruments, coming from ACM/PACM/RACM/ACS or ACM waste material.

Waste/Equipment decontamination facility (W/EDF) - The area in which equipment is decontaminated before removal from the regulated area.

Waste generator - Any owner or operator whose act or process produces asbestos-containing waste material.

Waste shipment record - The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos-containing waste material.

Wet cleaning - The process of thoroughly eliminating, by wet methods, any asbestos contamination from surfaces or objects.

1.4.3 REFERENCED STANDARDS ORGANIZATIONS

The following acronyms or abbreviations as referenced in contract/specification documents are defined to mean the associated names. Names and addresses may be subject to change.

- A. VA Department of Veterans Affairs
810 Vermont Avenue, NW
Washington, DC 20420

- B. AIHA American Industrial Hygiene Association
2700 Prosperity Avenue, Suite 250
Fairfax, VA 22031
703-849-8888

- C. ANSI American National Standards Institute
1430 Broadway
New York, NY 10018
212-354-3300

- D. ASTM American Society for Testing and Materials
1916 Race St.
Philadelphia, PA 19103
215-299-5400
- E. CFR Code of Federal Regulations
Government Printing Office
Washington, DC 20420
- F. CGA Compressed Gas Association
1235 Jefferson Davis Highway
Arlington, VA 22202
703-979-0900
- G. CS Commercial Standard of the National Institute of Standards and
Technology (NIST)
U. S. Department of Commerce
Government Printing Office
Washington, DC 20420
- H. EPA Environmental Protection Agency
401 M St., SW
Washington, DC 20460
202-382-3949
- I. MIL-STD Military Standards/Standardization Division
Office of the Assistant Secretary of Defense
Washington, DC 20420
- J. NIST National Institute for Standards and Technology
U. S. Department of Commerce
Gaithersburg, MD 20234
301-921-1000
- K. NEC National Electrical Code (by NFPA)
- L. NEMA National Electrical Manufacturer's Association
2101 L Street, N.W.
Washington, DC 20037
- M. NFPA National Fire Protection Association
1 Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101
800-344-3555
- N. NIOSH National Institutes for Occupational Safety and Health
4676 Columbia Parkway
Cincinnati, OH 45226
513-533-8236
- O. OSHA Occupational Safety and Health Administration
U.S. Department of Labor

Government Printing Office
Washington, DC 20402

P. UL Underwriters Laboratory
333 Pfingsten Rd.
Northbrook, IL 60062
312-272-8800

Q. South Dakota Dept. of Environment and Natural Resources
523 East Capitol
Pierre, SD 57501
605-773-3153

1.5 APPLICABLE CODES AND REGULATIONS

1.5.1 GENERAL APPLICABILITY OF CODES, REGULATIONS, AND STANDARDS

- A. All work under this contract shall be done in strict accordance with all applicable Federal, State, and local regulations, standards and codes governing asbestos abatement, and any other trade work done in conjunction with the abatement. All applicable codes, regulations and standards are adopted into this specification and will have the same force and effect as this specification.
- B. The most recent edition of any relevant regulation, standard, document or code shall be in effect. Where conflict among the requirements or with these specifications exists, the most stringent requirement(s) shall be utilized.
- C. Copies of all standards, regulations, codes and other applicable documents, including this specification and those listed in Section 1.5 shall be available at the worksite in the clean change area of the worker decontamination system.

1.5.2 CONTRACTOR RESPONSIBILITY

The Asbestos Abatement Contractor (Contractor) shall assume full responsibility and liability for compliance with all applicable Federal, State and Local regulations related to any and all aspects of the asbestos abatement project. The Contractor is responsible for providing and maintaining training, accreditations, medical exams, medical records, personal protective equipment (PPE) including respiratory protection including respirator fit testing, as required by applicable Federal, State and Local regulations. The Contractor shall hold the VA and VPIH/CIH consultants harmless for any Contractor's failure to comply with any applicable work, packaging, transporting, disposal, safety, health, or environmental requirement on the part of himself, his employees, or his subcontractors. The Contractor will incur all costs of the CPIH/CIH, including all sampling/analytical costs to assure compliance with OSHA/EPA/State requirements related to failure to comply with the regulations applicable to the work.

1.5.3 FEDERAL REQUIREMENTS

Federal requirements which govern some aspect of asbestos abatement include, but are not limited to, the following regulations.

- A. Occupational Safety and Health Administration (**OSHA**)
 - 1. Title 29 CFR 1926.1101 - Construction Standard for Asbestos

2. Title 29 CFR 1910.132 - Personal Protective Equipment
 3. Title 29 CFR 1910.134 - Respiratory Protection
 4. Title 29 CFR 1926 - Construction Industry Standards
 5. Title 29 CFR 1910.20 - Access to Employee Exposure and Medical Records
 6. Title 29 CFR 1910.1200 - Hazard Communication
 7. Title 29 CFR 1910.151 - Medical and First Aid
- B. Environmental Protection Agency (EPA)
1. 40 CFR 61 Subpart A and M (Revised Subpart B) - National Emission Standard for Hazardous Air Pollutants - Asbestos.
 2. 40 CFR 763.80 - Asbestos Hazard Emergency Response Act (AHERA)
- C. Department of Transportation (DOT)
- Title 49 CFR 100 - 185 - Transportation

1.5.4 STATE REQUIREMENTS

State requirements that apply to the asbestos abatement work, disposal, clearance, etc., include, but are not limited to, the following:

South Dakota Dept. of Environment and Natural Resources
Asbestos Waste Management Program
523 East Capitol
Pierre, SD 57501
605-773-3153

South Dakota Codified Law 34.44
Administrative Rules of South Dakota 74.36.08
Administrative Rules of South Dakota 74.31

1.5.5 LOCAL REQUIREMENTS

If local requirements are more stringent than federal or state standards, the local standards are to be followed.//

1.5.6 STANDARDS

- A. Standards which govern asbestos abatement activities include, but are not limited to, the following:
1. American National Standards Institute (ANSI) Z9.2-79 - Fundamentals Governing the Design and Operation of Local Exhaust Systems Z88.2 - Practices for Respiratory Protection.
 2. Underwriters Laboratories (UL) 586-90 - UL Standard for Safety of HEPA filter Units, 7th Edition.
- B. Standards which govern encapsulation work include, but are not limited to, the following:
1. American Society for Testing and Materials (ASTM)
- C. Standards which govern the fire and safety concerns in abatement work include, but are not limited to, the following:
1. National Fire Protection Association (NFPA) 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.
 2. NFPA 701 - Standard Methods for Fire Tests for Flame Resistant Textiles and Film.
 3. NFPA 101 - Life Safety Code

1.5.7 EPA GUIDANCE DOCUMENTS

- A. EPA guidance documents which discuss asbestos abatement work activities are listed below. These documents are made part of this section by reference. EPA publications can be ordered from (800) 424-9065.
- B. Guidance for Controlling ACM in Buildings (Purple Book) EPA 560/5-85-024
- C. Asbestos Waste Management Guidance EPA 530-SW-85-007
- D. A Guide to Respiratory Protection for the Asbestos Abatement Industry EPA-560-OPTS-86-001
- E. Guide to Managing Asbestos in Place (Green Book) TS 799 20T July 1990

1.5.8 NOTICES

- A. State and Local agencies: Send written notification as required by state and local regulations including the local fire department prior to beginning any work on ACM as follows:

South Dakota Dept. of Environment and Natural Resources
Asbestos Waste Management Program
523 East Capitol
Pierre, SD 57501
Asbestos Coordinator
Fax - 605-773-6035

- B. Copies of notifications shall be submitted to the VA for the facility's records in the same time frame notification are given to EPA, State, and Local authorities.

1.5.9 PERMITS/LICENSES

- A. The contractor shall apply for and have all required permits and licenses to perform asbestos abatement work as required by Federal, State, and Local regulations.

1.5.10 POSTING AND FILING OF REGULATIONS

- A. Maintain two (2) copies of applicable federal, state, and local regulations. Post one copy of each at the regulated area where workers will have daily access to the regulations and keep another copy in the Contractor's office.

1.5.11 VA RESPONSIBILITIES

Prior to commencement of work:

- A. Notify occupants adjacent to regulated areas of project dates and requirements for relocation, if needed. Arrangements must be made prior to starting work for relocation of desks, files, equipment and personal possessions to avoid unauthorized access into the regulated area. **Note: Notification of adjacent personnel is required by OSHA in 29 CFR 1926.1101 (k) to prevent unnecessary or unauthorized access to the regulated area.**
- B. Submit to the Contractor results of background air sampling; including location of samples, person who collected the samples, equipment utilized, calibration data and method of analysis. During abatement, submit to the Contractor, results of bulk material analysis and air sampling data collected during the course of the abatement. This information shall not release the Contractor from any responsibility for OSHA compliance.

1.5.12 SITE SECURITY

- A. Regulated area access is to be restricted only to authorized, trained/accredited and protected personnel. These may include the Contractor's employees, employees of Subcontractors, VA employees and representatives, State and local inspectors, and any other designated individuals. A list of authorized personnel shall be established prior to commencing the project and be posted in the clean room of the decontamination unit.
- B. Entry into the regulated area by unauthorized individuals shall be reported immediately to the Competent Person by anyone observing the entry. The Competent person shall immediately notify the VA.
- C. A log book shall be maintained in the clean room of the decontamination unit. Anyone who enters the regulated area must record their name, affiliation, time in, and time out for each entry.
- D. Access to the regulated area shall be through of a critical barrier doorway. All other access (doors, windows, hallways, etc.) shall be sealed or locked to prevent entry to or exit from the regulated area. The only exceptions for this requirement are the waste/equipment load-out area which shall be sealed except during the removal of containerized asbestos waste from the regulated area, and emergency exits. Emergency exits shall not be locked from the inside; however, they shall be sealed with poly sheeting and taped until needed.
- E. The Contractor's Competent Person shall control site security during abatement operations in order to isolate work in progress and protect adjacent personnel. A 24 hour security system shall be provided at the entrance to the regulated area to assure that all entrants are logged in/out and that only authorized personnel are allowed entrance.
- F. The Contractor will have the VA's assistance in notifying adjacent personnel of the presence, location and quantity of ACM in the regulated area and enforcement of restricted access by the VA's employees.
- G. The regulated area shall be locked during non-working hours and secured by VA security guards.

1.5.13 EMERGENCY ACTION PLAN AND ARRANGEMENTS

- A. An Emergency Action Plan shall be developed prior to commencing abatement activities and shall be agreed to by the Contractor and the VA. The Plan shall meet the requirements of 29 CFR 1910.38 (a); (b).
- B. Emergency procedures shall be in written form and prominently posted in the clean room and equipment room of the decontamination unit. Everyone, prior to entering the regulated area, must read and sign these procedures to acknowledge understanding of the regulated area layout, location of emergency exits and emergency procedures.
- C. Emergency planning shall include written notification of police, fire, and emergency medical personnel of planned abatement activities; work schedule; layout of regulated area; and access to the regulated area, particularly barriers that may affect response capabilities.
- D. Emergency planning shall include consideration of fire, explosion, hazardous atmospheres, electrical hazards, slips/trips and falls, confined spaces, and heat stress illness. Written procedures for response to emergency situations shall be developed and employee training in procedures shall be provided.

- E. Employees shall be trained in regulated area/site evacuation procedures in the event of workplace emergencies.
 - 1. For non-life-threatening situations - employees injured or otherwise incapacitated shall decontaminate following normal procedures with assistance from fellow workers, if necessary, before exiting the regulated area to obtain proper medical treatment.
 - 2. For life-threatening injury or illness, worker decontamination shall take least priority after measures to stabilize the injured worker, remove them from the regulated area, and secure proper medical treatment.
- F. Telephone numbers of any/all emergency response personnel shall be prominently posted in the clean room, along with the location of the nearest telephone.
- G. The Contractor shall provide verification of first aid/CPR training for personnel responsible for providing first aid/CPR. OSHA requires medical assistance within 3-4 minutes of a life-threatening injury/illness. Bloodborne Pathogen training shall also be verified for those personnel required to provide first aid/CPR.
- H. The Emergency Action Plan shall provide for a Contingency Plan in the event that an incident occurs that may require the modification of the Asbestos Hazard Abatement Plans during abatement. Such incidents include, but are not limited to, fire; accident; power failure; negative pressure failure; and supplied air system failure. The Contractor shall detail procedures to be followed in the event of an incident assuring that asbestos abatement work is stopped and wetting is continued until correction of the problem.

1.5.14 PRE-CONSTRUCTION MEETING

Prior to commencing the work, the Contractor shall meet with the VA Certified Industrial Hygienist (VPCIH) to present and review, as appropriate, the items following this paragraph. The Contractor's Competent Person(s) who will be on-site shall participate in the pre-start meeting. The pre-start meeting is to discuss and determine procedures to be used during the project. At this meeting, the Contractor shall provide:

- A. Proof of Contractor licensing.
- B. Proof the Competent Person(s) is trained and accredited and approved for working in this State. Verification of the experience of the Competent Person(s) shall also be presented.
- C. A list of all workers who will participate in the project, including experience and verification of training and accreditation.
- D. A list of and verification of training for all personnel who have current first-aid/CPR training. A minimum of one person per shift must have adequate training.
- E. Current medical written opinions for all personnel working on-site meeting the requirements of 29 CFR 1926.1101 (m).
- F. Current fit-tests for all personnel wearing respirators on-site meeting the requirements of 29 CFR 1926.1101 (h) and Appendix C.
- G. A copy of the Asbestos Hazard Abatement Plan. In these procedures, the following information must be detailed, specific for this project.
 - 1. Regulated area preparation procedures;

2. Notification requirements procedure of Contractor as required in 29 CFR 1926.1101 (d);
 3. Decontamination area set-up/layout and decontamination procedures for employees;
 4. Abatement methods/procedures and equipment to be used;
 5. Personal protective equipment to be used;
- H. At this meeting the Contractor shall provide all submittals as required.
- I. Procedures for handling, packaging and disposal of asbestos waste.
- J. Emergency Action Plan and Contingency Plan Procedures.

1.6 PROJECT COORDINATION

The following are the minimum administrative and supervisory personnel necessary for coordination of the work.

1.6.1 PERSONNEL

- A. Administrative and supervisory personnel shall consist of a qualified Competent Person(s) as defined by OSHA in the Construction Standards and the Asbestos Construction Standard; Contractor Professional Industrial Hygienist and Industrial Hygiene Technicians. These employees are the Contractor's representatives responsible for compliance with these specifications and all other applicable requirements.
- B. Non-supervisory personnel shall consist of an adequate number of qualified personnel to meet the schedule requirements of the project. Personnel shall meet required qualifications. Personnel utilized on-site shall be pre-approved by the VA representative. A request for approval shall be submitted for any person to be employed during the project giving the person's name; social security number; qualifications; accreditation card with color picture; Certificate of Worker's Acknowledgment; and Affidavit of Medical Surveillance and Respiratory Protection and current Respirator Fit Test.
- C. Minimum qualifications for Contractor and assigned personnel are:
 1. The Contractor has conducted within the last three (3) years, three (3) projects of similar complexity and dollar value as this project; has not been cited and penalized for serious violations of federal (and state as applicable) EPA and OSHA asbestos regulations in the past three (3) years; has adequate liability/occurrence insurance for asbestos work as required by the state; is licensed in applicable states; has adequate and qualified personnel available to complete the work; has comprehensive Asbestos Hazard Abatement Plans for asbestos work; and has adequate materials, equipment and supplies to perform the work.
 2. The Competent Person has four (4) years of abatement experience of which two (2) years were as the Competent Person on the project; meets the OSHA definition of a Competent Person; has been the Competent Person on two (2) projects of similar size and complexity as this project within the past three (3) years; has completed EPA AHERA/OSHA/State/Local training requirements/accreditation(s) and refreshers; and has all required OSHA documentation related to medical and respiratory protection.
 3. The Contractor Professional Industrial Hygienist/CIH (CPIH/CIH) shall have five (5) years of monitoring experience and supervision of asbestos abatement projects; has participated as senior IH on five (5) abatement projects, three (3) of which are similar in size and

- complexity as this project; has developed at least one complete Asbestos Hazard Abatement Plan for asbestos abatement; has trained abatement personnel for three (3) years; has specialized EPA AHERA/OSHA training in asbestos abatement management, respiratory protection, waste disposal and asbestos inspection; has completed the NIOSH 582 Course or equivalent, Contractor/Supervisor course; and has appropriate medical/respiratory protection records/documentation.
4. The Abatement Personnel shall have completed the EPA AHERA/OSHA abatement worker course; have training on the Asbestos Hazard Abatement Plans of the Contractor; has one year of asbestos abatement experience within the past three (3) years of similar size and complexity; has applicable medical and respiratory protection documentation; and has certificate of training/current refresher and State accreditation/license.

All personnel should be in compliance with OSHA construction safety training as applicable and submit certification.

1.7 RESPIRATORY PROTECTION

1.7.1 GENERAL - RESPIRATORY PROTECTION PROGRAM

The Contractor shall develop and implement a written Respiratory Protection Program (RPP) which is in compliance with the January 8, 1998 OSHA requirements found at 29 CFR 1926.1101 and 29 CFR 1910.Subpart I;134. ANSI Standard Z88.2-1992 provides excellent guidance for developing a respiratory protection program. All respirators used must be NIOSH approved for asbestos abatement activities. The written RPP shall, at a minimum, contain the basic requirements found at 29 CFR 1910.134 (c) (1) (i - ix) - Respiratory Protection Program.

1.7.2 RESPIRATORY PROTECTION PROGRAM COORDINATOR

The Respiratory Protection Program Coordinator (RPPC) must be identified and shall have two (2) years' experience coordinating RPP of similar size and complexity. The RPPC must submit a signed statement attesting to the fact that the program meets the above requirements.

1.7.3 SELECTION AND USE OF RESPIRATORS

The procedure for the selection and use of respirators must be submitted to the VA as part of the Contractor's qualifications. The procedure must be written clearly enough for workers to understand. A copy of the Respiratory Protection Program must be available in the clean room of the decontamination unit for reference by employees or authorized visitors.

1.7.4 MINIMUM RESPIRATORY PROTECTION

Minimum respiratory protection shall be a half face, HEPA filtered, air purifying respirator when fiber levels are maintained consistently at or below 0.1 f/cc. A higher level of respiratory protection may be provided or required, depending on fiber levels. Respirator selection shall meet the requirements of 29 CFR 1926.1101 (h); Table 1, except as indicated in this paragraph. Abatement personnel must have a respirator for their exclusive use.

1.7.5 MEDICAL WRITTEN OPINION

No employee shall be allowed to wear a respirator unless a physician or other licensed health care professional has provided a written determination they are medically qualified to wear the class of respirator to be used on the project while wearing whole body impermeable garments and subjected to heat or cold stress.

1.7.6 RESPIRATOR FIT TEST

All personnel wearing respirators shall have a current qualitative/quantitative fit test which was conducted in accordance with 29 CFR 1910.134 (f) and Appendix A. Quantitative fit tests shall be done for PAPRs which have been put into a motor/blower failure mode.

1.7.7 RESPIRATOR FIT CHECK

The Competent Person shall assure that the positive/negative pressure user seal check is done each time the respirator is donned by an employee. Head coverings must cover respirator head straps. Any situation that prevents an effective facepiece to face seal as evidenced by failure of a user seal check shall preclude that person from wearing a respirator inside the regulated area until resolution of the problem.

1.7.8 MAINTENANCE AND CARE OF RESPIRATORS

The Respiratory Protection Program Coordinator shall submit evidence and documentation showing compliance with 29 CFR 1910.134 (h) Maintenance and Care of Respirators.

1.7.9 SUPPLIED AIR SYSTEMS

If a supplied air system is used, the system shall meet all requirements of 29 CFR 1910.134 and the ANSI/Compressed Gas Association (CGA) Commodity Specification for Air current requirements for Type 1 - Grade D breathing air. Low pressure systems are not allowed to be used on asbestos abatement projects. Supplied Air respirator use shall be in accordance with EPA/NIOSH publication EPA-560-OPTS-86-001 "A Guide to Respiratory Protection for the Asbestos Abatement Industry". The competent person on site will be responsible for the supplied air system to ensure the safety of the worker.

1.8 WORKER PROTECTION

1.8.1 TRAINING OF ABATEMENT PERSONNEL

Prior to beginning any abatement activity, all personnel shall be trained in accordance with OSHA 29 CFR 1926.1101 (k)(9) and any additional State/Local requirements. Training must include, at a minimum, the elements listed at 29 CFR 1926.1101 (k)(9)(viii). Training shall have been conducted by a third party, EPA/State approved trainer meeting the requirements of EPA 40 CFR 763 Appendix C (AHERA MAP). Initial training certificates and current refresher and accreditation proof must be submitted for each person working at the site.

1.8.2 MEDICAL EXAMINATIONS

Medical examinations meeting the requirements of 29 CFR 1926.1101 (m) shall be provided for all personnel working in the regulated area, regardless of exposure levels. A current physician's written opinion as required by 29 CFR 1926.1101 (m) (4) shall be provided for each person and shall include in the medical opinion the person has been evaluated for working in a heat and cold stress environment while wearing personal protective equipment (PPE) and is able to perform the work without risk of material health impairment.

1.8.3 PERSONAL PROTECTIVE EQUIPMENT

Provide whole body clothing, head coverings, foot coverings and any other personal protective equipment as determined by conducting the hazard assessment required by OSHA at 29 CFR 1910.132 (d). The Competent Person shall ensure the integrity of personal protective equipment worn for the duration of the project. Duct tape shall be used to secure all suit sleeves to wrists and to secure foot coverings at the ankle. Worker protection shall meet the most stringent requirements.

1.8.4 REGULATED AREA ENTRY PROCEDURE

The Competent Person shall ensure that each time workers enter the regulated area they remove ALL street clothes in the clean room of the decontamination unit and put on new disposable coveralls, head coverings, a clean respirator, and then proceed through the shower room to the equipment room where they put on non-disposable required personal protective equipment.

1.8.5 DECONTAMINATION PROCEDURE

The Competent Person shall require all personnel to adhere to following decontamination procedures whenever they leave the regulated area.

- A. When exiting the regulated area, remove all disposable PPE and dispose of in a disposal bag provided in the regulated area.
- B. Carefully decontaminate and clean the respirator. Put in a clean container/bag.

1.8.6 REGULATED AREA REQUIREMENTS

The Competent Person shall meet all requirements of 29 CFR 1926.1101 (o) and assure that all requirements for Class I regulated areas at 29 CFR 1926.1101 (e) are met applicable to Class II work. All personnel in the regulated area shall not be allowed to eat, drink, smoke, chew tobacco or gum, apply cosmetics, or in any way interfere with the fit of their respirator.

1.9 DECONTAMINATION FACILITIES:

1.9.1 DESCRIPTION:

Provide each regulated area with separate personnel decontamination facilities (PDF) and waste/equipment decontamination facilities (W/EDF). Ensure that the PDF are the only means of ingress and egress to the regulated area and that all equipment, bagged waste, and other material exit the regulated area only through the W/EDF.

1.9.2 GENERAL REQUIREMENTS

All personnel entering or exiting a regulated area must go through the PDF and shall follow the requirements at 29 CFR 1926.1101 (j)(1) and these specifications. All waste, equipment and contaminated materials must exit the regulated area through the W/EDF and be decontaminated in accordance with these specifications. Walls and ceilings of the PDF and W/EDF must be constructed of a minimum of 3 layers of 6 mil opaque fire retardant polyethylene sheeting and be securely attached to existing building components and/or an adequate temporary framework. A minimum of 3 layers of 6 mil poly shall also be used to cover the floor under the PDF and W/EDF units. Construct doors so that they overlap and secure to adjacent surfaces. Weight inner doorway sheets with layers of duct tape so that they close quickly after release. Put arrows on sheets so they show direction of travel and overlap. If the building adjacent area is occupied, construct a solid barrier on the occupied side(s) to protect the sheeting and reduce potential for non-authorized personnel entering the regulated area.

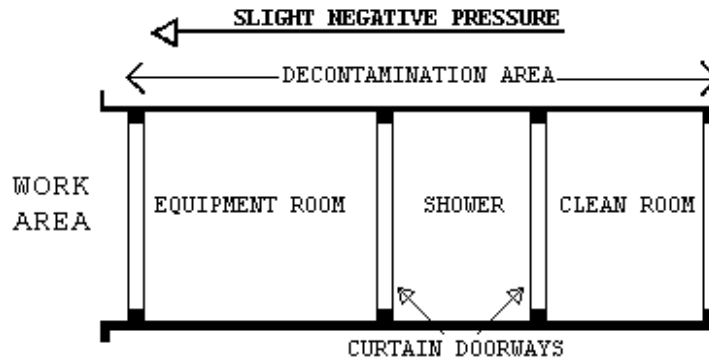
1.9.3 TEMPORARY FACILITIES TO THE PDF AND W/EDF

The Competent Person shall provide temporary water service connections to the PDF and W/EDF. Backflow prevention must be provided at the point of connection to the VA system. Water supply must be of adequate pressure and meet requirements of 29 CFR 1910.141 (d)(3). Provide adequate temporary overhead electric power with ground fault circuit interruption (GFCI) protection. Provide a sub-panel equipped with GFCI protection for all temporary power in the clean room. Provide adequate lighting to provide a minimum of 50 foot candles in the PDF and W/EDF. Provide temporary heat, if needed, to maintain 70°F throughout the PDF and W/EDF.

1.9.4 PERSONNEL DECONTAMINATION FACILITY (PDF)

1. Clean Room: The clean room must be physically and visually separated from the rest of the building to protect the privacy of personnel changing clothes. The clean room shall be constructed of at least 3 layers of 6 mil opaque fire retardant poly to provide an air tight room. Provide a minimum of 2 - 900 mm (3 foot) wide 6 mil poly opaque fire retardant doorways. One doorway shall be the entry from outside the PDF and the second doorway shall be to the shower room of the PDF. The floor of the clean room shall be maintained in a clean, dry condition. Shower overflow shall not be allowed into the clean room. Provide 1 storage locker per person. A portable fire extinguisher, minimum 10 pounds capacity, Type ABC, shall be provided in accordance with OSHA and NFPA Standard 10. All persons entering the regulated area shall remove all street clothing in the clean room and dress in disposable protective clothing and respiratory protection. Any person entering the clean room does so either from the outside with street clothing on or is coming from the shower room completely naked and thoroughly washed. Females required to enter the regulated area shall be ensured of their privacy throughout the entry/exit process by

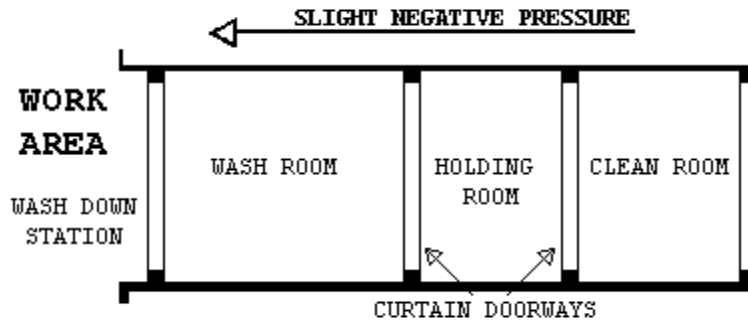
- posting guards at both entry points to the PDF so no male can enter or exit the PDF during her stay in the PDF.
2. Shower Room: The Competent Person shall assure that the shower room is a completely water tight compartment to be used for the movement of all personnel from the clean room to the equipment room and for the showering of all personnel going from the equipment room to the clean room. Each shower shall be constructed so water runs down the walls of the shower and into a drip pan. Install a freely draining smooth floor on top of the shower pan. The shower room shall be separated from the rest of the building and from the clean room and equipment room using air tight walls made from at least 3 layers of 6 mil opaque fire retardant poly. The shower shall be equipped with a shower head and controls, hot and cold water, drainage, soap dish and continuous supply of soap, and shall be maintained in a sanitary condition throughout its use. The controls shall be arranged so an individual can shower without assistance. Provide a flexible hose shower head, hose bibs and all other items shown on Shower Schematic. Waste water will be pumped to a drain after being filtered through a minimum of a 100 micron sock in the shower drain; a 20 micron filter; and a final 5 micron filter. Filters will be changed a minimum of daily or more often as needed. Filter changes must be done in the shower to prevent loss of contaminated water. Hose down all shower surfaces after each shift and clean any debris from the shower pan. Residue is to be disposed of as asbestos waste.
 3. Equipment Room: The Competent Person shall provide an equipment room which shall be an air tight compartment for the storage of work equipment/tools, reusable personal protective equipment, except for a respirator and for use as a gross decontamination area for personnel exiting the regulated area. The equipment room shall be separated from the regulated area by a minimum 3 foot wide door made with 2 layers of 6 mil opaque fire retardant poly. The equipment room shall be separated from the regulated area, the shower room and the rest of the building by air tight walls and ceiling constructed of a minimum of 3 layers of 6 mil opaque fire retardant poly. Damp wipe all surfaces of the equipment room after each shift change. Provide an additional loose layer of 6 mil fire retardant poly per shift change and remove this layer after each shift. If needed, provide a temporary electrical sub-panel equipped with GFCI in the equipment room to accommodate any equipment required in the regulated area.
 4. The PDF shall be as follows: Clean room at the entrance followed by a shower room followed by an equipment room leading to the regulated area. Each doorway in the PDF shall be a minimum of 2 layers of 6 mil opaque fire retardant poly.



1.9.5 WASTE/EQUIPMENT DECONTAMINATION FACILITY (W/EDF)

The Competent Person shall provide an W/EDF consisting of a wash room, holding room, and clean room for removal of waste, equipment and contaminated material from the regulated area. Personnel shall not enter or exit the W/EDF except in the event of an emergency. Clean debris and residue in the W/EDF daily. All surfaces in the W/EDF shall be wiped/hosed down after each shift and all debris shall be cleaned from the shower pan. The W/EDF shall consist of the following:

1. Wash Down Station: Provide an enclosed shower unit in the regulated area just outside the Wash Room as an equipment bag and container cleaning station.
2. Wash Room: Provide a wash room for cleaning of bagged or containerized asbestos containing waste materials passed from the regulated area. Construct the wash room using 50 x 100 mm (2" x 4") wood framing and 3 layers of 6 mil fire retardant poly. Locate the wash room so that packaged materials, after being wiped clean, can be passed to the Holding Room. Doorways in the wash room shall be constructed of 2 layers of 6 mil fire retardant poly.
3. Holding Room: Provide a holding room as a drop location for bagged materials passed from the wash room. Construct the holding room using 50 x 100 mm (2" x 4") wood framing and 3 layers of 6 mil fire retardant poly. The holding room shall be located so that bagged material cannot be passed from the wash room to the clean room unless it goes through the holding room. Doorways in the holding room shall be constructed of 2 layers of 6 mil fire retardant poly.
4. Clean Room: Provide a clean room to isolate the holding room from the exterior of the regulated area. Construct the clean room using 2 x 4 wood framing and 2 layers of 6 mil fire retardant poly. The clean room shall be located so as to provide access to the holding room from the building exterior. Doorways to the clean room shall be constructed of 2 layers of 6 mil fire retardant poly. When a negative pressure differential system is used, a rigid enclosure separation between the W/EDF clean room and the adjacent areas shall be provided.
5. The W/EDF shall be as follows: Wash Room leading to a Holding Room followed by a Clean Room leading to outside the regulated area. See diagram.



1.9.6 WASTE/EQUIPMENT DECONTAMINATION PROCEDURES:

At the washdown station in the regulated area, thoroughly wet clean contaminated equipment and/or sealed polyethylene bags and pass into Wash Room after visual inspection. When passing anything into the Wash Room, close all doorways of the W/EDF, other than the doorway between the washdown station and the Wash Room. Keep all outside personnel clear of the W/EDF. Once inside the Wash Room, wet clean the equipment and/or bags. After cleaning and inspection, pass items into the Holding Room. Close all doorways except the doorway between the Holding Room and the Clean Room. Workers from the Clean Room/Exterior shall enter the Holding Room and remove the decontaminated/cleaned equipment/bags for removal and disposal. These personnel will not be required to wear PPE. At no time shall personnel from the clean side be allowed to enter the Wash Room.

PART 2 - PRODUCTS, MATERIALS AND EQUIPMENT

2.1 MATERIALS AND EQUIPMENT

2.1.1 GENERAL REQUIREMENTS (ALL ABATEMENT PROJECTS)

Prior to the start of work, the contractor shall provide and maintain a sufficient quantity of materials and equipment to assure continuous and efficient work throughout the duration of the project. Work shall not start unless the following items have been delivered to the site and the CPIH/CIH has submitted verification to the VA's representative.

- A. All materials shall be delivered in their original package, container or bundle bearing the name of the manufacturer and the brand name (where applicable).
- B. Store all materials subject to damage off the ground, away from wet or damp surfaces and under cover sufficient enough to prevent damage or contamination. Flammable and combustible materials cannot be stored inside buildings. Replacement materials shall be stored outside of the regulated area until abatement is completed.
- C. The Contractor shall not block or hinder use of buildings by patients, staff, and visitors to the VA in partially occupied buildings by placing materials/equipment in any unauthorized location.

- D. The Competent Person shall inspect for damaged, deteriorating or previously used materials. Such materials shall not be used and shall be removed from the worksite and disposed of properly.
- E. Polyethylene sheeting for walls in the regulated area shall be a minimum of 4-mils. For floors and all other uses, sheeting of at least 6-mil shall be used in widths selected to minimize the frequency of joints. Fire retardant poly shall be used throughout.
- F. The method of attaching polyethylene sheeting shall be agreed upon in advance by the Contractor and the VA and selected to minimize damage to equipment and surfaces. Method of attachment may include any combination of moisture resistant duct tape furring strips, spray glue, staples, nails, screws, lumber and plywood for enclosures or other effective procedures capable of sealing polyethylene to dissimilar finished or unfinished surfaces under both wet and dry conditions.
- G. Polyethylene sheeting utilized for the PDF shall be opaque white or black in color, 6 mil fire retardant poly.
- H. Installation and plumbing hardware, showers, hoses, drain pans, sump pumps and waste water filtration system shall be provided by the Contractor.
- I. An adequate number of HEPA vacuums, scrapers, sprayers, nylon brushes, brooms, disposable mops, rags, sponges, staple guns, shovels, ladders and scaffolding of suitable height and length as well as meeting OSHA requirements, fall protection devices, water hose to reach all areas in the regulated area, airless spray equipment, and any other tools, materials or equipment required to conduct the abatement project. All electrically operated hand tools, equipment, electric cords shall be connected to GFCI protection.
- J. Special protection for objects in the regulated area shall be detailed (e.g., plywood over carpeting or hardwood floors to prevent damage from scaffolds, water and falling material).
- K. Disposal bags - 2 layers of 6 mil poly for asbestos waste shall be pre-printed with labels, markings and address as required by OSHA, EPA and DOT regulations.
- L. The VA shall be provided an advance copy of the MSDS as required for all hazardous chemicals under OSHA 29 CFR 1910.1200 - Hazard Communication in the pre-project submittal. Chlorinated compounds shall not be used with any spray adhesive, mastic remover or other product. Appropriate encapsulant(s) shall be provided.
- M. OSHA DANGER demarcation signs, as many and as required by OSHA 29 CFR 1926.1101(k) (7) shall be provided and placed by the Competent Person. All other posters and notices required by Federal and State regulations shall be posted in the Clean Room.
- N. Adequate and appropriate PPE for the project and number of personnel/shifts shall be provided. All personal protective equipment issued must be based on a written hazard assessment conducted under 29 CFR 1910.132(d).

2.1.2 NEGATIVE PRESSURE FILTRATION SYSTEM

The Contractor shall provide enough HEPA negative air machines to continuously maintain a pressure differential of -0.02" water column gauge (WCG). The Competent Person shall determine the number of units needed for the regulated area by dividing the cubic feet in the regulated area by 15 and then dividing that result by the cubic feet per minute (CFM) for each unit to determine the number of units needed to continuously

maintain a pressure differential of -0.02 " WCG. Provide a standby unit in the event of machine failure and/or emergency in an adjacent area.

NIOSH has done extensive studies and has determined that negative air machines typically operate at ~50% efficiency. The contractor shall consider this in their determination of number of units needed to continuously maintain a pressure differential of -0.02 " WCG. The contractor shall use 8 air changes per hour or double the number of machines, based on their calculations, or submit proof their machines operate at stated capacities, at a 2" pressure drop across the filters.

2.1.3 DESIGN AND LAYOUT

- A. Before start of work submit the design and layout of the regulated area and the negative air machines. The submittal shall indicate the number of, location of and size of negative air machines. The point(s) of exhaust, air flow within the regulated area, anticipated negative pressure differential, and supporting calculations for sizing shall be provided. In addition, submit the following:
 - 1. Method of supplying power to the units and designation/location of the panels.
 - 2. Description of testing method(s) for correct air volume and pressure differential.
 - 3. If auxiliary power supply is to be provided for the negative air machines, provide a schematic diagram of the power supply and manufacturer's data on the generator and switch.

2.1.4 NEGATIVE AIR MACHINES (HEPA UNITS)

- A. Negative Air Machine Cabinet: The cabinet shall be constructed of steel or other durable material capable of withstanding potential damage from rough handling and transportation. The width of the cabinet shall be less than 30" in order to fit in standard doorways. The cabinet must be factory sealed to prevent asbestos fibers from being released during use, transport, or maintenance. Any access to and replacement of filters shall be from the inlet end. The unit must be on casters or wheels.
- B. Negative Air Machine Fan: The rating capacity of the fan must indicate the CFM under actual operating conditions. Manufacturer's typically use "free-air" (no resistance) conditions when rating fans. The fan must be a centrifugal type fan.
- C. Negative Air Machine Final Filter: The final filter shall be a HEPA filter. The filter media must be completely sealed on all edges within a structurally rigid frame. The filter shall align with a continuous flexible gasket material in the negative air machine housing to form an air tight seal. Each HEPA filter shall be certified by the manufacturer to have an efficiency of not less than 99.97%. Testing shall have been done in accordance with Military Standard MIL-STD-282 and Army Instruction Manual 136-300-175A. Each filter must bear a UL586 label to indicate ability to perform under specified conditions. Each filter shall be marked with the name of the manufacturer, serial number, air flow rating, efficiency and resistance, and the direction of test air flow.
- D. Negative Air Machine Pre-filters: The pre-filters, which protect the final HEPA filter by removing larger particles, are required to prolong the operating life of the HEPA filter. Two stages of pre-filtration are required. A first stage pre-filter shall be a low efficiency type for

particles 10 micron or larger. A second stage pre-filter shall have a medium efficiency effective for particles down to 5 micron or larger. Pre-filters shall be installed either on or in the intake opening of the NAM and the second stage filter must be held in place with a special housing or clamps.

- E. Negative Air Machine Instrumentation: Each unit must be equipped with a gauge to measure the pressure drop across the filters and to indicate when filters have become loaded and need to be changed. A table indicating the cfm for various pressure readings on the gauge shall be affixed near the gauge for reference or the reading shall indicate at what point the filters shall be changed, noting cfm delivery. The unit must have an elapsed time meter to show total hours of operation.
- F. Negative Air Machine Safety and Warning Devices: An electrical/ mechanical lockout must be provided to prevent the fan from being operated without a HEPA filter. Units must be equipped with an automatic shutdown device to stop the fan in the event of a rupture in the HEPA filter or blockage in the discharge of the fan. Warning lights are required to indicate normal operation; too high a pressure drop across filters; or too low of a pressure drop across filters.
- G. Negative Air Machine Electrical: All electrical components shall be approved by the National Electrical Manufacturer's Association (NEMA) and Underwriters Laboratories (UL). Each unit must be provided with overload protection and the motor, fan, fan housing, and cabinet must be grounded.
- H. It is essential that replacement HEPA filters be tested using an "in-line" testing method, to ensure the seal around the periphery was not damaged during replacement. Damage to the outer HEPA filter seal could allow contaminated air to bypass the HEPA filter and be discharged to an inappropriate location. Contractor will provide written documentation of test results for negative air machine units with HEPA filters changed by the contractor or documentation when changed and tested by the contractor filters.

2.1.5 PRESSURE DIFFERENTIAL

The fully operational negative air system within the regulated area shall continuously maintain a pressure differential of -0.02" water column gauge. Before any disturbance of any asbestos material, this shall be demonstrated to the VA by use of a pressure differential meter/manometer as required by OSHA 29 CFR 1926.1101(e) (5) (i). The Competent Person shall be responsible for providing, maintaining, and documenting the negative pressure and air changes as required by OSHA and this specification.

2.2 CONTAINMENT BARRIERS AND COVERINGS IN THE REGULATED AREA

2.2.1 GENERAL

- A. Using critical barriers, seal off the perimeter to the regulated area to completely isolate the regulated area from adjacent spaces. All surfaces in the regulated area must be covered to prevent contamination and to facilitate clean-up. Should adjacent areas become contaminated as a result of the work, shall immediately stop work and clean up the contamination at no additional cost to the VA. Provide firestopping and identify all fire barrier penetrations due to abatement work as specified in Section 3.1.4.8; FIRESTOPPING.

- B. Place all tools, scaffolding, materials and equipment needed for working in the regulated area prior to erecting any plastic sheeting. All uncontaminated removable furniture, equipment and/or supplies shall be removed by the VA from the regulated area before commencing work. Any objects remaining in the regulated area shall be completely covered with 2 layers of 6-mil fire retardant poly sheeting and secured with duct tape. Lock out and tag out any HVAC/electrical systems in the regulated area.

2.2.3 CONTROLLING ACCESS TO THE REGULATED AREA

Access to the regulated area is allowed only through the personnel decontamination facility (PDF). All other means of access shall be eliminated and OSHA DANGER demarcation signs posted as required by OSHA. If the regulated area is adjacent to, or within view of an occupied area, provide a visual barrier of 6 mil opaque fire retardant poly to prevent building occupant observation. If the adjacent area is accessible to the public, the barrier must be solid and capable of withstanding the negative pressure.

2.2.4 CRITICAL BARRIERS

Completely separate any operations in the regulated area from adjacent areas using 2 layers of 6 mil fire retardant poly and duct tape. Individually seal with 2 layers of 6 mil poly and duct tape all HVAC openings into the regulated area. Individually seal all lighting fixtures, clocks, doors, windows, convectors, speakers, or any other objects/openings in the regulated area. Heat must be shut off any objects covered with poly.

2.2.5 SECONDARY BARRIERS:

A loose layer of 6 mil poly shall be used as a drop cloth to protect the primary layers from debris generated during the abatement. This layer shall be replaced as needed during the work and at a minimum once per work day.

2.2.6 EXTENSION OF THE REGULATED AREA

If the enclosure of the regulated area is breached in any way that could allow contamination to occur, the affected area shall be included in the regulated area and constructed as per this section. Decontamination measures must be started immediately and continue until air monitoring indicates background levels are met.

2.2.7 FIRESTOPPING

- A. Through penetrations caused by cables, cable trays, pipes, sleeves, conduits, etc. must be firestopped with a fire-rated firestop system providing an air tight seal.
- B. Firestop materials that are not equal to the wall or ceiling penetrated shall be brought to the attention of the VA Representative. The contractor shall list all areas of penetration, the type of sealant used, and whether or not the location is fire rated. Any discovery of penetrations during abatement shall be brought to the attention of the VA representative immediately. All walls, floors and ceilings are considered

fire rated unless otherwise determined by the VA Representative or Fire Marshall.

- C. Any visible openings whether or not caused by a penetration shall be reported by the Contractor to the VA Representative for a sealant system determination. Firestops shall meet ASTM E814 and UL 1479 requirements for the opening size, penetrant, and fire rating needed.

2.3 MONITORING, INSPECTION AND TESTING

2.3.1 GENERAL

- A. Perform throughout abatement work monitoring, inspection and testing inside and around the regulated area in accordance with the OSHA requirements and these specifications. OSHA requires that the Employee exposure to asbestos must not exceed 0.1 fibers per cubic centimeter (f/cc) of air, averaged over an 8-hour work shift. The CPIH/CIH is responsible for and shall inspect and oversee the performance of the Contractor IH Technician. The IH Technician shall continuously inspect and monitor conditions inside the regulated area to ensure compliance with these specifications. In addition, the CPIH/CIH shall personally manage air sample collection, analysis, and evaluation for personnel, regulated area, and adjacent area samples to satisfy OSHA requirements. Additional inspection and testing requirements are also indicated in other parts of this specification.
- B. The VA will employ an independent industrial hygienist (VPIH/CIH) consultant and/or use its own IH to perform various services on behalf of the VA. The VPIH/CIH will perform the necessary monitoring, inspection, testing, and other support services to ensure that VA patients, employees, and visitors will not be adversely affected by the abatement work, and that the abatement work proceeds in accordance with these specifications, that the abated areas or abated buildings have been successfully decontaminated. The work of the VPIH/CIH consultant in no way relieves the Contractor from their responsibility to perform the work in accordance with contract/specification requirements, to perform continuous inspection, monitoring and testing for the safety of their employees, and to perform other such services as specified. The cost of the VPIH/CIH and their services will be borne by the VA except for any repeat of final inspection and testing that may be required due to unsatisfactory initial results. Any repeated final inspections and/or testing, if required, will be paid for by the Contractor.
- C. If fibers counted by the VPIH/CIH during abatement work, either inside or outside the regulated area, utilizing the NIOSH 7400 air monitoring method, exceed the specified respective limits, the Contractor shall stop work. The Contractor may request confirmation of the results by analysis of the samples by TEM. Request must be in writing and submitted to the VA's representative. Cost for the confirmation of results will be borne by the Contractor for both the collection and analysis of samples and for the time delay that may/does result for this confirmation. Confirmation sampling and analysis will be the responsibility of the CPIH/CIH with review and approval of the VPIH/CIH. An agreement between the CPIH/CIH and the VPIH/CIH shall be reached on the exact details of the confirmation effort, in writing, including such things as the number of samples, location, collection, quality control on-site, analytical laboratory, interpretation of results and any follow-up actions. This written

agreement shall be co-signed by the IH's and delivered to the VA's representative.

2.3.2 SCOPE OF SERVICES OF THE VPIH/CIH CONSULTANT

- A. The purpose of the work of the VPIH/CIH is to: assure quality; adherence to the specification; resolve problems; prevent the spread of contamination beyond the regulated area; and assure clearance at the end of the project. In addition, their work includes performing the final inspection and testing to determine whether the regulated area or building has been adequately decontaminated. All air monitoring is to be done utilizing PCM/TEM. The VPIH/CIH will perform the following tasks:
1. Task 1: Establish background levels before abatement begins by collecting background samples. Retain samples for possible TEM analysis.
 2. Task 2: Perform continuous air monitoring, inspection, and testing outside the regulated area during actual abatement work to detect any faults in the regulated area isolation and any adverse impact on the surroundings from regulated area activities.
 3. Task 3: Perform unannounced visits to spot check overall compliance of work with contract/specifications. These visits may include any inspection, monitoring, and testing inside and outside the regulated area and all aspects of the operation except personnel monitoring.
 4. Task 4: Provide support to the VA representative such as evaluation of submittals from the Contractor, resolution of conflicts, interpret data, etc.
 5. Task 5: Perform, in the presence of the VA representative, final inspection and testing of a decontaminated regulated area at the conclusion of the abatement to certify compliance with all regulations and VA requirements/specifications.
 6. Task 6: Issue certificate of decontamination for each regulated area and project report.
- B. All documentation, inspection results and testing results generated by the VPIH/CIH will be available to the Contractor for information and consideration. The Contractor shall cooperate with and support the VPIH/CIH for efficient and smooth performance of their work.
- C. The monitoring and inspection results of the VPIH/CIH will be used by the VA to issue any Stop Removal orders to the Contractor during abatement work and to accept or reject a regulated area or building as decontaminated.

2.3.3 MONITORING, INSPECTION AND TESTING BY CONTRACTOR CPIH/CIH

The Contractor's CPIH/CIH is responsible for managing all monitoring, inspections, and testing required by these specifications, as well as any and all regulatory requirements adopted by these specifications. The CPIH/CIH is responsible for the continuous monitoring of all subsystems and procedures which could affect the health and safety of the Contractor's personnel. Safety and health conditions and the provision of those conditions inside the regulated area for all persons entering the regulated area is the exclusive responsibility of the Contractor/Competent Person. The person performing the personnel and area air monitoring inside the regulated area shall be an IH Technician, who shall be trained and shall have specialized field experience in sampling

and analysis. The IH Technician shall have successfully completed a NIOSH 582 Course or equivalent and provide documentation. The IH Technician shall participate in the AIHA Asbestos Analysis Registry or participate in the Proficiency Analytic Testing program of AIHA for fiber counting quality control assurance. The IH Technician shall also be an accredited EPA AHERA/State Contractor/Supervisor (or Abatement Worker) and Building Inspector. The IH Technician shall have participated in five abatement projects collecting personal and area samples as well as responsibility for documentation on substantially similar projects in size and scope. The analytic laboratory used by the Contractor to analyze the samples shall be AIHA accredited for asbestos PAT and approved by the VA prior to start of the project. A daily log shall be maintained by the CPIH/CIH or IH Technician, documenting all OSHA requirements for air personal monitoring for asbestos in 29 CFR 1926.1101 (f), (g) and Appendix A. This log shall be made available to the VA representative and the VPIH/CIH upon request. The log will contain, at a minimum, information on personnel or area samples, other persons represented by the sample, the date of sample collection, start and stop times for sampling, sample volume, flow rate, and fibers/cc. The CPIH/CIH shall collect and analyze samples for each representative job being done in the regulated area, i.e., removal, wetting, clean-up, and load-out. No fewer than two personal samples per shift shall be collected and one area sample per 1,000 square feet of regulated area where abatement is taking place and one sample per shift in the clean room area shall be collected. In addition to the continuous monitoring required, the CPIH/CIH will perform inspection and testing at the final stages of abatement for each regulated area as specified in the CPIH/CIH responsibilities. Additionally, the CPIH/CIH will monitor and record pressure readings within the containment daily with a minimum of two readings at the beginning and at the end of a shift, and submit the data in the daily report.

2.4 ASBESTOS HAZARD ABATEMENT PLAN

The Contractor shall have established Asbestos Hazard Abatement Plan (AHAP) in printed form and loose leaf folder consisting of simplified text, diagrams, sketches, and pictures that establish and explain clearly the procedures to be followed during all phases of the work by the Contractor's personnel. The AHAP must be modified as needed to address specific requirements of this project and the specifications. The AHAP(s) shall be submitted for review and approval to the VA prior to the start of any abatement work. The minimum topics and areas to be covered by the AHAP(s) are:

- A. Minimum Personnel Qualifications
- B. Emergency Action Plan/Contingency Plans and Arrangements
- C. Security and Safety Procedures
- D. Respiratory Protection/Personal Protective Equipment Program and Training
- E. Medical Surveillance Program and Recordkeeping
- F. Regulated Area Requirements - Containment Barriers/Isolation of Regulated Area
- G. Decontamination Facilities and Entry/Exit Procedures (PDF and W/EDF)
- H. Negative Pressure Systems Requirements
- I. Monitoring, Inspections, and Testing
- J. Removal Procedures for ACM
- K. Removal of Contaminated Soil (if applicable)

- L. Encapsulation Procedures for ACM
- M. Disposal of ACM waste/equipment
- N. Regulated Area Decontamination/Clean-up
- O. Regulated Area Visual and Air Clearance
- P. Project Completion/Closeout

2.5 SUBMITTALS

2.5.1 PRE-START MEETING SUBMITTALS

Submit to the VA a minimum of 14 days prior to the pre-start meeting the following for review and approval. Meeting this requirement is a prerequisite for the pre-start meeting for this project:

- A. Submit a detailed work schedule for the entire project reflecting contract documents and the phasing/schedule requirements from the CPM chart.
- B. Submit a staff organization chart showing all personnel who will be working on the project and their capacity/function. Provide their qualifications, training, accreditations, and licenses, as appropriate. Provide a copy of the "Certificate of Worker's Acknowledgment" and the "Affidavit of Medical Surveillance and Respiratory Protection" for each person.
- C. Submit Asbestos Hazard Abatement Plan developed specifically for this project, incorporating the requirements of the specifications, prepared, signed and dated by the CPIH/CIH.
- D. Submit the specifics of the materials and equipment to be used for this project with manufacturer names, model numbers, performance characteristics, pictures/diagrams, and number available for the following:
 - 1. Supplied air system, negative air machines, HEPA vacuums, air monitoring pumps, calibration devices, pressure differential monitoring device and emergency power generating system.
 - 2. Waste water filtration system, shower system, containment barriers.
 - 3. Encapsulants, surfactants, hand held sprayers, airless sprayers, and fire extinguishers.
 - 4. Respirators, protective clothing, personal protective equipment.
 - 5. Fire safety equipment to be used in the regulated area.
- E. Submit the name, location, and phone number of the approved landfill; proof/verification the landfill is approved for ACM disposal; the landfill's requirements for ACM waste; the type of vehicle to be used for transportation; and name, address, and phone number of subcontractor, if used. Proof of asbestos training for transportation personnel shall be provided.
- F. Submit required notifications and arrangements made with regulatory agencies having regulatory jurisdiction and the specific contingency/emergency arrangements made with local health, fire, ambulance, hospital authorities and any other notifications/arrangements.
- G. Submit the name, location and verification of the laboratory and/or personnel to be used for analysis of air and/or bulk samples. Personal air monitoring must be done in accordance with OSHA 29 CFR 1926.1101(f) and Appendix A. And area or clearance air monitoring in accordance with EPA AHERA protocols.
- H. Submit qualifications verification: Submit the following evidence of qualifications. Make sure that all references are current and verifiable by providing current phone numbers and documentation.
 - 1. Asbestos Abatement Company: Project experience within the past 3 years; listing projects first most similar to this project: Project Name;

- Type of Abatement; Duration; Cost; Reference Name/Phone Number; Final Clearance; and Completion Date
2. List of project(s) halted by owner, A/E, IH, regulatory agency in the last 3 years: Project Name; Reason; Date; Reference Name/Number; Resolution
 3. List asbestos regulatory citations (e.g., OSHA), notices of violations (e.g., Federal and state EPA), penalties, and legal actions taken against the company including and of the company's officers (including damages paid) in the last 3 years. Provide copies and all information needed for verification.
- I. Submit information on personnel: Provide a resume; address each item completely; copies of certificates, accreditations, and licenses. Submit an affidavit signed by the CPIH/CIH stating that all personnel submitted below have medical records in accordance with OSHA 29 CFR 1926.1101(m) and 29 CFR 1910.20 and that the company has implemented a medical surveillance program and written respiratory protection program, and maintains recordkeeping in accordance with the above regulations. Submit the phone number and doctor/clinic/hospital used for medical evaluations.
1. CPIH/CIH and IH Technician: Name; years of abatement experience; list of projects similar to this one; certificates, licenses, accreditations for proof of AHERA/OSHA specialized asbestos training; professional affiliations; number of workers trained; samples of training materials; samples of AHAP(s) developed; medical opinion; and current respirator fit test.
 2. Competent Person(s)/Supervisor(s): Number; names; social security numbers; years of abatement experience as Competent Person/Supervisor; list of similar projects in size/complexity as Competent Person/Supervisor; as a worker; certificates, licenses, accreditations; proof of AHERA/OSHA specialized asbestos training; maximum number of personnel supervised on a project; medical opinion (asbestos surveillance and respirator use); and current respirator fit test.
 3. Workers: Numbers; names; social security numbers; years of abatement experience; certificates, licenses, accreditations; training courses in asbestos abatement and respiratory protection; medical opinion (asbestos surveillance and respirator use); and current respirator fit test.
- J. Submit copies of State license for asbestos abatement; copy of insurance policy, including exclusions with a letter from agent stating in plain language the coverage provided and the fact that asbestos abatement activities are covered by the policy; copy of the AHAP incorporating the requirements of this specification; information on who provides your training, how often; who provides medical surveillance, how often; who performs and how is personal air monitoring of abatement workers conducted; a list of references of independent laboratories/IH's familiar with your air monitoring and Asbestos Hazard Abatement Plans; copies of monitoring results of the five referenced projects listed and analytical method(s) used.
- K. Rented equipment must be decontaminated prior to returning to the rental agency.
- L. Submit, before the start of work, the manufacturer's technical data for all types of encapsulants, all MSDS, and application instructions.

2.5.2 SUBMITTALS DURING ABATEMENT

- A. The Competent Person shall maintain and submit a daily log at the regulated area documenting the dates and times of the following: purpose, attendees and summary of meetings; all personnel entering/exiting the regulated area; document and discuss the resolution of unusual events such as barrier breaching, equipment failures, emergencies, and any cause for stopping work; representative air monitoring and results/TWAs/ELs. Submit this information daily to the VPIH/CIH.
- B. The CPIH/CIH shall document and maintain the inspection and approval of the regulated area preparation prior to start of work and daily during work.
 - 1. Removal of any poly barriers.
 - 2. Visual inspection/testing by the CPIH/CIH or IH Technician prior to application of lockdown encapsulant.
 - 3. Packaging and removal of ACM waste from regulated area.
 - 4. Disposal of ACM waste materials; copies of Waste Shipment Records/landfill receipts to the VA's representative on a weekly basis.

2.5.3 SUBMITTALS AT COMPLETION OF ABATEMENT

The CPIH/CIH shall submit a project report consisting of the daily log book requirements and documentation of events during the abatement project including Waste Shipment Records signed by the landfill's agent. It will also include information on the containment and transportation of waste from the containment with applicable Chain of Custody forms. The report shall include a certificate of completion, signed and dated by the CPIH/CIH, in accordance with Attachment #1. All clearance and perimeter area samples must be submitted. The VA Representative will retain the abatement report after completion of the project and provide copies of the abatement report to VAMC Office of Engineer and the Safety Office.

PART 3 - EXECUTION

3.1 PRE-ABATEMENT ACTIVITIES

3.1.1 PRE-ABATEMENT MEETING

The VA representative, upon receipt, review, and substantial approval of all pre-abatement submittals and verification by the CPIH/CIH that all materials and equipment required for the project are on the site, will arrange for a pre-abatement meeting between the Contractor, the CPIH/CIH, Competent Person(s), the VA representative(s), and the VPIH/CIH. The purpose of the meeting is to discuss any aspect of the submittals needing clarification or amplification and to discuss any aspect of the project execution and the sequence of the operation. The Contractor shall be prepared to provide any supplemental information/documentation to the VA's representative regarding any submittals, documentation, materials or equipment. Upon satisfactory resolution of any outstanding issues, the VA's representative will issue a written order to proceed to the Contractor. No abatement work of any kind described in the following provisions shall be initiated prior to the VA written order to proceed.

3.1.2 PRE-ABATEMENT INSPECTIONS AND PREPARATIONS

Before any work begins on the construction of the regulated area, the Contractor will:

- A. Conduct a space-by-space inspection with an authorized VA representative and prepare a written inventory of all existing damage in those spaces where asbestos abatement will occur. Still or video photography may be used to supplement the written damage inventory. Document will be signed and certified as accurate by both parties.
- B. The VA Representative, the Contractor, and the VPIH/CIH must be aware of AEQA 10-95 indicating the failure to identify asbestos in the areas listed as well as common issues when preparing specifications and contract documents. This is especially critical when demolition is planned, because AHERA surveys are non-destructive, and ACM may remain undetected. A NESHAPS (destructive) ACM inspection should be conducted on all building structures that will be demolished. Ensure the following areas are inspected on the project: Lay-in ceilings concealing ACM; ACM behind walls/windows from previous renovations; inside utility chases/walls; transite piping/ductwork/sheets; behind radiators; lab fume hoods; transite lab countertops; roofing materials; below window sills; water/sewer lines; electrical conduit coverings; crawl spaces (previous abatement contamination); flooring/mastic covered by carpeting/new flooring; exterior insulated wall panels; on underground fuel tanks; and steam line trench coverings.
- C. Ensure that all furniture, machinery, equipment, curtains, drapes, blinds, and other movable objects required to be removed from the regulated area have been cleaned and removed or properly protected from contamination.
- D. If present and required, remove and dispose of carpeting from floors in the regulated area. If ACM floor tile is attached to the carpet while the Contractor is removing the carpet that section of the carpet will be disposed of as asbestos waste.
- E. Inspect existing firestopping in the regulated area. Correct as needed.

3.1.3 PRE-ABATEMENT CONSTRUCTION AND OPERATIONS

- A. Perform all preparatory work for the first regulated area in accordance with the approved work schedule and with this specification.
- B. Upon completion of all preparatory work, the CPIH/CIH will inspect the work and systems and will notify the VA's representative when the work is completed in accordance with this specification. The VA's representative may inspect the regulated area and the systems with the VPIH/CIH and may require that upon satisfactory inspection, the Contractor's employees perform all major aspects of the approved AHAP, especially worker protection, respiratory systems, contingency plans, decontamination procedures, and monitoring to demonstrate satisfactory operation. The operational systems for respiratory protection and the negative pressure system shall be demonstrated for proper performance.
- C. The CPIH/CIH shall document the pre-abatement activities described above and deliver a copy to the VA's representative.
- D. Upon satisfactory inspection of the installation of and operation of systems the VA's representative will notify the Contractor in writing to proceed with the asbestos abatement work in accordance with this specification and all applicable regulations.

3.2 REGULATED AREA PREPARATIONS

3.2.1 OSHA DANGER SIGNS

Post OSHA DANGER signs meeting the specifications of OSHA 29 CFR 1926.1101 at any location and approaches to the regulated area where airborne concentrations of asbestos may exceed the PEL. Signs shall be posted at a distance sufficiently far enough away from the regulated area to permit any personnel to read the sign and take the necessary measures to avoid exposure. Additional signs will be posted following construction of the regulated area enclosure.

3.2.2 CONTROLLING ACCESS TO THE REGULATED AREA

Access to the regulated area is allowed only through the personnel decontamination facility (PDF), if required. All other means of access shall be eliminated and OSHA Danger demarcation signs posted as required by OSHA. If the regulated area is adjacent to or within view of an occupied area, provide a visual barrier of 6 mil opaque fire retardant poly sheeting to prevent building occupant observation. If the adjacent area is accessible to the public, the barrier must be solid

3.2.3 SHUT DOWN - LOCK OUT ELECTRICAL

Shut down and lock out/tag out electric power to the regulated area. Provide temporary power and lighting. Insure safe installation including GFCI of temporary power sources and equipment by compliance with all applicable electrical code requirements and OSHA requirements for temporary electrical systems. Electricity shall be provided by the VA.

3.2.4 SHUT DOWN - LOCK OUT HVAC

Shut down and lock out/tag out heating, cooling, and air conditioning system (HVAC) components that are in, supply or pass through the regulated area.

Investigate the regulated area and agree on pre-abatement condition with the VA's representative. Seal all intake and exhaust vents in the regulated area with duct tape and 2 layers of 6-mil poly. Also, seal any seams in system components that pass through the regulated area. Remove all contaminated HVAC system filters and place in labeled 6-mil poly disposal bags for disposal as asbestos waste.

3.2.5 SANITARY FACILITIES

The Contractor shall provide sanitary facilities for abatement personnel and maintain them in a clean and sanitary condition throughout the abatement project.

3.2.6 WATER FOR ABATEMENT

The VA will provide water for abatement purposes. The Contractor shall connect to the existing VA system. The service to the shower(s) shall be supplied with backflow prevention.

3.2.7 PREPARATION PRIOR TO SEALING OFF

Place all tools, materials and equipment needed for working in the regulated area prior to erecting any plastic sheeting. Remove all uncontaminated removable furniture, equipment and/or supplies from the regulated area before commencing work, or completely cover with 2 layers of 6-mil fire retardant poly sheeting and secure with duct tape. Lock out and tag out any HVAC systems in the regulated area.

3.2.8 CRITICAL BARRIERS

Completely separate any openings into the regulated area from adjacent areas using fire retardant poly at least 6 mils thick and duct tape. Individually seal with 2 layers of 6 mil poly and duct tape all HVAC openings into the regulated area. Individually seal all lighting fixtures, clocks, doors, windows, convectors, speakers, or any other objects in the regulated area. Heat must be shut off any objects covered with poly

3.2.9 FLOOR BARRIERS

If floor removal is not being done, all floors in the regulated area shall be covered with 2 layers of 6 mil fire retardant poly and brought up the wall 12 inches

3.2.10 PRE-CLEANING MOVABLE OBJECTS

Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area. After items have been pre-cleaned and decontaminated, they may be removed from the work area for storage until the completion of abatement in the work area.

Pre-clean all movable objects within the regulated area using a HEPA filtered vacuum and/or wet cleaning methods as appropriate. After cleaning, these objects shall be removed from the regulated area and carefully stored in an uncontaminated location.

3.2.11 PRE-CLEANING FIXED OBJECTS

Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area

Pre-clean all fixed objects in the regulated area using HEPA filtered vacuums and/or wet cleaning techniques as appropriate. Careful attention must be paid to machinery behind grills or gratings where access may be difficult but contamination may be significant. Also, pay particular attention to wall, floor and ceiling penetration behind fixed items. After pre-cleaning, enclose fixed objects with 2 layers of 6-mil poly and seal securely in place with duct tape. Objects (e.g., permanent fixtures, shelves, electronic equipment, laboratory tables, sprinklers, alarm systems, closed circuit TV equipment and computer cables) which must remain in the regulated area and that require special ventilation or enclosure requirements should be designated here along with specified means of protection. Contact the manufacturer for special protection requirements.

3.2.12 PRE-CLEANING SURFACES IN THE REGULATED AREA

Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area

Pre-clean all surfaces in the regulated area using HEPA filtered vacuums and/or wet cleaning methods as appropriate. Do not use any methods that would raise dust such as dry sweeping or vacuuming with equipment not equipped with HEPA filters. Do not disturb asbestos-containing materials during this pre-cleaning phase.

3.2.13 EXTENSION OF THE REGULATED AREA

If the regulated area barrier is breached in any manner that could allow the passage of asbestos fibers or debris, the Competent Person shall immediately stop work, continue wetting, and proceed to extend the regulated area to enclose the affected area as per procedures described in this specification. If the affected area cannot be enclosed, decontamination measures and cleanup shall start immediately. All personnel shall be isolated from the affected area until decontamination/cleanup is completed as verified by visual inspection and air monitoring. Air monitoring at completion must indicate background levels.

3.3 REMOVAL OF CLASS II FLOORING, ROOFING, AND TRANSITE MATERIALS:

3.3.1 GENERAL

All applicable requirements of OSHA, EPA, and DOT shall be followed during Class II work. Keep materials intact; do not disturb; wet while working with it; wrap as soon as possible with 2 layers of 6 mil plastic for disposal.

3.3.2 REMOVAL OF FLOORING MATERIALS:

- A. All requirements of OSHA Flooring agreement provisions shall be followed:
 1. The Contractor shall provide enough HEPA negative air machines to effect $> - 0.02''$ WCG pressure. Provide a standby unit in the event of machine failure and/or emergency in an adjacent area. The contractor shall use double the number of machines, based on their calculations, or submit proof their machines operate at stated capacities, at a 2" pressure drop across the filters.
 2. Flooring shall be removed intact, as much as possible. Do not rip or tear flooring.
 3. Mechanical chipping or sanding is not allowed.
 4. Flooring shall be removed with an infra-red heating unit operated by trained personnel following the manufacturer's instructions.
 5. Wet clean and HEPA vacuum the floor before and after removal of flooring.
 6. Place a 6 mil poly layer 4' by 10' adjacent to the regulated area for use as a decontaminated area. All waste must be contained in the regulated area.
 7. Package all waste in 6 mil poly lined fiberboard drums.

3.3.3 REMOVAL OF MASTIC

- A. All chemical mastic removers must be low in volatile organic compound (VOC) content, have a flash point greater than 200° Fahrenheit, contain no chlorinated solvents, and comply with California Air Resources Board (CARB) thresholds for VOCs (effective January 1, 2010).
- B. A negative air machine as required under flooring removal shall be provided.
- C. Follow all manufacturers' instructions in the use of the mastic removal material.
- D. Package all waste in 6 mil poly lined fiberboard drums.
- E. Prior to application of any liquid material, check the floor for penetrations and seal before removing mastic.

3.4 DISPOSAL OF CLASS II WASTE MATERIAL:

3.4.1 GENERAL

Dispose of waste ACM and debris which is packaged in accordance with these specifications, OSHA, EPA and DOT. The landfill requirements for packaging must also be met. Transport will be in compliance with 49 CFR 100-185 regulations. Disposal shall be done at an approved landfill. Disposal of non-friable ACM shall be done in accordance with applicable regulations.

3.5 PROJECT DECONTAMINATION

3.5.1 GENERAL

- A. The VA must be notified at least 24 hours in advance of any waste removed from the containment,
- B. The entire work related to project decontamination shall be performed under the close supervision and monitoring of the CPIH/CIH.
- C. If the asbestos abatement work is in an area which was contaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior to its removal and cleanings of the surfaces of the regulated area after the primary barrier removal.
- D. If the asbestos abatement work is in an area which was uncontaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior to its removal, thus preventing contamination of the building when the regulated area critical barriers are removed.

3.5.2 REGULATED AREA CLEARANCE

Air testing and other requirements which must be met before release of the Contractor and re-occupancy of the regulated area space are specified in Final Testing Procedures.

3.5.3 WORK DESCRIPTION

Decontamination includes the clearance air testing in the regulated area and the decontamination and removal of the enclosures/facilities installed prior to the abatement work including primary/critical barriers, PDF and W/EDF facilities, and negative pressure systems.

3.5.4 PRE-DECONTAMINATION CONDITIONS

- A. Before decontamination starts, all ACM waste from the regulated area shall be removed, all waste collected and removed, and the secondary barrier of poly removed and disposed of along with any gross debris generated by the work.
- B. At the start of decontamination, the following shall be in place:
 - 1. Critical barriers over all openings consisting of two layers of 6 mil poly which is the sole barrier between the regulated area and the rest of the building or outside.
 - 2. Decontamination facilities, if required for personnel and equipment in operating condition.

3.5.5 CLEANING:

Carry out a first cleaning of all surfaces of the regulated area including items of remaining poly sheeting, tools, scaffolding, ladders/staging by wet methods and/or HEPA vacuuming. Do not use dry dusting/sweeping/air blowing methods. Use each surface of a wetted cleaning cloth one time only and then dispose of as contaminated waste. Continue this cleaning until there is no visible residue from abated surfaces or poly or other surfaces. Remove all filters in the air handling system and dispose of as ACM waste in accordance with these specifications. The negative pressure system shall remain in operation during this time. Additional cleaning(s) may be needed as determined by the CPIH/VPIH/CIH.

3.6 VISUAL INSPECTION AND AIR CLEARANCE TESTING

3.6.1 GENERAL

Notify the VA representative 24 hours in advance for the performance of the final visual inspection and testing. The final visual inspection and testing will be performed by the VPIH/CIH after the final cleaning.

3.6.2 VISUAL INSPECTION

Final visual inspection will include the entire regulated area, the PDF, all poly sheeting, seals over HVAC openings, doorways, windows, and any other openings. If any debris, residue, dust or any other suspect material is detected, the final cleaning shall be repeated at no cost to the VA. Dust/material samples may be collected and analyzed at no cost to the VA at the discretion of the VPIH/CIH to confirm visual findings. When the regulated area is visually clean the final testing can be done.

3.6.3 AIR CLEARANCE TESTING

- A. After an acceptable final visual inspection by the VPIH/CIH and VA Representative, the VPIH/CIH will perform the final clearance testing. Air samples will be collected and analyzed in accordance with procedures for AHERA in this specification. If work is less than 260 lf/160 sf/35 cf, 5 PCM samples shall be collected for clearance and a minimum of one field blank. If work is equal to or more than 260 lf/160 sf/35 cf, AHERA TEM sampling shall be performed for clearance. TEM analysis shall be done in accordance with procedures for EPA AHERA in this specification. If the release criteria are not met, the Contractor shall repeat the final cleaning and continue decontamination procedures until clearance is

achieved. **All Additional inspection and testing costs will be borne by the Contractor.**

- B. If release criteria are met, proceed to perform the abatement closeout and to issue the certificate of completion in accordance with these specifications.

3.6.4 FINAL AIR CLEARANCE PROCEDURES

- A. Contractor's Release Criteria: Work in a regulated area is complete when the regulated area is visually clean and airborne fiber levels have been reduced to or below 0.01 f/cc as measured by the AHERA PCM protocol, or 70 AHERA structures per square millimeter (s/mm²) by AHERA TEM.
- B. Air Monitoring and Final Clearance Sampling: To determine if the elevated airborne fiber counts encountered during abatement operations have been reduced to the specified level, the VPIH/CIH will secure samples and analyze them according to the following procedures:
 - 1. Fibers Counted: "Fibers" referred to in this section shall be either all fibers regardless of composition as counted in the NIOSH 7400 PCM method or asbestos fibers counted using the AHERA TEM method.
 - 2. Aggressive Sampling: All final air testing samples shall be collected using aggressive sampling techniques except where soil is not encapsulated or enclosed. Samples will be collected on 0.8 μ MCE filters for PCM analysis and 0.45 μ Polycarbonate filters for TEM. A minimum of 1200 Liters of using calibrated pumps shall be collected for clearance samples. Before pumps are started, initiate aggressive air mixing sampling as detailed in 40 CFR 763 Subpart E (AHERA) Appendix A (III)(B)(7)(d). Air samples will be collected in areas subject to normal air circulation away from corners, obstructed locations, and locations near windows, doors, or vents. After air sampling pumps have been shut off, circulating fans shall be shut off. The negative pressure system shall continue to operate.

3.7 ABATEMENT CLOSEOUT AND CERTIFICATE OF COMPLIANCE

3.7.1 COMPLETION OF ABATEMENT WORK

- A. After thorough decontamination, complete asbestos abatement work upon meeting the regulated area clearance criteria and fulfilling the following:
 - 1. Remove all equipment, materials, and debris from the project area.
 - 2. Package and dispose of all asbestos waste as required.
 - 3. Repair or replace all interior finishes damaged during the abatement work.
 - 4. Fulfill other project closeout requirements as specified elsewhere in this specification.

3.7.2 CERTIFICATE OF COMPLETION BY CONTRACTOR

The CPIH shall complete and sign the "Certificate of Completion" in accordance with Attachment 1 at the completion of the abatement and decontamination of the regulated area.

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3.7.3 WORK SHIFTS

All work shall be done during administrative hours (8:00 AM to 4:30 PM) Monday - Friday excluding Federal Holidays. Any change in the work schedule must be approved in writing by the VA Representative.

ATTACHMENT #1

CERTIFICATE OF COMPLETION

DATE: _____ VA Project #: _____
PROJECT NAME: _____ Abatement Contractor: _____
VAMC/ADDRESS: _____

1. I certify that I have personally inspected, monitored and supervised the abatement work of (specify regulated area or Building):
which took place from / / to / /
2. That throughout the work all applicable requirements/regulations and the VA's specifications were met.
3. That any person who entered the regulated area was protected with the appropriate personal protective equipment and respirator and that they followed the proper entry and exit procedures and the proper operating procedures for the duration of the work.
4. That all employees of the Abatement Contractor engaged in this work were trained in respiratory protection, were experienced with abatement work, had proper medical surveillance documentation, were fit-tested for their respirator, and were not exposed at any time during the work to asbestos without the benefit of appropriate respiratory protection.
5. That I performed and supervised all inspection and testing specified and required by applicable regulations and VA specifications.
6. That the conditions inside the regulated area were always maintained in a safe and healthy condition and the maximum fiber count never exceeded 0.5 f/cc, except as described below.
7. That all abatement work was done in accordance with OSHA requirements and the manufacturer's recommendations.

CPIH/CIH Signature/Date: _____

CPIH/CIH Print Name: _____

Abatement Contractor Signature/Date: _____

Abatement Contractor Print Name: _____

ATTACHMENT #2

CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME: _____ DATE: _____

PROJECT ADDRESS: _____

ABATEMENT CONTRACTOR'S NAME: _____

WORKING WITH ASBESTOS CAN BE HAZARDOUS TO YOUR HEALTH. INHALING ASBESTOS HAS BEEN LINKED WITH VARIOUS TYPES OF CANCERS. IF YOU SMOKE AND INHALE ASBESTOS FIBERS, YOUR CHANCES OF DEVELOPING LUNG CANCER IS GREATER THAN THAT OF THE NON-SMOKING PUBLIC.

Your employer's contract with the owner for the above project requires that: You must be supplied with the proper personal protective equipment including an adequate respirator and be trained in its use. You must be trained in safe and healthy work practices and in the use of the equipment found at an asbestos abatement project. You must receive/have a current medical examination for working with asbestos. These things shall be provided at no cost to you. By signing this certificate you are indicating to the owner that your employer has met these obligations.

RESPIRATORY PROTECTION: I have been trained in the proper use of respirators and have been informed of the type of respirator to be used on the above indicated project. I have a copy of the written Respiratory Protection Program issued by my employer. I have been provided for my exclusive use, at no cost, with a respirator to be used on the above indicated project.

TRAINING COURSE: I have been trained by a third party, State/EPA accredited trainer in the requirements for an AHERA/OSHA Asbestos Abatement Worker training course, 32 hours minimum duration. I currently have a valid State accreditation certificate. The topics covered in the course include, as a minimum, the following:

- Physical Characteristics and Background Information on Asbestos
- Potential Health Effects Related to Exposure to Asbestos
- Employee Personal Protective Equipment
- Establishment of a Respiratory Protection Program
- State of the Art Work Practices
- Personal Hygiene
- Additional Safety Hazards
- Medical Monitoring
- Air Monitoring
- Relevant Federal, State and Local Regulatory Requirements, Procedures, and Standards
- Asbestos Waste Disposal

MEDICAL EXAMINATION: I have had a medical examination within the past 12 months which was paid for by my employer. This examination included: health history, occupational history, pulmonary function test, and may have included a chest x-ray evaluation. The physician issued a positive written opinion after the examination.

Signature: _____

Printed Name: _____

Social Security Number:_____

Witness:_____

ATTACHMENT #3

AFFIDAVIT OF MEDICAL SURVEILLANCE, RESPIRATORY PROTECTION AND TRAINING/ACCREDITATION

VA PROJECT NAME AND NUMBER:_____

VA MEDICAL FACILITY:_____

ABATEMENT CONTRACTOR'S NAME AND ADDRESS:_____

1. I verify that the following individual

Name:_____Social Security Number:_____

who is proposed to be employed in asbestos abatement work associated with the above project by the named Abatement Contractor, is included in a medical surveillance program in accordance with 29 CFR 1926.1101(m), and that complete records of the medical surveillance program as required by 29 CFR 1926.1101(m)(n) and 29 CFR 1910.20 are kept at the offices of the Abatement Contractor at the following address.

Address:_____

2. I verify that this individual has been trained, fit-tested and instructed in the use of all appropriate respiratory protection systems and that the person is capable of working in safe and healthy manner as expected and required in the expected work environment of this project.

3. I verify that this individual has been trained as required by 29 CFR 1926.1101(k). This individual has also obtained a valid State accreditation certificate. Documentation will be kept on-site.

4. I verify that I meet the minimum qualifications criteria of the VA specifications for a CPIH.

Signature of CPIH/CIH:_____Date:_____

Printed Name of CPIH/CIH: _____

Signature of Contractor:_____Date:_____

Printed Name of Contractor:_____

ATTACHMENT #4

ABATEMENT CONTRACTOR/COMPETENT PERSON(S) REVIEW AND ACCEPTANCE OF THE VA'S ASBESTOS SPECIFICATIONS

VA Project Location:_____

VA Project #:_____

VA Project Description:_____

This form shall be signed by the Asbestos Abatement Contractor Owner and the Asbestos Abatement Contractor's Competent Person(s) prior to any start of work at the VA related to this Specification. If the Asbestos Abatement Contractor's/Competent Person(s) has not signed this form, they shall not be allowed to work on-site.

I, the undersigned, have read VA's Asbestos Specification regarding the asbestos abatement requirements. I understand the requirements of the VA's Asbestos Specification and agree to follow these requirements as well as all required rules and regulations of OSHA/EPA/DOT and State/Local requirements. I have been given ample opportunity to read the VA's Asbestos Specification and have been given an opportunity to ask any questions regarding the content and have received a response related to those questions. I do not have any further questions regarding the content, intent and requirements of the VA's Asbestos Specification.

At the conclusion of the asbestos abatement, I will certify that all asbestos abatement work was done in accordance with the VA's Asbestos Specification and all ACM was removed properly and no fibrous residue remains on any abated surfaces.

Abatement Contractor Owner's Signature_____Date_____

Abatement Contractor Competent Person(s)_____Date_____

- - END- - - -

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SECTION 02 82 13.31
ASBESTOS CLASS II/TRANSITE ABATEMENT

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ASBESTOS TRANSITE ABATEMENT SPECIFICATIONS

PART 1 - GENERAL

1.1 SUMMARY OF THE WORK

1.1.1 CONTRACT DOCUMENTS AND RELATED REQUIREMENTS

Drawings, general provisions of the contract, including general and supplementary conditions and other Division 01 specifications, shall apply to the work of this section. The contract documents show the work to be done under the contract and related requirements and conditions impacting the project. Related requirements and conditions include applicable codes and regulations, notices and permits, existing site conditions and restrictions on use of the site, requirements for partial owner occupancy during the work, coordination with other work and the phasing of the work. In the event the Asbestos Abatement Contractor discovers a conflict in the contract documents and/or requirements or codes, the conflict must be brought to the immediate attention of the Contracting Officer for resolution. Whenever there is a conflict or overlap in the requirements, the most stringent shall apply. Any actions taken by the Contractor without obtaining guidance from the Contracting Officer shall become the sole risk and responsibility of the Asbestos Abatement Contractor. All costs incurred.

1.1.2 EXTENT OF WORK

- A. Below is a brief description of the estimated quantities of asbestos Class II/transite materials to be abated. These quantities are for informational purposes only and are based on the best information available at the time of the specification preparation. The Contractor shall satisfy himself as the actual quantities to be abated. Nothing in this section may be interpreted as limiting the extent of work otherwise required by this contract and related documents.
- B. Removal, clean-up and disposal of ACM transite in an appropriate regulated area in the following approximate quantities;

160 linear feet transite pipe

Fire-rated doors have not been tested. Assume ACM or sample determine asbestos content prior to disposal.

1.1.3 RELATED WORK

- A. Section 02 41 00, DEMOLITION.
- B. Section 02 82 13.13, GLOVEBAG ASBESTOS ABATEMENT.
- C. Section 02 82 13.19, ASBESTOS FLOOR TILE AND MASTIC ABATEMENT.
- D. Section 02 82 11, TRADITIONAL ASBESTOS ABATEMENT

1.1.4 TASKS

The work tasks are summarized briefly as follows:

- A. Pre-abatement activities including pre-abatement meeting(s), inspection(s), notifications, permits, submittal approvals, regulated

area preparations, emergency procedures arrangements, and standard operating procedures for asbestos abatement work.

- B. Abatement activities including removal, clean-up and disposal of ACM waste, recordkeeping, security, monitoring, and inspections.
- C. Cleaning and decontamination activities including final visual inspection, air monitoring and certification of decontamination.

1.1.5 ABATEMENT CONTRACTOR USE OF PREMISES

- A. The Contractor and Contractor's personnel shall cooperate fully with the VA representative/consultant to facilitate efficient use of buildings and areas within buildings. The Contractor shall perform the work in accordance with the VA specifications, drawings, phasing plan and in compliance with any/all applicable Federal, State and Local regulations and requirements.
- B. The Contractor shall use the existing facilities in the building strictly within the limits indicated in contract documents as well as the approved VA Design and Construction Procedure. VA Design and Construction Procedure drawings of partially occupied buildings will show the limits of regulated areas; the placement of decontamination facilities; the temporary location of bagged waste ACM; the path of transport to outside the building; and the temporary waste storage area for each building/regulated area. Any variation from the arrangements shown on drawings shall be secured in writing from the VA representative through the pre-abatement plan of action. The following limitations of use shall apply to existing facilities shown on drawings:

1.2 VARIATIONS IN QUANTITY

The quantities and locations of ACM as indicated on the drawings and the extent of work included in this section are estimated which are limited by the physical constraints imposed by occupancy of the buildings and accessibility to ACM. Accordingly, minor variations (+/- 5%) in quantities of ACM within the regulated area are considered as having no impact on contract price and time requirements of this contract. Where additional work is required beyond the above variation, the contractor shall provide unit prices for newly discovered ACM and those prices shall be used for additional work required under the contract.

1.3 STOP ASBESTOS REMOVAL

If the Contracting Officer; their field representative; (the facility Safety Officer/Manager or their designee, or the VA Professional Industrial Hygienist, Certified Industrial Hygienist (VPIH/CIH) presents a verbal **Stop Asbestos Removal Order**, the Contractor/Personnel shall immediately stop all asbestos removal and maintain HEPA filtered negative pressure air flow in the containment and adequately wet any exposed ACM. If a verbal Stop Asbestos Removal Order is issued, the VA shall follow-up with a written order to the Contractor as soon as practicable. The Contractor shall not resume any asbestos removal activity until authorized to do so in writing by the VA Contracting Officer. A stop asbestos removal order may be issued at any time the VA Contracting Officer determines abatement conditions/activities are not within VA specification, regulatory requirements or that an imminent hazard exists to human health

or the environment. Work stoppage will continue until conditions have been corrected to the satisfaction of the VA. Standby time and costs for corrective actions will be borne by the Contractor, including the VPIH/CIH time. The occurrence of any of the following events shall be reported immediately by the Contractor's competent person to the VA Contracting Office or field representative using the most expeditious means (e.g., verbal or telephonic), followed up with written notification to the Contracting Officer as soon as it is practical. The Contractor shall immediately stop asbestos removal/disturbance activities and initiate fiber reduction activities:

- A. Airborne PCM analysis results equal to or greater than 0.01 f/cc outside a regulated area or >0.05 f/cc inside a regulated area;
- B. breach or break in regulated area containment barrier(s);
- C. less than -0.02" WCG pressure in the regulated area;
- D. serious injury/death at the site ;
- E. fire/safety emergency at the site ;
- F. respiratory protection system failure;
- G. power failure or loss of wetting agent; or
- H. any visible emissions observed outside the regulated area.

1.4 DEFINITIONS

1.4.1 GENERAL

Definitions and explanations here are neither complete nor exclusive of all terms used in the contract documents, but are general for the work to the extent they are not stated more explicitly in another element of the contract documents. Drawings must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated therein.

1.4.2 GLOSSARY

Abatement - Procedures to control fiber release from asbestos-containing materials. Includes removal, encapsulation, enclosure, demolition and renovation activities related to asbestos containing materials (ACM).

Aerosol - Solid or liquid particulate suspended in air.

Adequately wet - Sufficiently mixed or penetrated with liquid to prevent the release of particulates. If visible emissions are observed coming from the ACM, then that material has not been adequately wetted.

Aggressive method - Removal or disturbance of building material by sanding, abrading, grinding, or other method that breaks, crumbles, or disintegrates intact ACM.

Aggressive sampling - EPA AHERA defined clearance sampling method using air moving equipment such as fans and leaf blowers to aggressively disturb and maintain in the air residual fibers after abatement.

AHERA - Asbestos Hazard Emergency Response Act. Asbestos regulations for schools issued in 1987.

Aircell - Pipe or duct insulation made of corrugated cardboard which contains asbestos.

Air monitoring - The process of measuring the fiber content of a known volume of air collected over a specified period of time. The NIOSH 7400 Method, Issue 2 is used to determine the fiber levels in air. For personal samples and clearance air testing using Phase Contrast Microscopy (PCM) analysis. NIOSH Method 7402 can be used when it is necessary to confirm fibers counted by PCM as being asbestos. The AHERA TEM analysis may be

used for background, area samples and clearance samples when required by this specification, or at the discretion of the VPIH/CIH as appropriate.

Air sample filter - The filter used to collect fibers which are then counted. The filter is made of mixed cellulose ester membrane for PCM (Phase Contrast Microscopy) and polycarbonate for TEM (Transmission Electron Microscopy)

Amended water - Water to which a surfactant (wetting agent) has been added to increase the penetrating ability of the liquid.

Asbestos - Includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated or altered. Asbestos also includes PACM, as defined below.

Asbestos Hazard Abatement Plan (AHAP) - Asbestos work procedures required to be submitted by the contractor before work begins.

Asbestos-containing material (ACM) - Any material containing more than one percent of asbestos.

Asbestos contaminated elements (ACE) - Building elements such as ceilings, walls, lights, or ductwork that are contaminated with asbestos.

Asbestos-contaminated soil (ACS) - Soil found in the work area or in adjacent areas such as crawlspaces or pipe tunnels which is contaminated with asbestos-containing material debris and cannot be easily separated from the material.

Asbestos-containing waste (ACW) material - Asbestos-containing material or asbestos contaminated objects requiring disposal.

Asbestos Project Monitor - Some states require that any person conducting asbestos abatement clearance inspections and clearance air sampling be licensed as an asbestos project monitor.

Asbestos waste decontamination facility - A system consisting of drum/bag washing facilities and a temporary storage area for cleaned containers of asbestos waste. Used as the exit for waste and equipment leaving the regulated area. In an emergency, it may be used to evacuate personnel.

Authorized person - Any person authorized by the VA, the Contractor, or government agency and required by work duties to be present in regulated areas.

Authorized visitor - Any person approved by the VA; the contractor; or any government agency representative having jurisdiction over the regulated area (e.g., OSHA, Federal and State EPA).

Barrier - Any surface that isolates the regulated area and inhibits fiber migration from the regulated area.

Containment Barrier - An airtight barrier consisting of walls, floors, and/or ceilings of sealed plastic sheeting which surrounds and seals the outer perimeter of the regulated area.

Critical Barrier - The barrier responsible for isolating the regulated area from adjacent spaces, typically constructed of plastic sheeting secured in place at openings such as doors, windows, or any other opening into the regulated area.

Primary Barrier - Plastic barriers placed over critical barriers and exposed directly to abatement work.

Secondary Barrier - Any additional plastic barriers used to isolate and provide protection from debris during abatement work.

Breathing zone - The hemisphere forward of the shoulders with a radius of about 150 - 225 mm (6 - 9 inches) from the worker's nose.

Bridging encapsulant - An encapsulant that forms a layer on the surface of the ACM.

Building/facility owner - The legal entity, including a lessee, which exercises control over management and recordkeeping functions relating to a building and/or facility in which asbestos activities take place.

Bulk testing - The collection and analysis of suspect asbestos containing materials.

Certified Industrial Hygienist (CIH) - A person certified in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene.

Class I asbestos work - Activities involving the removal of Thermal System Insulation (TSI) and surfacing ACM and Presumed Asbestos Containing Material (PACM).

Class II asbestos work - Activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic.

Clean room/Changing room - An uncontaminated room having facilities for the storage of employee's street clothing and uncontaminated materials and equipment.

Clearance sample - The final air sample taken after all asbestos work has been done and visually inspected. Performed by the VA's professional industrial hygiene consultant/Certified Industrial Hygienist (VPIH/CIH).

Closely resemble - The major workplace conditions which have contributed to the levels of historic asbestos exposure, are no more protective than conditions of the current workplace.

Competent person - In addition to the definition in 29 CFR 1926.32(f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f); in addition, for Class I and II work who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for supervisor.

Contractor's Professional Industrial Hygienist (CPIH/CIH) - The asbestos abatement contractor's industrial hygienist. The industrial hygienist must meet the qualification requirements of a PIH and may be a certified industrial hygienist (CIH).

Count - Refers to the fiber count or the average number of fibers greater than five microns in length with a length-to-width (aspect) ratio of at least 3 to 1, per cubic centimeter of air.

Crawlspace - An area which can be found either in or adjacent to the work area. This area has limited access and egress and may contain asbestos materials and/or asbestos contaminated soil.

Decontamination area/unit - An enclosed area adjacent to and connected to the regulated area and consisting of an equipment room, shower room, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos.

Demolition - The wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.

VA Total - means a building or substantial part of the building is completely removed, torn or knocked down, bulldozed, flattened, or razed, including removal of building debris.

Disposal bag - Typically 6 mil thick sift-proof, dustproof, leak-tight container used to package and transport asbestos waste from regulated

areas to the approved landfill. Each bag/container must be labeled/marked in accordance with EPA, OSHA and DOT requirements.

Disturbance - Activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM or PACM, no greater than the amount that can be contained in one standard sized glove bag or waste bag in order to access a building component. In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or disposal bag which shall not exceed 60 inches in length or width.

Drum - A rigid, impermeable container made of cardboard fiber, plastic, or metal which can be sealed in order to be sift-proof, dustproof, and leak-tight.

Employee exposure - The exposure to airborne asbestos that would occur if the employee were not wearing respiratory protection equipment.

Encapsulant - A material that surrounds or embeds asbestos fibers in an adhesive matrix and prevents the release of fibers.

Encapsulation - Treating ACM with an encapsulant.

Enclosure - The construction of an air tight, impermeable, permanent barrier around ACM to control the release of asbestos fibers from the material and also eliminate access to the material.

Equipment room - A contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.

Fiber - A particulate form of asbestos, 5 microns or longer, with a length to width (aspect) ratio of at least 3 to 1.

Fibers per cubic centimeter (f/cc) - Abbreviation for fibers per cubic centimeter, used to describe the level of asbestos fibers in air.

Filter - Media used in respirators, vacuums, or other machines to remove particulate from air.

Firestopping - Material used to close the open parts of a structure in order to prevent a fire from spreading.

Friable asbestos containing material - Any material containing more than one (1) percent or asbestos as determined using the method specified in appendix A, Subpart F, 40 CFR 763, section 1, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

Glovebag - Not more than a 60 x 60-inch impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which materials and tools may be handled.

High efficiency particulate air (HEPA) filter - An ASHRAE MERV 17 filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.

HEPA vacuum - Vacuum collection equipment equipped with a HEPA filter system capable of collecting and retaining asbestos fibers.

Homogeneous area - An area of surfacing, thermal system insulation or miscellaneous ACM that is uniform in color, texture and date of application.

HVAC - Heating, Ventilation and Air Conditioning

Industrial hygienist (IH) - A professional qualified by education, training, and experience to anticipate, recognize, evaluate, and develop controls for occupational health hazards. Meets definition requirements of the American Industrial Hygiene Association (AIHA).

Industrial hygienist technician (IH Technician) - A person working under the direction of an IH or CIH who has special training, experience, certifications and licenses required for the industrial hygiene work assigned. Some states require that an industrial hygienist technician conducting asbestos abatement clearance inspection and clearance air sampling be licensed as an asbestos project monitor.

Intact - The ACM has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix.

Lockdown - Applying encapsulant, after a final visual inspection, on all abated surfaces at the conclusion of ACM removal prior to removal of critical barriers.

National Emission Standards for Hazardous Air Pollutants (NESHAP) - EPA's rule to control emissions of asbestos to the environment (40 CFR part 61, Subpart M).

Negative initial exposure assessment - A demonstration by the employer which complies with the criteria in 29 CFR 1926.1101 (f)(2)(iii), that employee exposure during an operation is expected to be consistently below the PEL's.

Negative pressure - Air pressure which is lower than the surrounding area, created by exhausting air from a sealed regulated area through HEPA equipped filtration units. OSHA requires maintaining -0.02" water column gauge inside the negative pressure enclosure.

Negative pressure respirator - A respirator in which the air pressure inside the facepiece is negative during inhalation relative to the air pressure outside the respirator facepiece.

Non-friable ACM - Material that contains more than 1 percent asbestos but cannot be crumbled, pulverized, or reduced to powder by hand pressure.

Organic vapor cartridge - The type of cartridge used on air purifying respirators to remove organic vapor hazardous air contaminants.

Outside air - The air outside buildings and structures, including, but not limited to, the air under a bridge or in an open ferry dock.

Owner/operator - Any person who owns, leases, operates, controls, or supervises the facility being demolished or renovated or any person who owns, leases, operates, controls, or supervises the demolition or renovation operation, or both.

Penetrating encapsulant - Encapsulant that is absorbed into the ACM matrix without leaving a surface layer.

Personal protective equipment (PPE) - equipment designed to protect user from injury and/or specific job hazard. Such equipment may include protective clothing, hard hats, safety glasses, and respirators.

Personal sampling/monitoring - Representative air samples obtained in the breathing zone for one or workers within the regulated area using a filter cassette and a calibrated air sampling pump to determine asbestos exposure.

Permissible exposure limit (PEL) - The level of exposure OSHA allows for an 8-hour time weighted average. For asbestos fibers, the eight (8) hour time weighted average PEL is 0.1 fibers per cubic centimeter (0.1 f/cc) of air and the 30-minute Excursion Limit is 1.0 fibers per cubic centimeter (1 f/cc).

Pipe tunnel - An area, typically located adjacent to mechanical spaces or boiler rooms in which the pipes servicing the heating system in the building are routed to allow the pipes to access heating elements. These

areas may contain asbestos pipe insulation, asbestos fittings, or asbestos-contaminated soil.

Polarized light microscopy (PLM) - Light microscopy using dispersion staining techniques and refractive indices to identify and quantify the type(s) of asbestos present in a bulk sample.

Polyethylene sheeting - Strong plastic barrier material 4 to 6 mils thick, semi-transparent, flame retardant per NFPA 241.

Positive/negative fit check - A method of verifying the seal of a facepiece respirator by temporarily occluding the filters and breathing in (inhaling) and then temporarily occluding the exhalation valve and breathing out (exhaling) while checking for inward or outward leakage of the respirator respectively.

Presumed ACM (PACM) - Thermal system insulation, surfacing, and flooring material installed in buildings prior to 1981. If the building owner has actual knowledge, or should have known through the exercise of due diligence that other materials are ACM, they too must be treated as PACM. The designation of PACM may be rebutted pursuant to 29 CFR 1926.1101 (b).

Professional IH - An IH who meets the definition requirements of AIHA; meets the definition requirements of OSHA as a "Competent Person" at 29 CFR 1926.1101 (b); has completed two specialized EPA approved courses on management and supervision of asbestos abatement projects; has formal training in respiratory protection and waste disposal; and has a minimum of four projects of similar complexity with this project of which at least three projects serving as the supervisory IH. The PIH may be either the VA's PIH (VPIH) of Contractor's PIH (CPIH/CIH).

Project designer - A person who has successfully completed the training requirements for an asbestos abatement project designer as required by 40 CFR 763 Appendix C, Part I; (B) (5).

Assigned Protection factor - A value assigned by OSHA/NIOSH to indicate the expected protection by each respirator class, when the respirator is properly selected and worn correctly. The number indicates the reduction of exposure level from outside to inside the respirator facepiece.

Qualitative fit test (QLFT) - A fit test using a challenge material that can be sensed by the wearer if leakage in the respirator occurs.

Quantitative fit test (QNFT) - A fit test using a challenge material which is quantified outside and inside the respirator thus allowing the determination of the actual fit factor.

Regulated area - An area established by the employer to demarcate where Class I, II, III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work may accumulate; and a work area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed the PEL.

Regulated ACM (RACM) - Friable ACM; Category I non-friable ACM that has become friable; Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading or; Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of the demolition or renovation operation.

Removal - All operations where ACM, PACM and/or RACM is taken out or stripped from structures or substrates, including demolition operations.

Renovation - Altering a facility or one or more facility components in any way, including the stripping or removal of asbestos from a facility component which does not involve demolition activity.

Repair - Overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM or PACM attached to structures or substrates.

Shower room - The portion of the PDF where personnel shower before leaving the regulated area.

Supplied air respirator (SAR) - A respiratory protection system that supplies minimum Grade D respirable air per ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989.

Surfacing ACM - A material containing more than 1 percent asbestos that is sprayed, troweled on or otherwise applied to surfaces for acoustical, fireproofing and other purposes.

Surfactant - A chemical added to water to decrease water's surface tension thus making it more penetrating into ACM.

Thermal system ACM - A material containing more than 1 percent asbestos applied to pipes, fittings, boilers, breeching, tanks, ducts, or other structural components to prevent heat loss or gain.

Transmission electron microscopy (TEM) - A microscopy method that can identify and count asbestos fibers.

VA Professional Industrial Hygienist (VPIH/CIH) - The Department of Veterans Affairs Professional Industrial Hygienist must meet the qualifications of a PIH, and may be a Certified Industrial Hygienist (CIH).

VA Representative - The VA official responsible for on-going project work.

Visible emissions - Any emissions, which are visually detectable without the aid of instruments, coming from ACM/PACM/RACM/ACS or ACM waste material.

Waste/Equipment decontamination facility (W/EDF) - The area in which equipment is decontaminated before removal from the regulated area.

Waste generator - Any owner or operator whose act or process produces asbestos-containing waste material.

Waste shipment record - The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos-containing waste material.

Wet cleaning - The process of thoroughly eliminating, by wet methods, any asbestos contamination from surfaces or objects.

1.4.3 REFERENCED STANDARDS ORGANIZATIONS

The following acronyms or abbreviations as referenced in contract/specification documents are defined to mean the associated names. Names and addresses may be subject to change.

- A. VA Department of Veterans Affairs
810 Vermont Avenue, NW
Washington, DC 20420

- B. AIHA American Industrial Hygiene Association
2700 Prosperity Avenue, Suite 250
Fairfax, VA 22031
703-849-8888

- C. ANSI American National Standards Institute
1430 Broadway
New York, NY 10018
212-354-3300

- D. ASTM American Society for Testing and Materials
1916 Race St.
Philadelphia, PA 19103
215-299-5400
- E. CFR Code of Federal Regulations
Government Printing Office
Washington, DC 20420
- F. CGA Compressed Gas Association
1235 Jefferson Davis Highway
Arlington, VA 22202
703-979-0900
- G. CS Commercial Standard of the National Institute of Standards and
Technology (NIST)
U. S. Department of Commerce
Government Printing Office
Washington, DC 20420
- H. EPA Environmental Protection Agency
401 M St., SW
Washington, DC 20460
202-382-3949
- I. MIL-STD Military Standards/Standardization Division
Office of the Assistant Secretary of Defense
Washington, DC 20420
- J. NIST National Institute for Standards and Technology
U. S. Department of Commerce
Gaithersburg, MD 20234
301-921-1000
- K. NEC National Electrical Code (by NFPA)
- L. NEMA National Electrical Manufacturer's Association
2101 L Street, N.W.
Washington, DC 20037
- M. NFPA National Fire Protection Association
1 Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101
800-344-3555
- N. NIOSH National Institutes for Occupational Safety and Health
4676 Columbia Parkway
Cincinnati, OH 45226
513-533-8236
- O. OSHA Occupational Safety and Health Administration
U.S. Department of Labor

Government Printing Office
Washington, DC 20402

P. UL Underwriters Laboratory
333 Pfingsten Rd.
Northbrook, IL 60062
312-272-8800

Q. South Dakota Dept. of Environment and Natural Resources
523 East Capitol
Pierre, SD 57501
605-773-3153

1.5 APPLICABLE CODES AND REGULATIONS

1.5.1 GENERAL APPLICABILITY OF CODES, REGULATIONS, AND STANDARDS

- A. All work under this contract shall be done in strict accordance with all applicable Federal, State, and local regulations, standards and codes governing asbestos abatement, and any other trade work done in conjunction with the abatement. All applicable codes, regulations and standards are adopted into this specification and will have the same force and effect as this specification.
- B. The most recent edition of any relevant regulation, standard, document or code shall be in effect. Where conflict among the requirements or with these specifications exists, the most stringent requirement(s) shall be utilized.
- C. Copies of all standards, regulations, codes and other applicable documents, including this specification and those listed in Section 1.5 shall be available at the worksite in the clean change area of the worker decontamination system.

1.5.2 CONTRACTOR RESPONSIBILITY

The Asbestos Abatement Contractor (Contractor) shall assume full responsibility and liability for compliance with all applicable Federal, State and Local regulations related to any and all aspects of the asbestos abatement project. The Contractor is responsible for providing and maintaining training, accreditations, medical exams, medical records, personal protective equipment (PPE) including respiratory protection including respirator fit testing, as required by applicable Federal, State and Local regulations. The Contractor shall hold the VA and VPIH/CIH consultants harmless for any Contractor's failure to comply with any applicable work, packaging, transporting, disposal, safety, health, or environmental requirement on the part of himself, his employees, or his subcontractors. The Contractor will incur all costs of the CPIH/CIH, including all sampling/analytical costs to assure compliance with OSHA/EPA/State requirements related to failure to comply with the regulations applicable to the work.

1.5.3 FEDERAL REQUIREMENTS

Federal requirements which govern some aspect of asbestos abatement include, but are not limited to, the following regulations.

- A. Occupational Safety and Health Administration (**OSHA**)

1. Title 29 CFR 1926.1101 - Construction Standard for Asbestos
 2. Title 29 CFR 1910 Subpart I - Personal Protective Equipment
 3. Title 29 CFR 1910.134 - Respiratory Protection
 4. Title 29 CFR 1926 - Construction Industry Standards
 5. Title 29 CFR 1910.1020 - Access to Employee Exposure and Medical Records
 6. Title 29 CFR 1910.1020 - Hazard Communication
 7. Title 29 CFR 1910 Subpart K - Medical and First Aid
- B. Environmental Protection Agency (EPA)
1. 40 CFR 61 Subpart A and M (Revised Subpart B) - National Emission Standard for Hazardous Air Pollutants - Asbestos.
 2. 40 CFR 763.80 - Asbestos Hazard Emergency Response Act (AHERA)
- C. Department of Transportation (DOT)
- Title 49 CFR 100 - 185 - Transportation

1.5.4 STATE REQUIREMENTS

State requirements that apply to the asbestos abatement work, disposal, clearance, etc., include, but are not limited to, the following:

South Dakota Dept. of Environment and Natural Resources
Asbestos Waste Management Program
523 East Capitol
Pierre, SD 57501
605-773-3153

South Dakota Codified Law 34.44
Administrative Rules of South Dakota 74.36.08
Administrative Rules of South Dakota 74.31

1.5.5 LOCAL REQUIREMENTS

If local requirements are more stringent than federal or state standards, the local standards are to be followed.

1.5.6 STANDARDS

- A. Standards which govern asbestos abatement activities include, but are not limited to, the following:
1. American National Standards Institute (ANSI) Z9.2-79 - Fundamentals Governing the Design and Operation of Local Exhaust Systems Z88.2 - Practices for Respiratory Protection.
 2. Underwriters Laboratories (UL) 586-90 - UL Standard for Safety of HEPA filter Units, 7th Edition.
- B. Standards which govern encapsulation work include, but are not limited to, the following:
1. American Society for Testing and Materials (ASTM)
- C. Standards which govern the fire and safety concerns in abatement work include, but are not limited to, the following:
1. National Fire Protection Association (NFPA) 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.
 2. NFPA 701 - Standard Methods for Fire Tests for Flame Resistant Textiles and Film.
 3. NFPA 101 - Life Safety Code

1.5.7 EPA GUIDANCE DOCUMENTS

- A. EPA guidance documents which discuss asbestos abatement work activities are listed below. These documents are made part of this section by reference. EPA publications can be ordered from (800) 424-9065.
- B. Guidance for Controlling ACM in Buildings (Purple Book) EPA 560/5-85-024
- C. Asbestos Waste Management Guidance EPA 530-SW-85-007
- D. A Guide to Respiratory Protection for the Asbestos Abatement Industry EPA-560-OPTS-86-001
- E. Guide to Managing Asbestos in Place (Green Book) TS 799 20T July 1990

1.5.8 NOTICES

- A. State and Local agencies: Send written notification as required by state and local regulations including the local fire department prior to beginning any work on ACM as follows:

South Dakota Dept. of Environment and Natural Resources
Asbestos Waste Management Program
523 East Capitol
Pierre, SD 57501
Asbestos Coordinator
Fax - 605-773-6035

- B. Copies of notifications shall be submitted to the VA for the facility's records, in the same time frame as notification is given to EPA, State, and Local authorities.

1.5.9 PERMITS/LICENSES

- A. The contractor shall apply for and have all required permits and licenses to perform asbestos abatement work as required by Federal, State, and Local regulations.

1.5.10 POSTING AND FILING OF REGULATIONS

- A. Maintain two (2) copies of applicable federal, state, and local regulations. Post one copy of each at the regulated area where workers will have daily access to the regulations and keep another copy in the Contractor's office.

1.5.11 VA RESPONSIBILITIES

Prior to commencement of work:

- A. Notify occupants adjacent to regulated areas of project dates and requirements for relocation, if needed. Arrangements must be made prior to starting work for relocation of desks, files, equipment, and personal possessions to avoid unauthorized access into the regulated area. **Note: Notification of adjacent personnel is required by OSHA in 29 CFR 1926.1101 (k) to prevent unnecessary or unauthorized access to the regulated area.**
- B. Submit to the Contractor results of background air sampling; including location of samples, person who collected the samples, equipment utilized, calibration data and method of analysis. During abatement, submit to the Contractor, results of bulk material analysis and air sampling data

collected during the course of the abatement. This information shall not release the Contractor from any responsibility for OSHA compliance.

1.5.13 EMERGENCY ACTION PLAN AND ARRANGEMENTS

- A. An Emergency Action Plan shall be developed by prior to commencing abatement activities and shall be agreed to by the Contractor and the VA. The Plan shall meet the requirements of 29 CFR 1910.38 (a);(b).
- B. Emergency procedures shall be in written form and prominently posted in the clean room and equipment room of the decontamination unit. Everyone, prior to entering the regulated area, must read and sign these procedures to acknowledge understanding of the regulated area layout, location of emergency exits and emergency procedures.
- C. Emergency planning shall include written notification of police, fire, and emergency medical personnel of planned abatement activities; work schedule; layout of regulated area; and access to the regulated area, particularly barriers that may affect response capabilities.
- D. Emergency planning shall include consideration of fire, explosion, hazardous atmospheres, electrical hazards, slips/trips and falls, confined spaces, and heat stress illness. Written procedures for response to emergency situations shall be developed and employee training in procedures shall be provided.
- E. Employees shall be trained in regulated area/site evacuation procedures in the event of workplace emergencies.
 - 1. For non-life-threatening situations - employees injured or otherwise incapacitated shall decontaminate following normal procedures with assistance from fellow workers, if necessary, before exiting the regulated area to obtain proper medical treatment.
 - 2. For life-threatening injury or illness, worker decontamination shall take least priority after measures to stabilize the injured worker, remove them from the regulated area, and secure proper medical treatment.
- F. Telephone numbers of any/all emergency response personnel shall be prominently posted in the clean room, along with the location of the nearest telephone.
- G. The Contractor shall provide verification of first aid/CPR training for personnel responsible for providing first aid/CPR. OSHA requires medical assistance within 3-4 minutes of a life-threatening injury/illness. Bloodborne Pathogen training shall also be verified for those personnel required to provide first aid/CPR.
- H. The Emergency Action Plan shall provide for a Contingency Plan in the event that an incident occurs that may require the modification of the standard operating procedures during abatement. Such incidents include, but are not limited to, fire; accident; power failure; negative pressure failure; and supplied air system failure. The Contractor shall detail procedures to be followed in the event of an incident assuring that asbestos abatement work is stopped and wetting is continued until correction of the problem.

1.5.14 PRE-CONSTRUCTION MEETING

Prior to commencing the work, the Contractor shall meet with the VA Certified Industrial Hygienist (VPCIH) to present and review, as appropriate, the items following this paragraph. The Contractor's Competent Person(s) who will be on-site shall participate in the pre-

start meeting. The pre-start meeting is to discuss and determine procedures to be used during the project. At this meeting, the Contractor shall provide:

- A. Proof of Contractor licensing.
- B. Proof the Competent Person(s) is trained and accredited and approved for working in this State. Verification of the experience of the Competent Person(s) shall also be presented.
- C. A list of all workers who will participate in the project, including experience and verification of training and accreditation.
- D. A list of and verification of training for all personnel who have current first-aid/CPR training. A minimum of one person per shift must have adequate training.
- E. Current medical written opinions for all personnel working on-site meeting the requirements of 29 CFR 1926.1101 (m).
- F. Current fit-tests for all personnel wearing respirators on-site meeting the requirements of 29 CFR 1926.1101 (h) and Appendix C.
- G. A copy of the Contractor's Asbestos Hazard Abatement Plan. In these procedures, the following information must be detailed, specific for this project.
 - 1. Regulated area preparation procedures;
 - 2. Notification requirements procedure of Contractor as required in 29 CFR 1926.1101 (d);
 - 3. Decontamination area set-up/layout and decontamination procedures for employees;
 - 4. Abatement methods/procedures and equipment to be used; and
 - 5. Personal protective equipment to be used.
- H. At this meeting the Contractor shall provide all submittals as required.
- I. Procedures for handling, packaging and disposal of asbestos waste.
- J. Emergency Action Plan and Contingency Plan Procedures.

1.6 PROJECT COORDINATION

The following are the minimum administrative and supervisory personnel necessary for coordination of the work.

1.6.1 PERSONNEL

- A. Administrative and supervisory personnel shall consist of a qualified Competent Person(s) as defined by OSHA in the Construction Standards and the Asbestos Construction Standard; Contractor Professional Industrial Hygienist and Industrial Hygiene Technicians. These employees are the Contractor's representatives responsible for compliance with these specifications and all other applicable requirements.
- B. Non-supervisory personnel shall consist of an adequate number of qualified personnel to meet the schedule requirements of the project. Personnel shall meet required qualifications. Personnel utilized on-site shall be pre-approved by the VA representative. A request for approval shall be submitted for any person to be employed during the project giving the person's name; social security number; qualifications; accreditation card with color picture; Certificate of Worker's Acknowledgment; and Affidavit of Medical Surveillance and Respiratory Protection and current Respirator Fit Test.
- C. Minimum qualifications for Contractor and assigned personnel are:

1. The Contractor has conducted within the last three (3) years, three (3) projects of similar complexity and dollar value as this project; has not been cited and penalized for serious violations of federal (and state as applicable) EPA and OSHA asbestos regulations in the past three (3) years; has adequate liability/occurrence insurance for asbestos work as required by the state; is licensed in applicable states; has adequate and qualified personnel available to complete the work; has comprehensive standard operating procedures for asbestos work; has adequate materials, equipment and supplies to perform the work.
2. The Competent Person has four (4) years of abatement experience of which two (2) years were as the Competent Person on the project; meets the OSHA definition of a Competent Person; has been the Competent Person on two (2) projects of similar size and complexity as this project within the past three (3) years; has completed EPA AHERA/OSHA/State/Local training requirements/accreditation(s) and refreshers; and has all required OSHA documentation related to medical and respiratory protection.
3. The Contractor Professional Industrial Hygienist/CIH (CPIH/CIH) shall have five (5) years of monitoring experience and supervision of asbestos abatement projects; has participated as senior IH on five (5) abatement projects, three (3) of which are similar in size and complexity as this project; has developed at least one complete standard operating procedure for asbestos abatement; has trained abatement personnel for three (3) years; has specialized EPA AHERA/OSHA training in asbestos abatement management, respiratory protection, waste disposal and asbestos inspection; has completed the NIOSH 582 Course or equivalent, Contractor/Supervisor course; and has appropriate medical/respiratory protection records/documentation.
4. The Abatement Personnel shall have completed the EPA AHERA/OSHA abatement worker course; have training on the standard operating procedures of the Contractor; has one year of asbestos abatement experience within the past three (3) years of similar size and complexity; has applicable medical and respiratory protection documentation; has certificate of training/current refresher and State accreditation/license.
All personnel should be in compliance with OSHA construction safety training as applicable and submit certification.

1.7 RESPIRATORY PROTECTION

1.7.1 GENERAL - RESPIRATORY PROTECTION PROGRAM

The Contractor shall develop and implement a written Respiratory Protection Program (RPP) which is in compliance with the January 8, 1998 OSHA requirements found at 29 CFR 1926.1101 and 29 CFR 1910.Subpart I;134. ANSI Standard Z88.2-1992 provides excellent guidance for developing a respiratory protection program. All respirators used must be NIOSH approved for asbestos abatement activities. The written RPP shall, at a minimum, contain the basic requirements found at 29 CFR 1910.134 (c) (1) (i - ix) - Respiratory Protection Program.

1.7.2 RESPIRATORY PROTECTION PROGRAM COORDINATOR

The Respiratory Protection Program Coordinator (RPPC) must be identified and shall have two (2) years experience coordinating RPP of similar size and complexity. The RPPC must submit a signed statement attesting to the fact that the program meets the above requirements.

1.7.3 SELECTION AND USE OF RESPIRATORS

The procedure for the selection and use of respirators must be submitted to the VA as part of the Contractor's qualifications. The procedure must be written clearly enough for workers to understand. A copy of the Respiratory Protection Program must be available in the clean room of the decontamination unit for reference by employees or authorized visitors.

1.7.4 MINIMUM RESPIRATORY PROTECTION

Minimum respiratory protection shall be a half face, HEPA filtered, air purifying respirator when fiber levels are maintained consistently at or below 0.1 f/cc. A higher level of respiratory protection may be provided or required, depending on fiber levels. Respirator selection shall meet the requirements of 29 CFR 1926.1101 (h); Table 1, except as indicated in this paragraph. Abatement personnel must have a respirator for their exclusive use.

1.7.5 MEDICAL WRITTEN OPINION

No employee shall be allowed to wear a respirator unless a physician or other licensed health care professional has provided a written determination, they are medically qualified to wear the class of respirator to be used on the project while wearing whole body impermeable garments and subjected to heat or cold stress.

1.7.6 RESPIRATOR FIT TEST

All personnel wearing respirators shall have a current qualitative/quantitative fit test which was conducted in accordance with 29 CFR 1910.134 (f) and Appendix A. Quantitative fit tests shall be done for PAPRs which have been put into a motor/blower failure mode.

1.7.7 RESPIRATOR FIT CHECK

The Competent Person shall assure that the positive/negative pressure user seal check is done each time the respirator is donned by an employee. Head coverings must cover respirator head straps. Any situation that prevents an effective facepiece to face seal as evidenced by failure of a user seal check shall preclude that person from wearing a respirator inside the regulated area until resolution of the problem.

1.7.8 MAINTENANCE AND CARE OF RESPIRATORS

The Respiratory Protection Program Coordinator shall submit evidence and documentation showing compliance with 29 CFR 1910.134 (h) Maintenance and care of respirators.

1.8 WORKER PROTECTION

1.8.1 TRAINING OF ABATEMENT PERSONNEL

Prior to beginning any abatement activity, all personnel shall be trained in accordance with OSHA 29 CFR 1926.1101 (k)(9) and any additional State/Local requirements. Training must include, at a minimum, the elements listed at 29 CFR 1926.1101 (k)(9)(viii). Training shall have been conducted by a third party, EPA/State approved trainer meeting the requirements of EPA 40 CFR 763 Appendix C (AHERA MAP). Initial training certificates and current refresher and accreditation proof must be submitted for each person working at the site.

1.8.2 MEDICAL EXAMINATIONS

Medical examinations meeting the requirements of 29 CFR 1926.1101 (m) shall be provided for all personnel working in the regulated area, regardless of exposure levels. A current physician's written opinion as required by 29 CFR 1926.1101 (m)(4) shall be provided for each person and shall include in the medical opinion the person has been evaluated for working in a heat and cold stress environment while wearing personal protective equipment (PPE) and is able to perform the work without risk of material health impairment.

1.8.3 PERSONAL PROTECTIVE EQUIPMENT

Provide whole body clothing, head coverings, foot coverings and any other personal protective equipment as determined by conducting the hazard assessment required by OSHA at 29 CFR 1910.132 (d). The Competent Person shall ensure the integrity of personal protective equipment worn for the duration of the project. Duct tape shall be used to secure all suit sleeves to wrists and to secure foot coverings at the ankle. Worker protection shall meet the most stringent requirements.

1.8.4 REGULATED AREA ENTRY PROCEDURE

The Competent Person shall ensure that each time workers enter the regulated area, they remove ALL street clothes in the clean room of the decontamination unit and put on new disposable coveralls, head coverings, a clean respirator, and then proceed through the shower room to the equipment room where they put on non-disposable required personal protective equipment.

1.8.5 DECONTAMINATION PROCEDURE

The Competent Person shall require all personnel to adhere to following decontamination procedures whenever they leave the regulated area.

- A. When exiting the regulated area, remove all disposable PPE and dispose of in a disposal bag provided in the regulated area.
- B. Carefully decontaminate and clean the respirator. Put in a clean container/bag.

1.8.6 REGULATED AREA REQUIREMENTS

The Competent Person shall meet all requirements of 29 CFR 1926.1101 (o) and assure that all requirements for Class I regulated areas at 29 CFR 1926.1101 (e) are met applicable to Class II work. All personnel in the

regulated area shall not be allowed to eat, drink, smoke, chew tobacco or gum, apply cosmetics, or in any way interfere with the fit of their respirator.

1.9 DECONTAMINATION FACILITIES

1.9.1 DESCRIPTION

Provide each regulated area with a fiber drum with a disposal bag in it for personnel waste materials.

1.9.2 WASTE/EQUIPMENT DECONTAMINATION AREA (W/EDA)

The Competent Person shall provide a W/EDA for removal of all waste, equipment and contaminated material from the regulated area.

1.9.3 WASTE/EQUIPMENT DECONTAMINATION PROCEDURES

Contain all waste in 6 mil poly bags. Clean/decontaminate bags and pass through a double 6 mil flap doorway into another bag or fiber drum. Remove to disposal dumpster/gondola/vehicle. At no time shall unprotected personnel from the clean side be allowed to enter the regulated area.

PART 2 - PRODUCTS, MATERIALS AND EQUIPMENT

2.1 MATERIALS AND EQUIPMENT

2.1.1 GENERAL REQUIREMENTS (ALL ABATEMENT PROJECTS)

Prior to the start of work, the contractor shall provide and maintain a sufficient quantity of materials and equipment to assure continuous and efficient work throughout the duration of the project. Work shall not start unless the following items have been delivered to the site and the CPIH/CIH has submitted verification to the VA's representative.

- A. All materials shall be delivered in their original package, container or bundle bearing the name of the manufacturer and the brand name (where applicable).
- B. Store all materials subject to damage off the ground, away from wet or damp surfaces and under cover sufficient enough to prevent damage or contamination. Flammable and combustible materials cannot be stored inside buildings. Replacement materials shall be stored outside of the regulated area until abatement is completed.
- C. The Contractor shall not block or hinder use of buildings by patients, staff, and visitors to the VA in partially occupied buildings by placing materials/equipment in any unauthorized location.
- D. The Competent Person shall inspect for damaged, deteriorating or previously used materials. Such materials shall not be used and shall be removed from the worksite and disposed of properly.
- E. Polyethylene sheeting for walls in the regulated area shall be a minimum of 4-mils. For floors and all other uses, sheeting of at least 6-mils shall be used in widths selected to minimize the frequency of joints. Fire retardant poly shall be used throughout.
- F. The method of attaching polyethylene sheeting shall be agreed upon in advance by the Contractor and the VA and selected to minimize damage to equipment and surfaces. Method of attachment may include any combination

of moisture resistant duct tape furring strips, spray glue, staples, nails, screws, lumber and plywood for enclosures or other effective procedures capable of sealing polyethylene to dissimilar finished or unfinished surfaces under both wet and dry conditions.

- G. Polyethylene sheeting utilized for the PDF shall be opaque white or black in color, 6 mil fire retardant poly.
- H. Installation and plumbing hardware, showers, hoses, drain pans, sump pumps and waste water filtration system shall be provided by the Contractor.
- I. An adequate number of HEPA vacuums, scrapers, sprayers, nylon brushes, brooms, disposable mops, rags, sponges, staple guns, shovels, ladders and scaffolding of suitable height and length as well as meeting OSHA requirements, fall protection devices, water hose to reach all areas in the regulated area, airless spray equipment, and any other tools, materials or equipment required to conduct the abatement project. All electrically operated hand tools, equipment, electric cords shall be connected to GFCI protection.
- J. Special protection for objects in the regulated area shall be detailed (e.g., plywood over carpeting or hardwood floors to prevent damage from scaffolds, water and falling material).
- K. Disposal bags - Materials shall be wrapped in 2 layers of 6 mil poly for transite waste and shall be pre-printed with labels, markings and address as required by OSHA, EPA and DOT regulations. If necessary, materials may be boxed or otherwise packaged to prevent damage to transite waste materials during transport. If boxed or otherwise packaged, appropriate labels shall be affixed to the outer layer of the final container.
- L. The VA shall be provided an advance copy of the MSDS as required for all hazardous chemicals under OSHA 29 CFR 1910.1200 - Hazard Communication in the pre-project submittal. Chlorinated compounds shall not be used with any spray adhesive, mastic remover or other product. Appropriate encapsulant(s) shall be provided.
- M. OSHA DANGER demarcation signs, as many and as required by OSHA 29 CFR 1926.1101(k) (7) shall be provided and placed by the Competent Person. All other posters and notices required by Federal and State regulations shall be posted in the Clean Room.
- N. Adequate and appropriate PPE for the project and number of personnel/shifts shall be provided. All personal protective equipment issued must be based on a written hazard assessment conducted under 29 CFR 1910.132(d).

2.2 CONTAINMENT BARRIERS AND COVERINGS IN THE REGULATED AREA

2.2.1 GENERAL

- A. Using critical barriers, Seal off the perimeter to the regulated area to completely isolate the regulated area from adjacent spaces. All surfaces in the regulated area must be covered to prevent contamination and to facilitate clean-up. Should adjacent areas become contaminated as a result of the work, shall immediately stop work and clean up the contamination at no additional cost to the VA. Provide firestopping and identify all fire barrier penetrations due to abatement work as specified in Section 3.1.4.8; FIRESTOPPING.
- B. Place all tools, scaffolding, materials and equipment needed for working in the regulated area prior to erecting any plastic sheeting. All uncontaminated removable furniture, equipment and/or supplies shall be removed by the VA from the regulated area before commencing work. Any

objects remaining in the regulated area shall be completely covered with 2 layers of 6-mil fire retardant poly sheeting and secured with duct tape. Lock out and tag out any HVAC/electrical systems in the regulated area.

2.2.3 CONTROLLING ACCESS TO THE REGULATED AREA

Access to the regulated area is allowed only through the personnel decontamination facility (PDF), if required. All other means of access shall be eliminated, and OSHA DANGER demarcation signs posted as required by OSHA. If the regulated area is adjacent to or within view of an occupied area, provide a visual barrier of 6 mil opaque fire-retardant poly sheeting to prevent building occupant observation. If the adjacent area is accessible to the public, the barrier must be solid.

2.2.4 CRITICAL BARRIERS

Completely separate any operations in the regulated area from adjacent areas using 2 layers of 6 mil fire retardant poly and duct tape. Individually seal with 2 layers of 6 mil poly and duct tape all HVAC openings into the regulated area. Individually seal all lighting fixtures, clocks, doors, windows, convectors, speakers, or any other objects/openings in the regulated area. Heat must be shut off any objects covered with poly.

2.2.5 SECONDARY BARRIERS:

A loose layer of 6 mil poly shall be used as a drop cloth to protect the primary layers from debris generated during the abatement. This layer shall be replaced as needed during the work and at a minimum once per work day.

2.2.6 EXTENSION OF THE REGULATED AREA

If the enclosure of the regulated area is breached in any way that could allow contamination to occur, the affected area shall be included in the regulated area and constructed as per this section. Decontamination measures must be started immediately and continue until air monitoring indicates background levels are met.

2.2.7 FIRESTOPPING:

- A. Through penetrations caused by cables, cable trays, pipes, sleeves, conduits, etc. must be firestopped with a fire-rated firestop system providing an air tight seal.
- B. Firestop materials that are not equal to the wall or ceiling penetrated shall be brought to the attention of the VA Representative. The contractor shall list all areas of penetration, the type of sealant used, and whether or not the location is fire rated. Any discovery of penetrations during abatement shall be brought to the attention of the VA representative immediately. All walls, floors and ceilings are considered fire rated unless otherwise determined by the VA Representative or Fire Marshall.
- C. Any visible openings whether or not caused by a penetration shall be reported by the Contractor to the VA Representative for a sealant system determination. Firestops shall meet ASTM E814 and UL 1479 requirements for the opening size, penetrant, and fire rating needed.

2.3 MONITORING, INSPECTION AND TESTING

2.3.1 GENERAL

- A. Perform throughout abatement work monitoring, inspection and testing inside and around the regulated area in accordance with the OSHA requirements and these specifications. OSHA requires that the employee exposure to asbestos must not exceed 0.1 fibers per cubic centimeter (f/cc) of air, averaged over an 8-hour work shift. The CPIH/CIH is responsible for and shall inspect and oversee the performance of the Contractor IH Technician. The IH Technician shall continuously inspect and monitor conditions inside the regulated area to ensure compliance with these specifications. In addition, the CPIH/CIH shall personally manage air sample collection, analysis, and evaluation for personnel, regulated area, and adjacent area samples to satisfy OSHA requirements. Additional inspection and testing requirements are also indicated in other parts of this specification.
- B. The VA will employ an independent industrial hygienist (VPIH/CIH) consultant and/or use its own IH to perform various services on behalf of the VA. The VPIH/CIH will perform the necessary monitoring, inspection, testing, and other support services to ensure that VA patients, employees, and visitors will not be adversely affected by the abatement work, and that the abatement work proceeds in accordance with these specifications, that the abated areas or abated buildings have been successfully decontaminated. The work of the VPIH/CIH consultant in no way relieves the Contractor from their responsibility to perform the work in accordance with contract/specification requirements, to perform continuous inspection, monitoring and testing for the safety of their employees, and to perform other such services as specified. The cost of the VPIH/CIH and their services will be borne by the VA except for any repeat of final inspection and testing that may be required due to unsatisfactory initial results. Any repeated final inspections and/or testing, if required, will be paid for by the Contractor.
- C. If fibers counted by the VPIH/CIH during abatement work, either inside or outside the regulated area, utilizing the NIOSH 7400 air monitoring method, exceed the specified respective limits, the Contractor shall stop work. The Contractor may request confirmation of the results by analysis of the samples by TEM. Request must be in writing and submitted to the VA's representative. Cost for the confirmation of results will be borne by the Contractor for both the collection and analysis of samples and for the time delay that may/does result for this confirmation. Confirmation sampling and analysis will be the responsibility of the CPIH/CIH with review and approval of the VPIH/CIH. An agreement between the CPIH/CIH and the VPIH/CIH shall be reached on the exact details of the confirmation effort, in writing, including such things as the number of samples, location, collection, quality control on-site, analytical laboratory, interpretation of results and any follow-up actions. This written agreement shall be co-signed by the IH's and delivered to the VA's representative.

2.3.2 SCOPE OF SERVICES OF THE VPIH/CIH CONSULTANT

- A. The purpose of the work of the VPIH/CIH is to: assure quality; adherence to the specification; resolve problems; prevent the spread of

contamination beyond the regulated area; and assure clearance at the end of the project. In addition, their work includes performing the final inspection and testing to determine whether the regulated area or building has been adequately decontaminated. All air monitoring is to be done utilizing PCM/TEM. The VPIH/CIH will perform the following tasks:

1. Task 1: Establish background levels before abatement begins by collecting background samples. Retain samples for possible TEM analysis.
 2. Task 2: Perform continuous air monitoring, inspection, and testing outside the regulated area during actual abatement work to detect any faults in the regulated area isolation and any adverse impact on the surroundings from regulated area activities.
 3. Task 3: Perform unannounced visits to spot check overall compliance of work with contract/specifications. These visits may include any inspection, monitoring, and testing inside and outside the regulated area and all aspects of the operation except personnel monitoring.
 4. Task 4: Provide support to the VA representative such as evaluation of submittals from the Contractor, resolution of conflicts, interpret data, etc.
 5. Task 5: Perform, in the presence of the VA representative, final inspection and testing of a decontaminated regulated area at the conclusion of the abatement to certify compliance with all regulations and VA requirements/specifications.
 6. Task 6: Issue certificate of decontamination for each regulated area and project report.
- B. All documentation, inspection results and testing results generated by the VPIH/CIH will be available to the Contractor for information and consideration. The Contractor shall cooperate with and support the VPIH/CIH for efficient and smooth performance of their work.
- C. The monitoring and inspection results of the VPIH/CIH will be used by the VA to issue any Stop Removal orders to the Contractor during abatement work and to accept or reject a regulated area or building as decontaminated.
- D. All air sampling and analysis data will be recorded on VA Form 10-0018.

2.3.3 MONITORING, INSPECTION AND TESTING BY CONTRACTOR CPIH/CIH

The Contractor's CPIH/CIH is responsible for managing all monitoring, inspections, and testing required by these specifications, as well as any and all regulatory requirements adopted by these specifications. The CPIH/CIH is responsible for the continuous monitoring of all subsystems and procedures which could affect the health and safety of the Contractor's personnel. Safety and health conditions and the provision of those conditions inside the regulated area for all persons entering the regulated area is the exclusive responsibility of the Contractor/Competent Person. The person performing the personnel and area air monitoring inside the regulated area shall be an IH Technician, who shall be trained and shall have specialized field experience in sampling and analysis. The IH Technician shall have successfully completed a NIOSH 582 Course or equivalent and provide documentation. The IH Technician shall participate in the AIHA Asbestos Analysis Registry or participate in the Proficiency Analytic Testing program of AIHA for fiber counting quality control assurance. The IH Technician shall also be an accredited

EPA AHERA/State Contractor/Supervisor, Abatement Worker and Building Inspector. The IH Technician shall have participated in five abatement projects collecting personal and area samples as well as responsibility for documentation on substantially similar projects in size and scope. The analytic laboratory used by the Contractor to analyze the samples shall be AIHA accredited for asbestos PAT and approved by the VA prior to start of the project. A daily log, shall be maintained by the CPIH/CIH or IH Technician, documenting all OSHA requirements for air personal monitoring for asbestos in 29 CFR 1926.1101(f), (g) and Appendix A. This log shall be made available to the VA representative and the VPIH/CIH upon request. The log will contain, at a minimum, information on personnel or area samples, other persons represented by the sample, the date of sample collection, start and stop times for sampling, sample volume, flow rate, and fibers/cc. The CPIH/CIH shall collect and analyze samples for each representative job being done in the regulated area, i.e., removal, wetting, clean-up, and load-out. No fewer than two personal samples per shift shall be collected and one area sample per 1,000 square feet of regulated area where abatement is taking place and one sample per shift in the clean room area shall be collected. In addition to the continuous monitoring required, the CPIH/CIH will perform inspection and testing at the final stages of abatement for each regulated area as specified in the CPIH/CIH responsibilities. Additionally, the CPIH/CIH will monitor and record pressure readings within the containment daily with a minimum of two readings at the beginning and at the end of a shift, and submit the data in the daily report.

2.4 ASBESTOS HAZARD ABATEMENT PLAN

The Contractor shall have established Asbestos Hazard Abatement Plan (AHAP) in printed form and loose-leaf folder consisting of simplified text, diagrams, sketches, and pictures that establish and explain clearly the ways and procedures to be followed during all phases of the work by the contractor's personnel. The AHAP(s) must be modified as needed to address specific requirements of the project. The AHAP shall be submitted for review and approval prior to the start of any abatement work. The minimum topics and areas to be covered by the AHAP(s) are:

- A. Minimum Personnel Qualifications
- B. Contingency Plans and Arrangements
- C. Security and Safety Procedures
- D. Respiratory Protection/Personal Protective Equipment Program and Training
- E. Medical Surveillance Program and Recordkeeping
- F. Regulated Area Requirements for Class II work
- G. Decontamination Facilities and Entry/Exit Procedures (PDF and W/EDF)
- H. Monitoring, Inspections, and Testing
- I. Removal Procedures for Class II Materials
- J. Disposal of ACM Waste
- K. Regulated Area Decontamination/Clean-up
- L. Regulated Area Visual and Air Clearance
- M. Project Completion/Closeout

2.5 SUBMITTALS

2.5.1 PRE-START MEETING SUBMITTALS

Submit to the VA a minimum of 14 days prior to the pre-start meeting the following for review and approval. Meeting this requirement is a prerequisite for the pre-start meeting for this project:

- A. Submit a detailed work schedule for the entire project reflecting contract documents and the phasing/schedule requirements from the CPM chart.
- B. Submit a staff organization chart showing all personnel who will be working on the project and their capacity/function. Provide their qualifications, training, accreditations, and licenses, as appropriate. Provide a copy of the "Certificate of Worker's Acknowledgment" and the "Affidavit of Medical Surveillance and Respiratory Protection" for each person.
- C. Submit Asbestos Hazard Abatement Plan developed specifically for this project, incorporating the requirements of the specifications, prepared, signed and dated by the CPIH/CIH.
- D. Submit the specifics of the materials and equipment to be used for this project with manufacturer names, model numbers, performance characteristics, pictures/diagrams, and number available for the following:
 1. Supplied air system, negative air machines, HEPA vacuums, air monitoring pumps, calibration devices, pressure differential monitoring device and emergency power generating system.
 2. Waste water filtration system, shower system, containment barriers.
 3. Encapsulants, surfactants, hand held sprayers, airless sprayers, and fire extinguishers.
 4. Respirators, protective clothing, personal protective equipment.
 5. Fire safety equipment to be used in the regulated area.
- E. Submit the name, location, and phone number of the approved landfill; proof/verification the landfill is approved for ACM disposal; the landfill's requirements for ACM waste; the type of vehicle to be used for transportation; and name, address, and phone number of subcontractors, if used. Proof of asbestos training for transportation personnel shall be provided.
- F. Submit required notifications and arrangements made with regulatory agencies having regulatory jurisdiction and the specific contingency/emergency arrangements made with local health, fire, ambulance, hospital authorities and any other notifications/arrangements.
- G. Submit the name, location and verification of the laboratory and/or personnel to be used for analysis of air and/or bulk samples. Personal air monitoring must be done in accordance with OSHA 29 CFR 1926.1101(f) and Appendix A. Area or clearance air monitoring shall be conducted in accordance with EPA AHERA protocols.
- H. Submit qualifications verification: Submit the following evidence of qualifications. Make sure that all references are current and verifiable by providing current phone numbers and documentation.
 1. Asbestos Abatement Company: Project experience within the past 3 years; listing projects first most similar to this project: Project Name; Type of Abatement; Duration; Cost; Reference Name/Phone Number; Final Clearance; and Completion Date
 2. List of project(s) halted by owner, A/E, IH, regulatory agency in the last 3 years: Project Name; Reason; Date; Reference Name/Number; Resolution

3. List asbestos regulatory citations (e.g., OSHA), notices of violations (e.g., Federal and state EPA), penalties, and legal actions taken against the company including and of the company's officers (including damages paid) in the last 3 years. Provide copies and all information needed for verification.
- I. Submit information on personnel: Provide a resume; address each item completely; copies of certificates, accreditations, and licenses. Submit an affidavit signed by the CPIH/CIH stating that all personnel submitted below have medical records in accordance with OSHA 29 CFR 1926.1101(m) and 29 CFR 1910.20 and that the company has implemented a medical surveillance program and written respiratory protection program, and maintains recordkeeping in accordance with the above regulations. Submit the phone number and doctor/clinic/hospital used for medical evaluations.
 1. CPIH/CIH and IH Technician: Name; years of abatement experience; list of projects similar to this one; certificates, licenses, accreditations for proof of AHERA/OSHA specialized asbestos training; professional affiliations; number of workers trained; samples of training materials; samples of AHAP(s) developed; medical opinion; and current respirator fit test.
 2. Competent Person(s)/Supervisor(s): Number; names; social security numbers; years of abatement experience as Competent Person/Supervisor; list of similar projects in size/complexity as Competent Person/Supervisor; as a worker; certificates, licenses, accreditations; proof of AHERA/OSHA specialized asbestos training; maximum number of personnel supervised on a project; medical opinion (asbestos surveillance and respirator use); and current respirator fit test.
 3. Workers: Numbers; names; social security numbers; years of abatement experience; certificates, licenses, accreditations; training courses in asbestos abatement and respiratory protection; medical opinion (asbestos surveillance and respirator use); and current respirator fit test.
 - J. Submit copies of State license for asbestos abatement; copy of insurance policy, including exclusions with a letter from agent stating in plain language the coverage provided and the fact that asbestos abatement activities are covered by the policy; copy of SOP's incorporating the requirements of this specification; information on who provides your training, how often; who provides medical surveillance, how often; who performs and how is personal air monitoring of abatement workers conducted; a list of references of independent laboratories/IH's familiar with your air monitoring and standard operating procedures; copies of monitoring results of the five referenced projects listed and analytical method(s) used.
 - K. Rented equipment must be decontaminated prior to returning to the rental agency.
 - L. Submit, before the start of work, the manufacturer's technical data for all types of encapsulants, all MSDS and application instructions.

2.5.2 SUBMITTALS DURING ABATEMENT

- A. The Competent Person shall maintain and submit a daily log at the regulated area documenting the dates and times of the following: purpose, attendees and summary of meetings; all personnel entering/exiting the regulated area; document and discuss the resolution of unusual events

such as barrier breeching, equipment failures, emergencies, and any cause for stopping work; representative air monitoring and results/TWAs/ELs. Submit this information daily to the VPIH/CIH.

- B. The CPIH/CIH shall document and maintain the inspection and approval of the regulated area preparation prior to start of work and daily during work.
 - 1. Removal of any poly barriers.
 - 2. Visual inspection/testing by the CPIH/CIH or IH Technician prior to application of lockdown encapsulant.
 - 3. Packaging and removal of ACM waste from regulated area.
 - 4. Disposal of ACM waste materials; copies of Waste Shipment Records/landfill receipts to the VA's representative on a weekly basis.

2.5.3 SUBMITTALS AT COMPLETION OF ABATEMENT

The CPIH/CIH shall submit a project report consisting of the daily log book requirements and documentation of events during the abatement project including Waste Shipment Records signed by the landfill's agent. It will also include information on the containment and transportation of waste from the containment with applicable Chain of Custody forms. The report shall include a certificate of completion, signed and dated by the CPIH/CIH, in accordance with Attachment #1. All clearance and perimeter area samples must be submitted. The VA Representative will retain the abatement report after completion of the project and provide copies of the abatement report to VAMC Office of Engineer and the Safety Office.

PART 3 - EXECUTION

3.1 REGULATED AREA PREPARATIONS

3.1.1 SITE SECURITY

- A. Regulated area access is to be restricted only to authorized, trained/accredited and protected personnel. These may include the Contractor's employees, employees of Subcontractors, VA employees and representatives, State and local inspectors, and any other designated individuals. A list of authorized personnel shall be established prior to commencing the project and be posted in the clean room of the decontamination unit.
- B. Entry into the regulated area by unauthorized individuals shall be reported immediately to the Competent Person by anyone observing the entry. The Competent person shall immediately notify the VA.
- C. A log book shall be maintained in the clean room of the decontamination unit. Anyone who enters the regulated area must record their name, affiliation, time in, and time out for each entry.
- D. Access to the regulated area shall be through of a critical barrier doorway. All other access (doors, windows, hallways, etc.) shall be sealed or locked to prevent entry to or exit from the regulated area. The only exceptions for this requirement are the waste/equipment load-out area which shall be sealed except during the removal of containerized asbestos waste from the regulated area, and emergency exits. Emergency exits shall not be locked from the inside; however, they shall be sealed with poly sheeting and taped until needed.
- E. The Contractor's Competent Person shall control site security during abatement operations in order to isolate work in progress and protect adjacent personnel. A 24-hour security system shall be provided at the

entrance to the regulated area to assure that all entrants are logged in/out and that only authorized personnel are allowed entrance.

- F. The Contractor will have the VA's assistance in notifying adjacent personnel of the presence, location and quantity of ACM in the regulated area and enforcement of restricted access by the VA's employees.
- G. The regulated area shall be locked during non-working hours and secured by VA Representative or Competent Person. The VA Police should be informed of asbestos abatement regulated areas to provide security checks during facility rounds and emergency response.

3.1.2 OSHA DANGER SIGNS

Post OSHA DANGER signs meeting the specifications of OSHA 29 CFR 1926.1101 at any location and approaches to the regulated area where airborne concentrations of asbestos may exceed the PEL. Signs shall be posted at a distance sufficiently far enough away from the regulated area to permit any personnel to read the sign and take the necessary measures to avoid exposure. Additional signs will be posted following construction of the regulated area enclosure.

3.1.3 SHUT DOWN - LOCK OUT ELECTRICAL

Shut down and lock out/tag out electric power to the regulated area. Provide temporary power and lighting. Insure safe installation including GFCI of temporary power sources and equipment by compliance with all applicable electrical code requirements and OSHA requirements for temporary electrical systems. Electricity shall be provided by the VA.

3.1.4 SHUT DOWN - LOCK OUT HVAC

Shut down and lock out/tag out heating, cooling, and air conditioning system (HVAC) components that are in, supply or pass through the regulated area.

Investigate the regulated area and agree on pre-abatement condition with the VA's representative. Seal all intake and exhaust vents in the regulated area with duct tape and 2 layers of 6-mil poly. Also, seal any seams in system components that pass through the regulated area. Remove all contaminated HVAC system filters and place in labeled 6-mil poly disposal bags for disposal as asbestos waste.

3.1.5 NEGATIVE PRESSURE FILTRATION SYSTEM

The Contractor shall provide enough HEPA negative air machines to effect greater than (>) - 0.02" water column gauge (WCG) pressure. The Competent Person shall determine the number of units needed for the regulated area by dividing the cubic feet in the regulated area by 15 and then dividing that result by the cubic feet per minute (CFM) for each unit to determine the number of units needed to effect > - 0.02" WCG pressure. Provide a standby unit in the event of machine failure and/or emergency in an adjacent area.

NIOSH has done extensive studies and has determined that negative air machines typically operate at ~50% efficiency. The contractor shall consider this in their determination of number of units needed to provide > - 0.02" WCG pressure. The contractor shall use double the number of

machines, based on their calculations, or submit proof their machines operate at stated capacities, at a 2" pressure drop across the filters.

3.1.6 CONTAINMENT BARRIERS AND COVERINGS FOR THE REGULATED AREA

3.1.6.1 GENERAL

- A. Using critical barriers, seal off the perimeter to the regulated area to completely isolate the regulated area from adjacent spaces. All surfaces in the regulated area must be covered to prevent contamination and to facilitate clean-up. Should adjacent areas become contaminated as a result of the work, shall immediately stop work and clean up the contamination at no additional cost to the VA. Provide firestopping and identify all fire barrier penetrations due to abatement work as specified in Section 3.1.4.8; FIRESTOPPING.

3.1.6.2 PREPARATION PRIOR TO SEALING OFF

Place all tools, scaffolding, materials and equipment needed for working in the regulated area prior to erecting any plastic sheeting. All uncontaminated removable furniture, equipment and/or supplies shall be removed by the VA from the regulated area before commencing work. Any objects remaining in the regulated area shall be completely covered with 2 layers of 6-mil fire retardant poly sheeting and secured with duct tape. Lock out and tag out any HVAC/electrical systems in the regulated area.

3.1.6.3 CONTROLLING ACCESS TO THE REGULATED AREA

Access to the regulated area shall be permitted only by the competent person. All other means of access shall be eliminated, and OSHA DANGER demarcation signs posted as required by OSHA. If the regulated area is adjacent to, or within view of an occupied area, provide a visual barrier of 6 mil opaque fire-retardant poly to prevent building occupant observation. If the adjacent area is accessible to the public, the barrier must be solid and capable of withstanding the negative pressure.

3.1.6.4 CRITICAL BARRIERS

Completely separate any operations in the regulated area from adjacent areas using 2 layers of 6 mil fire retardant poly and duct tape. Individually seal with 2 layers of 6 mil poly and duct tape all HVAC openings into the regulated area. Individually seal all lighting fixtures, clocks, doors, windows, convectors, speakers, or any other objects/openings in the regulated area. Heat must be shut off any objects covered with poly.

3.1.6.5 EXTENSION OF THE REGULATED AREA

If the enclosure of the regulated area is breached in any way that could allow contamination to occur, the affected area shall be included in the regulated area and constructed as per this section. Decontamination measures must be started immediately and continue until air monitoring indicates background levels are met

3.1.6.6 FLOOR BARRIERS

If floor removal is not being done, all floors in the regulated area shall be covered with 2 layers of 6 mil fire retardant poly and brought up the wall 12 inches.

3.1.7 PERSONAL PROTECTIVE EQUIPMENT

Refer to Sections 1,7 and 1.8.3 of this documents.

3.1.8 SANITARY FACILITIES

The Contractor shall provide sanitary facilities for abatement personnel and maintain them in a clean and sanitary condition throughout the abatement project.

3.1.9 PRE-CLEANING

3.1.9.1 PRE-CLEANING MOVABLE OBJECTS

Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area. After items have been pre-cleaned and decontaminated, they may be removed from the work area for storage until the completion of abatement in the work area.

Pre-clean all movable objects within the regulated area using a HEPA filtered vacuum and/or wet cleaning methods as appropriate. After cleaning, these objects shall be removed from the regulated area and carefully stored in an uncontaminated location.

3.1.9.2 PRE-CLEANING FIXED OBJECTS

Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area

Pre-clean all fixed objects in the regulated area using HEPA filtered vacuums and/or wet cleaning techniques as appropriate. Careful attention must be paid to machinery behind grills or gratings where access may be difficult, but contamination may be significant. Also, pay particular attention to wall, floor and ceiling penetration behind fixed items. After pre-cleaning, enclose fixed objects with 2 layers of 6-mil poly and seal securely in place with duct tape. Objects (e.g., permanent fixtures, shelves, electronic equipment, laboratory tables, sprinklers, alarm systems, closed circuit TV equipment and computer cables) which must remain in the regulated area and that require special ventilation or enclosure requirements should be designated here along with specified means of protection. Contact the manufacturer for special protection requirements.

3.1.9.3 PRE-CLEANING SURFACES IN THE REGULATED AREA

Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area

Pre-clean all surfaces in the regulated area using HEPA filtered vacuums and/or wet cleaning methods as appropriate. Do not use any methods that

would raise dust such as dry sweeping or vacuuming with equipment not equipped with HEPA filters. Do not disturb asbestos-containing materials during this pre-cleaning phase.

3.1.10 PRE-ABATEMENT ACTIVITIES

3.1.10.1 PRE-ABATEMENT MEETING

The VA representative, upon receipt, review, and substantial approval of all pre-abatement submittals and verification by the CPIH that all materials and equipment required for the project are on the site, will arrange for a pre-abatement meeting between the Contractor, the CPIH, Competent Person(s), the VA representative(s), and the VPIH/CIH. The purpose of the meeting is to discuss any aspect of the submittals needing clarification or amplification and to discuss any aspect of the project execution and the sequence of the operation. The Contractor shall be prepared to provide any supplemental information/ documentation to the VA's representative regarding any submittals, documentation, materials or equipment. Upon satisfactory resolution of any outstanding issues, the VA's representative will issue a written order to proceed to the Contractor. No abatement work of any kind described in the following provisions shall be initiated prior to the VA written order to proceed.

3.1.10.2 PRE-ABATEMENT INSPECTIONS AND PREPARATIONS

Before any work begins on the construction of the regulated area, the Contractor will:

- A. Conduct a space-by-space inspection with an authorized VA representative and prepare a written inventory of all existing damage in those spaces where asbestos abatement will occur. Still or video photography may be used to supplement the written damage inventory. Document will be signed and certified as accurate by both parties.
- B. The VA Representative, the Contractor, and the VPIH/CIH must be aware of AEQA 10-95 indicating the failure to identify asbestos in the areas listed as well as common issues when preparing specifications and contract documents. This is especially critical when demolition is planned, because AHERA surveys are non-destructive, and ACM may remain undetected. A NESHAP-compliant (destructive) ACM inspection should be conducted on all building structures that will be demolished. Ensure the following areas are inspected on the project: Lay-in ceilings concealing ACM; ACM behind walls/windows from previous renovations; inside utility chases/walls; transite piping/ductwork/sheets; behind radiators; lab fume hoods; transite lab countertops; roofing materials; below window sills; water/sewer lines; electrical conduit coverings; crawl spaces(previous abatement contamination); flooring/mastic covered by carpeting/new flooring; exterior insulated wall panels; on underground fuel tanks; steam line trench coverings.
- C. Ensure that all furniture, machinery, equipment, curtains, drapes, blinds, and other movable objects required to be removed from the regulated area have been cleaned and removed or properly protected from contamination.
- D. Shut down and seal with a minimum of 2 layers of 6 mil fire retardant poly all HVAC systems and critical openings in the regulated area. The regulated area critical barriers shall be completely isolate the regulated

area from any other air in the building. The VA's representative will monitor the isolation provision.

- E. Shut down and lock out in accordance with 29 CFR 1910.147 all electrical circuits which pose a potential hazard. Electrical arrangements will be tailored to the particular regulated area and the systems involved. All electrical circuits affected will be turned off at the circuit box outside the regulated area, not just the wall switch. The goal is to eliminate the potential for electrical shock which is a major threat to life in the regulated area due to water use and possible energized circuits. Electrical lines used to power equipment in the regulated area shall conform to all electrical safety standards and shall be isolated by the use of a ground fault circuit interrupter (GFCI). All GFCI shall be tested prior to use. The VA's representative will monitor the electrical shutdown.
- F. If required, remove and dispose of carpeting from floors in the regulated area.
- G. Inspect existing firestopping in the regulated area. Correct as needed.

3.1.10.3 PRE-ABATEMENT CONSTRUCTION AND OPERATIONS

- A. Perform all preparatory work for the first regulated area in accordance with the approved work schedule and with this specification.
- B. Upon completion of all preparatory work, the CPIH/CIH will inspect the work and systems and will notify the VA's representative when the work is completed in accordance with this specification. The VA's representative may inspect the regulated area and the systems with the VPIH/CIH and may require that upon satisfactory inspection, the Contractor's employees perform all major aspects of the approved AHAP(s), especially worker protection, respiratory systems, contingency plans, decontamination procedures, and monitoring to demonstrate satisfactory operation. The operational systems for respiratory protection and the negative pressure system shall be demonstrated for proper performance.
- C. The CPIH/CIH shall document the pre-abatement activities described above and deliver a copy to the VA's representative.
- D. Upon satisfactory inspection of the installation of and operation of systems the VA's representative will notify the Contractor in writing to proceed with the asbestos abatement work in accordance with this specification and all applicable regulations.

3.2 REMOVAL OF CLASS II TRANSITE MATERIALS

3.2.1 GENERAL

All applicable requirements of OSHA, EPA, and DOT shall be followed during Class II work. Keep materials intact; do not break up materials; wet while working with it; wrap as soon as possible with 2 layers of 6 mil plastic for disposal, and maintain good housekeeping in work areas during abatement.

3.2.2 OUTDOOR WORK AREAS

On some projects, work must be performed on exterior areas of the building. If outdoor work is to be performed, all applicable OSHA, state and local regulations must be followed to ensure that outdoor work areas

are in compliance so that workers, the general public and the environment are protected.

3.2.3 SCAFFOLD FALL PROTECTION

Each employee more than 6 feet above the base work level shall be protected from falls by guardrails or a fall arrest system. Fall arrest system includes harnesses, components of the harness/belt such as Dee-rings, and snap hooks, lifelines, and anchorage points. Lifelines must be independent of supports lines and suspension ropes and not attached to the same anchorage point as the support or suspension rope. OSHA's scaffolding standard defines a competent person as "one who is capable of identifying existing and predictable hazards in the surroundings or working conditions, which are unsanitary, hazardous to employees, and who has authorization to take prompt corrective measures to eliminate them." The competent person will determine if it is safe for employees to work on or from a scaffold or roof during storms or high winds and to ensure that a personal fall arrest system will protect the employees. The competent person will also inspect the scaffold and scaffold components for visible defects before each work shift and after any occurrence which could affect the structural integrity and to authorize prompt corrective measures.

3.2.4 ROOF/ELEVATED WORK AREA PROTECTION

The competent person shall determine if the walking/working surfaces on which the employees are to work on have the strength and structural integrity to support the employees safely. Each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge which is 6 feet or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest system.

3.2.5 EXCAVATION/TRENCHING WORK AREA PROTECTION

Each employee who is working in excavation/trenching work areas to alter or remove materials such as underground piping shall be protected from hazards arising from such work areas. A competent person who is OSHA trained in excavation/trenching operations must be present on site at all time in which work in these areas occurs. The competent person will determine if it is safe for employees to work on or in excavation/trenching work areas and to ensure that all applicable safety measures will protect the employees. The competent person will also inspect the excavation/trenching areas for visible defects before each work shift and after any occurrence which could affect the structural integrity of the excavation/trenching areas and to authorize prompt corrective measures.

3.2.6 REMOVAL OF TRANSITE:

- A. All transite must be wetted prior to removal. Unfasten transite panels without disturbance. Keep transite intact.
- B. All waste must be wrapped in two layers of 6 mil poly and lowered carefully to the ground.
- C. Materials may not be dropped from any height. Unless the material is carried or passed to the ground by hand, it shall be lowered to the ground via covered, dust-tight chute, crane or hoist.

3.3 DISPOSAL OF CLASS II WASTE MATERIAL

3.3.1 GENERAL

The VA must be notified at least 24 hours in advance of any waste removed from the containment. Dispose of waste ACM and debris which is packaged in accordance with these specifications, OSHA, EPA and DOT. The landfill requirements for packaging must also be met. Transport will be in compliance with 49 CFR 100-185 regulations. Disposal shall be done at an approved landfill. Disposal of non-friable ACM shall be done in accordance with applicable regulations.

3.4 PROJECT DECONTAMINATION

3.4.1 GENERAL

- A. The entire work related to project decontamination shall be performed under the close supervision and monitoring of the CPIH/CIH.
- B. If the asbestos abatement work is in an area which was contaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior to its removal and cleanings of the surfaces of the regulated area after the primary barrier removal.
- C. If the asbestos abatement work is in an area which was uncontaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior to its removal, thus preventing contamination of the building when the regulated area critical barriers are removed.

3.4.2 REGULATED AREA CLEARANCE

Air testing and other requirements which must be met before release of the Contractor and re-occupancy of the regulated area space are specified in Final Testing Procedures.

3.4.3 WORK DESCRIPTION

Decontamination includes the clearance air testing in the regulated area and the decontamination and removal of the enclosures/facilities installed prior to the abatement work including primary/critical barriers, PDF and W/EDF facilities, and negative pressure systems.

3.4.4 PRE-DECONTAMINATION CONDITIONS

- A. Before decontamination starts, all ACM waste from the regulated area shall be removed, all waste collected and removed, and the secondary barrier of poly removal and disposed of along with any gross debris generated by the work.
- B. At the start of decontamination, the following shall be in place:

1. Critical barriers over all openings consisting of two layers of 6 mil poly which is the sole barrier between the regulated area and the rest of the building or outside.
2. Decontamination facilities, if required for personnel and equipment in operating condition.

3.4.5. CLEANING

Carry out a first cleaning of all surfaces of the regulated area including items of remaining poly sheeting, tools, scaffolding, ladders/staging by wet methods and/or HEPA vacuuming. Do not use dry dusting/sweeping/air blowing methods. Use each surface of a wetted cleaning cloth one time only and then dispose of as contaminated waste. Continue this cleaning until there is no visible residue from abated surfaces or poly or other surfaces. Remove all filters in the air handling system and dispose of as ACM waste in accordance with these specifications. The negative pressure system shall remain in operation during this time. Additional cleaning(s) may be needed as determined by the CPIH/VPIH/CIH.

3.5 VISUAL INSPECTION AND AIR CLEARANCE TESTING

3.5.1 GENERAL

Notify the VA representative 24 hours in advance for the performance of the final visual inspection and testing. The final visual inspection and testing will be performed by the VPIH/CIH after the cleaning.

3.5.2 VISUAL INSPECTION

Final visual inspection will include the entire regulated area, all poly sheeting, seals over HVAC openings, doorways, windows, and any other openings. If any debris, residue, dust or any other suspect material is detected, the cleaning shall be repeated at no cost to the VA. Dust/material samples may be collected and analyzed at no cost to the VA at the discretion of the VPIH/CIH to confirm visual findings. When the regulated area is visually clean the final testing can be done.

3.5.3 AIR CLEARANCE TESTING

- A. After an acceptable final visual inspection by the VPIH/CIH and VA Representative, the VPIH/CIH will perform the final clearance testing. Air samples will be collected and analyzed in accordance with procedures for AHERA in this specification. If work is less than 260 lf/160 sf/35 cf, 5 PCM samples shall be collected for clearance and a minimum of one field blank. If work is equal to or more than 260 lf/160 sf/35 cf, AHERA TEM sampling shall be performed for clearance. TEM analysis shall be done in accordance with procedures for EPA AHERA in this specification. If the release criteria are not met, the Contractor shall repeat the final cleaning and continue decontamination procedures until clearance is achieved. **All Additional inspection and testing costs will be borne by the Contractor.**
- B. If release criteria are met, proceed to perform the abatement closeout and to issue the certificate of completion in accordance with these specifications.

3.5.4 FINAL AIR CLEARANCE PROCEDURES

- A. Contractor's Release Criteria: Work in a regulated area is complete when the regulated area is visually clean and airborne fiber levels have been reduced to or below 0.01 f/cc, as measured by PCM methods.
- B. Air Monitoring and Final Clearance Sampling: To determine if the elevated airborne fiber counts encountered during abatement operations have been reduced to the specified level, the VPIH/CIH will secure samples and analyze them according to the following procedures:
 - 1. Fibers Counted: "Fibers" referred to in this section shall be either all fibers regardless of composition as counted in the NIOSH 7400 PCM method.
 - 2. All final air testing samples shall be collected using aggressive sampling techniques except where soil is not encapsulated or enclosed. Samples will be collected on 0.8 μ MCE filters for PCM analysis and 0.45 μ Polycarbonate filters for TEM. A minimum of 1200 Liters of using calibrated pumps shall be collected for clearance samples. Before pumps are started, initiate aggressive air mixing sampling as detailed in 40 CFR 763 Subpart E (AHERA) Appendix A (III) (B) (7) (d). Air samples will be collected in areas subject to normal air circulation away from corners, obstructed locations, and locations near windows, doors, or vents. After air sampling pumps have been shut off, circulating fans shall be shut off. The negative pressure system shall continue to operate.

3.6 ABATEMENT CLOSEOUT AND CERTIFICATE OF COMPLIANCE

3.6.1 COMPLETION OF ABATEMENT WORK

- A. After thorough decontamination, complete asbestos abatement work upon meeting the regulated area clearance criteria and fulfilling the following:
 - 1. Remove all equipment, materials, and debris from the project area.
 - 2. Package and dispose of all asbestos waste as required.
 - 3. Repair or replace all interior finishes damaged during the abatement work.
 - 4. Fulfill other project closeout requirements as specified elsewhere in this specification.

3.6.2 CERTIFICATE OF COMPLETION BY CONTRACTOR

The CPIH shall complete and sign the "Certificate of Completion" in accordance with Attachment 1 at the completion of the abatement and decontamination of the regulated area.

3.6.3 WORK SHIFTS

All work shall be done during administrative hours (8:00 AM to 4:30 PM) Monday - Friday excluding Federal Holidays. Any change in the work schedule must be approved in writing by the VA Representative. Workers will be provided with adequate washing and break area facilities located away from the containment site.

ATTACHMENT #1

CERTIFICATE OF COMPLETION

DATE: _____ VA Project #: _____
PROJECT NAME: _____ Abatement Contractor: _____
VAMC/ADDRESS: _____

1. I certify that I have personally inspected, monitored and supervised the abatement work of (specify regulated area or Building):
which took place from / / to / /
2. That throughout the work all applicable requirements/regulations and the VA's specifications were met.
3. That any person who entered the regulated area was protected with the appropriate personal protective equipment and respirator and that they followed the proper entry and exit procedures and the proper operating procedures for the duration of the work.
4. That all employees of the Abatement Contractor engaged in this work were trained in respiratory protection, were experienced with abatement work, had proper medical surveillance documentation, were fit-tested for their respirator, and were not exposed at any time during the work to asbestos without the benefit of appropriate respiratory protection.
5. That I performed and supervised all inspection and testing specified and required by applicable regulations and VA specifications.
6. That the conditions inside the regulated area were always maintained in a safe and healthy condition and the maximum fiber count never exceeded 0.5 f/cc, except as described below.
7. That all abatement work was done in accordance with OSHA requirements and the manufacturer's recommendations.

CPIH/CIH Signature/Date: _____

CPIH/CIH Print Name: _____

Abatement Contractor Signature/Date: _____

Abatement Contractor Print Name: _____

ATTACHMENT #2

CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME: _____ DATE: _____
PROJECT ADDRESS: _____
ABATEMENT CONTRACTOR'S NAME: _____

WORKING WITH ASBESTOS CAN BE HAZARDOUS TO YOUR HEALTH. INHALING ASBESTOS HAS BEEN LINKED WITH VARIOUS TYPES OF CANCERS. IF YOU SMOKE AND INHALE ASBESTOS FIBERS, YOUR CHANCES OF DEVELOPING LUNG CANCER IS GREATER THAN THAT OF THE NON-SMOKING PUBLIC.

Your employer's contract with the owner for the above project requires that: You must be supplied with the proper personal protective equipment including an adequate respirator and be trained in its use. You must be trained in safe and healthy work practices and in the use of the equipment found at an asbestos abatement project. You must receive/have a current medical examination for working with asbestos. These things shall be provided at no cost to you. By signing this certificate, you are indicating to the owner that your employer has met these obligations.

RESPIRATORY PROTECTION: I have been trained in the proper use of respirators and have been informed of the type of respirator to be used on the above indicated project. I have a copy of the written Respiratory Protection Program issued by my employer. I have been provided for my exclusive use, at no cost, with a respirator to be used on the above indicated project.

TRAINING COURSE: I have been trained by a third party, State/EPA accredited trainer in the requirements for an AHERA/OSHA Asbestos Abatement Worker training course, 32 hours minimum duration. I currently have a valid State accreditation certificate. The topics covered in the course include, as a minimum, the following:

- Physical Characteristics and Background Information on Asbestos
- Potential Health Effects Related to Exposure to Asbestos
- Employee Personal Protective Equipment
- Establishment of a Respiratory Protection Program
- State of the Art Work Practices
- Personal Hygiene
- Additional Safety Hazards
- Medical Monitoring
- Air Monitoring
- Relevant Federal, State and Local Regulatory Requirements, Procedures, and Standards
- Asbestos Waste Disposal

MEDICAL EXAMINATION: I have had a medical examination within the past 12 months which was paid for by my employer. This examination included: health history, occupational history, pulmonary function test, and may have included a chest x-ray evaluation. The physician issued a positive written opinion after the examination.

Signature: _____

Printed Name: _____

Social Security Number:_____

Witness:_____

ATTACHMENT #3

AFFIDAVIT OF MEDICAL SURVEILLANCE, RESPIRATORY PROTECTION AND TRAINING/ACCREDITATION

VA PROJECT NAME AND NUMBER:_____

VA MEDICAL FACILITY:_____

ABATEMENT CONTRACTOR'S NAME AND ADDRESS:_____

1. I verify that the following individual

Name:_____ Social Security Number:_____

who is proposed to be employed in asbestos abatement work associated with the above project by the named Abatement Contractor, is included in a medical surveillance program in accordance with 29 CFR 1926.1101(m), and that complete records of the medical surveillance program as required by 29 CFR 1926.1101(m)(n) and 29 CFR 1910.20 are kept at the offices of the Abatement Contractor at the following address.

Address:_____

2. I verify that this individual has been trained, fit-tested and instructed in the use of all appropriate respiratory protection systems and that the person is capable of working in safe and healthy manner as expected and required in the expected work environment of this project.

3. I verify that this individual has been trained as required by 29 CFR 1926.1101(k). This individual has also obtained a valid State accreditation certificate. Documentation will be kept on-site.

4. I verify that I meet the minimum qualifications criteria of the VA specifications for a CPIH.

Signature of CPIH/CIH:_____ Date:_____

Printed Name of CPIH/CIH: _____

Signature of Contractor:_____ Date:_____

Printed Name of Contractor:_____

ATTACHMENT #4

ABATEMENT CONTRACTOR/COMPETENT PERSON(S) REVIEW AND ACCEPTANCE OF THE VA'S ASBESTOS SPECIFICATIONS

VA Project Location:_____

VA Project #:_____

VA Project Description:_____

This form shall be signed by the Asbestos Abatement Contractor Owner and the Asbestos Abatement Contractor's Competent Person(s) prior to any start of work at the VA related to this Specification. If the Asbestos Abatement Contractor's/Competent Person(s) has not signed this form, they shall not be allowed to work on-site.

I, the undersigned, have read VA's Asbestos Specification regarding the asbestos abatement requirements. I understand the requirements of the VA's Asbestos Specification and agree to follow these requirements as well as all required rules and regulations of OSHA/EPA/DOT and State/Local requirements. I have been given ample opportunity to read the VA's Asbestos Specification and have been given an opportunity to ask any questions regarding the content and have received a response related to those questions. I do not have any further questions regarding the content, intent and requirements of the VA's Asbestos Specification.

At the conclusion of the asbestos abatement, I will certify that all asbestos abatement work was done in accordance with the VA's Asbestos Specification and all ACM was removed properly and no fibrous residue remains on any abated surfaces.

Abatement Contractor Owner's Signature_____Date_____

Abatement Contractor Competent Person(s)_____Date_____

- - END- - - -

SECTION 02 83 33.13
LEAD-BASED PAINT REMOVAL AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removal and disposal of lead-based paint drywall or concrete walls at interior locations in elevator lobby (s) (Main basement and third floor) as required.
2. Removal and disposal of lead-based paint covered downspouts on tower exterior roof.

1.2 RELATED REQUIREMENTS

- A. Hazardous Material Abatement: Section 02 82 11, TRADITIONAL ASBESTOS ABATEMENT.
- B. Demolition Disturbing Lead-Based Paint: Section 02 41 00, DEMOLITION.
- C. Surface Preparation Disturbing Lead-Based Paint: Section 09 91 00, PAINTING.

1.3 DEFINITIONS

- A. Action Level: Employee exposure, without regard to use of respirator, to lead airborne concentration of 30 micrograms per cubic meter (0.03 parts per million) of air averaged over 8-hour period. As used in this section, "30 micrograms per cubic meter of air (0.03 parts per million)" refers to action level.
- B. Area Monitoring: Sampling of lead concentrations within lead control area and inside physical boundaries which are representative of airborne lead concentrations which may reach breathing zone of personnel potentially exposed to lead.
- C. Breathing Zone: Area within hemisphere, forward of shoulders, with 150 mm to 225 mm (6 to 9 inches) radius and center at nose or mouth of employee.
- D. Certified Industrial Hygienist (CIH): As used in this section, refers to an Industrial Hygienist employed by Contractor.
- E. Change Rooms and Shower Facilities: Rooms within designated physical boundary around lead control area equipped with separate storage facilities for clean protective work clothing and equipment and for street clothes which prevent cross- contamination.

- F. Competent Person: Person capable of identifying lead hazards in work area and authorized by contractor to take corrective action.
- G. Decontamination Room: Room for removal of contaminated personal protective equipment (PPE).
- H. Eight-Hour Time Weighted Average (TWA): Airborne concentration of lead averaged over 8-hour workday to which an employee is exposed.
- I. High Efficiency Particulate Air (HEPA) Filter Equipment: HEPA filtered vacuuming equipment with UL 586 filter system capable of collecting and retaining lead-contaminated paint dust. HEPA filter means 99.97 percent efficient against 0.3-micron (0.012 mil) size particles.
- J. Lead: Metallic lead, inorganic lead compounds, and organic lead soaps. Excluded from this definition are other organic lead compounds.
- K. Lead Control Area: Enclosed area or structure with full containment to prevent spreading lead dust, paint chips, and debris from lead-based paint removal operations. Lead control area is isolated by physical boundaries to prevent unauthorized entry of personnel.
- L. Lead Permissible Exposure Limit (PEL): Fifty micrograms per cubic meter (0.05 parts per million) of air as 8-hour time weighted average as determined by 29 CFR Part 1910.1025. When employee is exposed for more than 8 hours per work day, determine PEL by following formula. PEL micrograms/cubic meter (parts per million) of air = 400/No. of hrs. worked per day.
- M. Personnel Monitoring: Sampling of lead concentrations within employee breathing zone to determine 8-hour time weighted average concentration according to 29 CFR Part 1910.1025. Take samples representative of employee's work tasks.
- N. Physical Boundary: Area physically roped or partitioned off around enclosed lead control area to limit unauthorized entry of personnel. As used in this section, "inside boundary" shall mean same as "outside lead control area."

1.4 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American National Standards Institute (ANSI):
 - 1. Z9.2-12 - Fundamentals Governing the Design & Operation of Local Exhaust Ventilation Systems.

C. Code of Federal Regulations (CFR):

1. 29 CFR Part 1910 - Occupational Safety and Health Standards.
2. 29 CFR Part 1926 - Safety and Health Regulations for Construction.
3. 40 CFR Part 260 - Hazardous Waste Management System: General.
4. 40 CFR Part 261 - Identification and Listing of Hazardous Waste.
5. 40 CFR Part 262 - Standards Applicable to Generators of Hazardous Waste.
6. 40 CFR Part 263 - Standards Applicable to Transporters of Hazardous Waste.
7. 40 CFR Part 264 - Standards for Owners and Operations of Hazardous Waste Treatment, Storage, and Disposal Facilities.
8. 40 CFR Part 265 - Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.
9. 40 CFR Part 268 - Land Disposal Restrictions.
10. 49 CFR Part 172 - Hazardous Material Table, Special Provisions, Hazardous Material Communications, Emergency Response Information, and Training Requirements, and Security Plans.
11. 49 CFR Part 178 - Specifications for Packaging.

D. Underwriters Laboratories (UL):

1. 586-09 - High-Efficiency, Particulate, Air Filter Units.

1.5 PRE-REMOVAL MEETINGS

A. Conduct pre-removal meeting at project site minimum 10 days before beginning Work of this section.

1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Certified Industrial Hygienist.
 - c. Architect/Engineer.
 - d. Inspection and Testing Agency.
 - e. Contractor.
 - f. Paint removal contractor.
 - g. Other installers responsible for finishing resulting surfaces.
2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Respiratory protection program.
 - b. Hazard communication program.
 - c. Hazardous waste management plan.

- d. Safety and health regulation compliance.
 - e. Employee training.
 - f. Removal schedule.
 - g. Removal sequence.
 - h. Preparatory work.
 - i. Protection before, during, and after removal.
 - j. Removal.
 - k. Inspecting and testing.
 - l. Other items affecting successful completion.
3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.6 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - a. Paint removal products.
 - b. Vacuum filters.
 - c. Respirators.
 - 2. Safety data sheet for each paint removal product.
 - 3. Installation instructions.
 - a. Paint removal products.
- C. Test Reports: Submit testing laboratory reports.
 - 1. Submit air monitoring results within three working days, signed by testing laboratory employee performing air monitoring, employee analyzing sample, and CIH.
- D. Certificates: Certify completed training.
 - 1. Submit certificate for each employee signed and dated by CIH and employee stating employee was trained.
- E. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Paint removal contractor.
 - 2. Testing laboratory.
 - a. Name, address, and telephone number.
 - b. Current evidence of participation in NIOSH PAT Program.
 - c. Copy of current AIHA accreditation certificate.
 - 3. Industrial hygienist.

- a. Name, address, and telephone number.
 - b. Resume showing previous experience.
 - c. Copy of current ABIH CIH certification.
 4. Paint disposal facility.
 - a. Name, address, and telephone number.
 - b. Current license or authorization to receive and dispose lead contaminated waste.
- F. Record Documents:
1. Completed and signed hazardous waste manifest from waste transporter.
 2. Paint disposal facility receipts and disposition reports.
 3. Certification of medical examinations.
 4. Employee training certification.

1.7 QUALITY ASSURANCE

- A. Safety and Health Regulation Compliance:
1. Comply with laws, ordinances, rules, and regulations of federal, state, and local authorities having jurisdiction regarding removing, handling, storing, transporting, and disposing lead waste materials.
 - a. U.S. EPA Region 8 (8P-P3T)
1595 Wynkoop Street
Denver, CO 80202-1129
(303) 312-6966
 - b. South Dakota Dept. of Environment and Natural Resources
523 East Capitol
Pierre, SD 57501
605-773-3153
 - c. Comply with applicable requirements of 29 CFR Part 1910.1025.
 - d. Notify Contracting Officer's Representative and request resolution of conflicts between regulations and specified requirements before starting work.
 2. Comply with the following local laws, ordinances, criteria, rules and regulations regarding removing, handling, storing, transporting, and disposing lead-contaminated materials: None applicable.
- B. Paint Removal Contractor: Experienced contractor, registered or licensed by applicable state agency regulating lead-based paint removal.

- C. Testing Laboratory: State certified independent testing laboratory experienced in airborne lead monitoring, testing, and reporting.
 - 1. Successful participant in NIOSH Proficiency Analytical Testing (PAT) Program within prior 12 months.
 - 2. Accredited by American Industrial Hygiene Association (AIHA).
- D. Certified Industrial Hygienist: Certified as CIH by American Board of Industrial Hygiene in comprehensive practice and responsible for:
 - 1. Certify Training.
 - 2. Review and approve lead-based paint removal plan for conformance to applicable referenced standards.
 - 3. Inspect lead-based paint removal work for conformance with approved plan.
 - 4. Direct monitoring.
 - 5. Ensure work is performed according to specifications.
 - 6. Ensure personnel and environment hazardous exposures are adequately controlled.
- E. Paint Disposal Facility: State certified disposal facility qualified to receive and dispose lead-based paint.
- F. Lead-based Paint Removal Plan:
 - 1. Submit detailed, site-specific plan describing lead-based paint removal procedures.
 - 2. Include sketch showing location, size, and details of lead control areas, decontamination rooms, change rooms, shower facilities, and mechanical ventilation system.
 - 3. Include eating, drinking, and restroom procedures, interface of trades, work sequencing, collected wastewater and paint debris disposal plan, air sampling plan, respirators, protective equipment, and detailed description of containment methods ensuring airborne lead concentrations do not exceed action level outside lead control area.
 - a. Eating, drinking, and smoking are not acceptable within lead control area.
 - 4. Include air sampling, training and strategy, sampling methodology, frequency, duration, and qualifications of air monitoring personnel.
- G. Respiratory Protection Program: Establish and implement program required by 29 CFR Part 1910.134, 29 CFR Part 1910.1025, and 29 CFR Part 1926.62.

1. Provide each employee negative pressure or other appropriate respirator.
 - a. Test fit each employee's respirator at initial fitting and maximum 6-month intervals, as required by 29 CFR Part 1926.62.
- H. Hazard Communication Program: Establish and implement program required by 29 CFR Part 1910.1200.
- I. Hazardous Waste Management Plan: Establish and implement plan according to applicable requirements of Federal, State, and local hazardous waste regulations including the following:
 1. Identification of hazardous wastes associated with work.
 2. Estimated quantities of generated and disposed waste.
 3. Names and qualifications of each contractor transporting, storing, treating, and disposing wastes. Include facility location and 24-hour point of contact. Provide two copies of EPA Identification numbers.
 4. Names and qualifications (experience and training) of personnel working on-site with hazardous wastes.
 5. List of required waste handling equipment including cleaning, volume reduction, and transport equipment.
 6. Spill prevention, containment, and cleanup contingency implementation measures.
 7. Work plan and schedule for waste containment, removal, and disposal with daily waste cleaned up and containerization.
 8. Hazardous waste disposal cost.

1.8 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 PAINT REMOVAL PRODUCTS

- A. Chemical Stripper: Biodegradable, non-toxic, capable of removing existing paint layers in one application, and acceptable to CIH.

2.2 ACCESSORIES

- A. Waste Collection Drums: 49 CFR Part 178; Type 1A2, steel, removable head, 200 L (55 gal.) capacity, capable of containing waste without loss.

- B. Vacuum Cleaner: HEPA filtered type.
- C. Scrapers:
 - 1. Metal type for use on metal, concrete, and masonry surfaces.
 - 2. Plastic type for use on wood, plaster, gypsum board, and other surfaces.
- D. Rinse Water: Potable.
- E. Cleaning Cloths: Cotton.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before exposure to lead-contaminated dust, provide workers with comprehensive medical examination required by 29 CFR Part 1926.62 (I) (1) (i) and (ii).
 - 1. Exemption: Examination is not required when employee medical records show last examination required by 29 CFR Part 1926.62(I) was completed within previous 12 months.
- B. Maintain complete and accurate employee medical records according to 29 CFR Part 1910.20.
- C. Train each employee performing paint removal, disposal, and air sampling operations according to 29 CFR Part 1926.62.
 - 1. Certify training is completed before employee is permitted to work on project and enter lead control area.

3.2 PREPARATION

- A. Protect existing work indicated to remain.
 - 1. Perform paint removal work without damaging and contaminating adjacent work.
 - 2. Restore damage and contamination to original condition.
- B. Notify Contracting Officer 10days before starting paint removal work.
- C. Lead Control Area Requirements:
 - 1. Establish lead control area by completely enclosing lead-based paint removal work area with containment screens .
 - 2. Contain removal operations using negative pressure full containment system with minimum one change room and HEPA filtered exhaust.
- D. Boundary Requirements: Provide physical boundaries around lead control area by roping off area designated on drawings or providing curtains, portable partitions or other enclosures to ensure that airborne lead

concentrations do not meet or exceed action level outside of lead control area.

- E. Heating, Ventilating and Air Conditioning (HVAC) Systems: Shut down, lock out, and isolate HVAC systems supplying exhausting, and passing through lead control areas. Seal HVAC inlets and outlet within lead control area with 6-mil plastic sheet and tape. Tape seal seams in HVAC components passing through lead control area.
- F. Change Room and Shower Facilities: Provide clean change rooms and shower facilities within physical boundary around lead control area according to 29 CFR Part 1926.62.
- G. Mechanical Ventilation System:
 - 1. Provide ventilation system to control personnel exposure to lead according to 29 CFR Part 1926.57.
 - 2. Design, construct, install, and maintain HEPA filtered fixed local exhaust ventilation system according to ANSI Z9.2 and approved by CIH.
 - 3. Exhaust ventilation air to exterior wherever possible.
 - 4. When exhaust ventilation air must be recirculated into work area, provide HEPA filter with reliable back-up filter and controls to monitor lead concentration in return air and to bypass recirculation system automatically when system fails.
- H. Personnel Protection: Provide and use required protective clothing and equipment within lead control area.
- I. Warning Signs: Provide warning signs complying with 29 CFR Part 1926.62 at lead control area approaches. Locate signs so personnel read signs and take necessary precautions before entering lead control area.

3.3 WORK PROCEDURES

- A. Remove lead-based paint according to approved lead-based paint removal plan.
 - 1. Perform work only in presence of CIH or Industrial Hygienist (IH) Technician under direction of CIH ensuring continuous inspection of work in progress and direction of air monitoring activities.
 - 2. Handle, store, transport, and dispose lead or and lead contaminated waste according to 40 CFR Part 260, 40 CFR Part 261, 40 CFR Part 262, 40 CFR Part 263, 40 CFR Part 264, and

40 CFR Part 265. Comply with land disposal restriction notification requirements as required by 40 CFR Part 268.

- B. Use procedures and equipment required to limit occupational and environmental lead exposure when lead-based paint is removed according to 29 CFR Part 1926.62.
- C. Dispose removed paint and waste according to Environmental Protection Agency (EPA), federal, state, and local requirements.
- D. Personnel Exiting Procedures:
 - 1. When personnel exit lead control area, comply with the following procedures:
 - a. Vacuum exposed clothing surfaces.
 - b. Remove protective clothing and equipment in decontamination room. Place clothing in approved impermeable disposal bag.
 - c. Shower.
 - d. Dress in clean clothes before leaving lead control area.
- E. Monitoring - General:
 - 1. Monitor airborne lead concentrations according to 29 CFR Part 1910.1025 by testing laboratory as directed by CIH.
 - 2. Take personal air monitoring samples on employees anticipated to have greatest exposure risk as determined by CIH. Additionally, take air monitoring samples on minimum 25 percent of work crew or minimum of two employees, whichever is greater, during each work shift.
 - 3. Submit results of air monitoring samples, signed by CIH, within 48 hours after taking air samples. Notify Contracting Officer's Representative immediately of lead exposure at or exceeding action level outside of lead control area.
- F. Monitoring During Paint Removal:
 - 1. Perform personal and area monitoring during entire paint removal operation.
 - 2. Conduct area monitoring at physical boundary daily for each work shift to ensure unprotected personnel are not exposed above action level anytime.
 - 3. For outdoor operations, take at least one sample on each shift leeward of lead control area. When adjacent areas are contaminated, clean area of contamination and have CIH visually inspect and certify lead contamination is cleaned.

4. Stop work when outside boundary lead levels meet or exceed action level. Notify Contracting Officer's Representative, immediately.
5. Correct conditions causing increased lead concentration as directed by CIH.
6. Review sampling data collected during work stoppage to determine if conditions require additional work method modifications as determined by CIH.
7. Resume paint removal when approved by CIH.

3.4 LEAD-BASED PAINT REMOVAL

- A. Remove paint within areas indicated on drawings completely exposing substrate. Minimize damage to substrate.
- B. Comply with paint removal processes described lead paint removal plan.
- C. Lead-Based Paint Removal: Select processes for each application to minimize work area lead contamination and waste.

3.5 SUBSTRATE SURFACE PREPARATION

- A. Protect substrates from deterioration and contamination until refinished.
 1. Protect metal substrates from flash rusting.
- B. Prepare and paint substrates according to Section 09 91 00, PAINTING.

3.6 FIELD QUALITY CONTROL

- A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Perform sampling and testing for:
 1. Air monitoring.
 2. Lead based paint.

3.7 CLEANING AND DISPOSAL

- A. Cleaning:
 1. Maintain lead control area surfaces free of accumulating paint chips and dust. Confine dust, debris, and waste to work area.
 2. Vacuum clean work area daily, at end of each shift, and when paint removal operation is complete.
- B. CIH Certification: Certify in writing that inside and outside lead control area air monitoring samples are less than action level, employee respiratory protection was adequate, the work was performed

according to 29 CFR Part 1926.62, and no visible accumulations of lead-based paint and dust remain on worksite.

1. Do not remove lead control area or roped-off boundary and warning signs before Contracting Officer's Representative's receipt of CIH's certification.
 2. Reclean areas showing dust or residual paint chips.
- C. Testing: Where indicated and when directed by Contracting Officer's Representative, test lead-based paint residue and used abrasive according to 40 CFR Part 261 for hazardous waste.
- D. Waste Collection:
1. Collect lead-contaminated materials including waste, scrap, debris, bags, containers, equipment, and clothing, which may produce airborne lead contamination.
 2. Place lead contaminated materials in waste disposal drums. Label each drum identifying waste type according to 49 CFR Part 172 and date waste materials were first put into drum. Obtain and complete the Uniform Hazardous Waste Manifest forms. Comply with land disposal restriction notification requirements required by 40 CFR Part 268:
 3. Coordinate temporary storage location on project site with Contracting Officer's Representative.
- E. Waste Disposal:
1. Do not store hazardous waste drums in temporary storage location longer than 90 calendar days from drum label date.
 2. Remove, transport, and deliver drums to paint disposal facility.
 - a. Obtain signed receipt including date, time, quantity, and description of materials received according to 40 CFR Part 262.
 - b. Obtain final report of materials disposition after disposal completion.

- - - E N D - - -

**SECTION 03 30 00
CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies cast-in-place structural concrete and materials and mixes for other concrete.

1.2 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Concrete roads, walks, and similar exterior site work: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.

1.3 TESTING AGENCY FOR CONCRETE MIX DESIGN:

- A. Testing agency for the trial concrete mix design retained and reimbursed by the Contractor and approved by COR. For all other testing, refer to Section 01 45 29 Testing Laboratory Services.
- B. Testing agency maintaining active participation in Program of Cement and Concrete Reference Laboratory (CCRL) of National Institute of Standards and Technology.
- C. Testing agency shall furnish equipment and qualified technicians to establish proportions of ingredients for concrete mixes.

1.4 TOLERANCES:

- A. Formwork: ACI 117, except the elevation tolerance of formed surfaces before removal of shores is +0 mm (+0 inch) and -20 mm (-3/4 inch).
- B. Reinforcement Fabricating and Placing: ACI 117, except that fabrication tolerance for bar sizes Nos. 10, 13, and 16 (Nos. 3, 4, and 5) (Tolerance Symbol 1 in Fig. 2.1(a), ACI, 117) used as column ties or stirrups is +0 mm (+0 inch) and -13 mm (-1/2 inch) where gross bar length is less than 3600 mm (12 feet), or +0 mm (+0 inch) and -20 mm (-3/4 inch) where gross bar length is 3600 mm (12 feet) or more.
- C. Cross-Sectional Dimension: ACI 117, except tolerance for thickness of slabs 12 inches or less is +20 mm (+3/4 inch) and - 6 mm (-1/4 inch). Tolerance of thickness of beams more than 300 mm (12 inch) but less than 900 mm (3 feet) is +20 mm (+3/4 inch) and -10 mm (-3/8 inch).
- D. Slab Finishes: ACI 117, Section 4.5.6, F-number method in accordance with ASTM E1155, except as follows:

1. Test entire slab surface, including those areas within 600 mm (2 feet) of construction joints and vertical elements that project through slab surface.
2. Maximum elevation change which may occur within 600 mm (2 feet) of any column or wall element is 6 mm (0.25 inches).
3. Allow sample measurement lines that are perpendicular to construction joints to extend past joint into previous placement no further than 1500 mm (5 feet).

1.5 REGULATORY REQUIREMENTS:

- A. ACI SP-66 - ACI Detailing Manual.
- B. ACI 318 - Building Code Requirements for Reinforced Concrete.
- C. ACI 301 - Standard Specifications for Structural Concrete.

1.6 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Shop Drawings: Reinforcing steel: Complete shop drawings
- C. Mill Test Reports:
 1. Reinforcing Steel.
 2. Cement.
- D. Manufacturer's Certificates:
 1. Abrasive aggregate.
 2. Not Used.
 3. Air-entraining admixture.
 4. Chemical admixtures, including chloride ion content.
 5. Waterproof paper for curing concrete.
 6. Liquid membrane-forming compounds for curing concrete.
 7. Non-shrinking grout.
 8. Liquid hardener.
 9. Not Used.
 10. Expansion joint filler.
 11. Adhesive binder.
- E. Testing Agency for Concrete Mix Design: Approval request including qualifications of principals and technicians and evidence of active participation in program of Cement and Concrete Reference Laboratory (CCRL) of National Institute of Standards and Technology.

F. Test Report for Concrete Mix Designs: Trial mixes including water-cement fly ash ratio curves, concrete mix ingredients, and admixtures.

1.7 DELIVERY, STORAGE, AND HANDLING:

- A. Conform to ACI 304. Store aggregate separately for each kind or grade, to prevent segregation of sizes and avoid inclusion of dirt and other materials.
- B. Deliver cement in original sealed containers bearing name of brand and manufacturer, and marked with net weight of contents. Store in suitable watertight building in which floor is raised at least 300 mm (1 foot) above ground. Store bulk cement and fly ash in separate suitable bins.
- C. Deliver other packaged materials for use in concrete in original sealed containers, plainly marked with manufacturer's name and brand, and protect from damage until used.

1.8 PRE-CONCRETE CONFERENCE:

- A. General: At least 15 days prior to submittal of design mixes, conduct a meeting to review proposed methods of concrete construction to achieve the required results.
- B. Agenda: Includes but is not limited to:
 - 1. Submittals.
 - 2. Coordination of work.
 - 3. Availability of material.
 - 4. Concrete mix design including admixtures.
 - 5. Methods of placing, finishing, and curing.
 - 6. Finish criteria required to obtain required flatness and levelness.
 - 7. Timing of floor finish measurements.
 - 8. Material inspection and testing.
- C. Attendees: Include but not limited to representatives of Contractor; subcontractors involved in supplying, conveying, placing, finishing, and curing concrete; admixture manufacturers; COR; Consulting Engineer; Department of Veterans Affairs retained testing laboratories for concrete testing and finish (F-number) verification.
- D. Minutes of the meeting: Contractor shall take minutes and type and distribute the minutes to attendees within five days of the meeting.

1.9 NOT USED

1.10 APPLICABLE PUBLICATIONS:

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.

B. American Concrete Institute (ACI):

- 117-10Specifications for Tolerances for Concrete Construction and Materials and Commentary
- 211.1-91 (R2009)Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
- 214R-11Guide to Evaluation of Strength Test Results of Concrete
- 301-10Standard Practice for Structural Concrete
- 304R-00 (R2009)Guide for Measuring, Mixing, Transporting, and Placing Concrete
- 305.1-06Specification for Hot Weather Concreting
- 306.1-90 (R2002)Standard Specification for Cold Weather Concreting
- 308.1-11Specification for Curing Concrete
- 309R-05Guide for Consolidation of Concrete
- 318-11Building Code Requirements for Structural Concrete and Commentary
- 347-04Guide to Formwork for Concrete
- SP-66-04ACI Detailing Manual

C. American National Standards Institute and American Hardboard Association (ANSI/AHA):

- A135.4-2004Basic Hardboard

D. American Society for Testing and Materials (ASTM):

- A82/A82M-07Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
- A185/185M-07Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
- A615/A615M-09Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement
- A653/A653M-11Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process

C31/C31M-10Standard Practice for Making and Curing
Concrete Test Specimens in the field

C33/C33M-11AStandard Specification for Concrete Aggregates

C39/C39M-12Standard Test Method for Compressive Strength
of Cylindrical Concrete Specimens

C94/C94M-12Standard Specification for Ready Mixed Concrete

C143/C143M-10Standard Test Method for Slump of Hydraulic
Cement Concrete

C150-11Standard Specification for Portland Cement

C171-07Standard Specification for Sheet Materials for
Curing Concrete

C172-10Standard Practice for Sampling Freshly Mixed
Concrete

C173-10...Standard Test Method for Air Content of Freshly
Mixed Concrete by the Volumetric Method

C192/C192M-07Standard Practice for Making and Curing
Concrete Test Specimens in the Laboratory

C231-10Standard Test Method for Air Content of Freshly
Mixed Concrete by the Pressure Method

C260-10Standard Specification for Air Entraining
Admixtures for Concrete

C309-11Standard Specification for Liquid Membrane
Forming Compounds for Curing Concrete

C494/C494M-11Standard Specification for Chemical Admixtures
for Concrete

C618-12Standard Specification for Coal Fly Ash and Raw
or Calcined Natural Pozzolan for Use in
Concrete

C666/C666M-03 (R2008) ...Standard Test Method for Resistance of Concrete
to Rapid Freezing and Thawing

C881/C881M-10Standard Specification for Epoxy Resin Base
Bonding Systems for Concrete

C1107/1107M-11Standard Specification for Packaged Dry,
Hydraulic-Cement Grout (Non-shrink)

C1315-11Standard Specification for Liquid Membrane
Forming Compounds Having Special Properties for
Curing and Sealing Concrete

- D6-95 (R2011)Standard Test Method for Loss on Heating of Oil and Asphaltic Compounds
- D297-93 (R2006)Standard Methods for Rubber Products Chemical Analysis
- D412-06AE2Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
- D1751-04 (R2008)Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
- D4263-83 (2012)Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
- D4397-10Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications
- E1155-96 (R2008)Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers
- F1869-11Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

E. Not Used

F. Concrete Reinforcing Steel Institute (CRSI):
Handbook 2008

G. Not Used.

H. U. S. Department of Commerce Product Standard (PS):
PS 1 Construction and Industrial Plywood
PS 20 American Softwood Lumber

I. Not Used.

PART 2 - PRODUCTS:

2.1 FORMS:

- A. Wood: PS 20 free from loose knots and suitable to facilitate finishing concrete surface specified; tongue and grooved.
- B. Plywood: PS-1 Exterior Grade B-B (concrete-form) 16 mm (5/8 inch), or 20 mm (3/4 inch) thick for unlined contact form. B-B High Density Concrete Form Overlay optional.
- C. Not Used.

- D. Permanent Steel Form for Concrete Slabs: Corrugated, ASTM A653, Grade E, and Galvanized, ASTM A653, G90. Provide venting where insulating concrete fill is used.
- E. Corrugated Fiberboard Void Boxes: Double faced, completely impregnated with paraffin and laminated with moisture resistant adhesive, size as shown. Design forms to support not less than 48 KPa (1000 psf) and not lose more than 15 percent of their original strength after being completely submerged in water for 24 hours and then air dried.
- F. Form Lining:
 - 1. Hardboard: ANSI/AHA A135.4, Class 2 with one (S1S) smooth side)
 - 2. Plywood: Grade B-B Exterior (concrete-form) not less than 6 mm (1/4 inch) thick.
 - 3. Plastic, fiberglass, or elastomeric capable of reproducing the desired pattern or texture.
- G. Concrete products shall comply with following standards for biobased materials:

Material Type	Percent by Weight
Concrete Penetrating Liquid	79 percent biobased material
Concrete form Release Agent	87 percent biobased material
Concrete Sealer	11 percent biobased material

The minimum-content standards are based on the weight (not the volume) of the material.

- H. Form Ties: Develop a minimum working strength of 13.35 kN (3000 pounds) when fully assembled. Ties shall be adjustable in length to permit tightening of forms and not have any lugs, cones, washers to act as spreader within form, nor leave a hole larger than 20 mm (3/4 inch) diameter, or a depression in exposed concrete surface, or leave metal closer than 40 mm (1 1/2 inches) to concrete surface. Wire ties not permitted. Cutting ties back from concrete face not permitted.

2.2 MATERIALS:

- A. Portland Cement: ASTM C150 Type I or II.
- B. Fly Ash: ASTM C618, Class C or F including supplementary optional requirements relating to reactive aggregates and alkalis, and loss on ignition (LOI) not to exceed 5 percent.
- C. Coarse Aggregate: ASTM C33.

1. Size 67 or Size 467 may be used for footings and walls over 300 mm (12 inches) thick.
 2. Coarse aggregate for applied topping, encasement of steel columns, and metal pan stair fill shall be Size 7.
 3. Maximum size of coarse aggregates not more than one-fifth of narrowest dimension between sides of forms, one-third of depth of slabs, nor three-fourth of minimum clear spacing between reinforcing bars.
- E. Fine Aggregate: ASTM C33. Fine aggregate for applied concrete floor topping shall pass a 4.75 mm (No. 4) sieve, 10 percent maximum shall pass a 150 μ m (No. 100) sieve.
- F. Mixing Water: Fresh, clean, and potable.
- G. Admixtures:
1. Water Reducing Admixture: ASTM C494, Type A and not contain more chloride ions than are present in municipal drinking water.
 2. Water Reducing, Retarding Admixture: ASTM C494, Type D and not contain more chloride ions than are present in municipal drinking water.
 3. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C494, Type F or G, and not contain more chloride ions than are present in municipal drinking water.
 4. Non-Corrosive, Non-Chloride Accelerator: ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. Admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory of at least one year duration using an acceptable accelerated corrosion test method such as that using electrical potential measures.
 5. Air Entraining Admixture: ASTM C260.
 6. Not Used.
 7. Calcium Nitrite corrosion inhibitor: ASTM C494 Type C.
 8. Prohibited Admixtures: Calcium chloride, thiocyanate or admixtures containing more than 0.05 percent chloride ions are not permitted.
 9. Certification: Written conformance to the requirements above and the chloride ion content of the admixture prior to mix design review.
- H. Vapor Barrier: ASTM D4397, 0.38 mm (15 mil).
- I. Reinforcing Steel: ASTM A615, or ASTM A996, deformed, grade as shown.
- J. Welded Wire Fabric: ASTM A185.

- K. Not Used
- L. Not Used
- M. Not Used
- N. Cold Drawn Steel Wire: ASTM A82.
- O. Not Used
- P. Not Used.
- Q. Supports, Spacers, and Chairs: Types which will hold reinforcement in position shown in accordance with requirements of ACI 318 except as specified.
- R. Expansion Joint Filler: ASTM D1751.
- S. Sheet Materials for Curing Concrete: ASTM C171.
- T. Liquid Membrane-forming Compounds for Curing Concrete: ASTM C309, Type I, with fugitive dye, and shall meet the requirements of ASTM C1315. Compound shall be compatible with scheduled surface treatment, such as paint and resilient tile, and shall not discolor concrete surface.
- U. Abrasive Aggregate: Aluminum oxide grains or emery grits.
- V. Not Used.
- W. Moisture Vapor Emissions & Alkalinity Control Sealer: 100% active colorless aqueous silicate solution concrete surface.
 - 1. ASTM C1315 Type 1 Class A, and ASTM C309 Type 1 Class A, penetrating product to have no less than 34% solid content, leaving no sheen, volatile organic compound (VOC) content rating as required to suite regulatory requirements. The product shall have at least a five (5) year documented history in controlling moisture vapor emission from damaging floor covering, compatible with all finish materials.
 - 2. MVE 15-Year Warranty:
 - a. When a floor covering is installed on a below grade, on grade, or above grade concrete slab treated with Moisture Vapor Emissions & Alkalinity Control Sealer according to manufacturer's instruction, sealer manufacturer shall warrant the floor covering system against failure due to moisture vapor migration or moisture-born contaminates for a period of fifteen (15) years from the date of original installation. The warranty shall cover all labor and materials needed to replace all floor covering that fails due to moisture vapor emission & moisture born contaminates.

X. Not Used.

Y. Non-Shrink Grout:

1. ASTM C1107, pre-mixed, produce a compressive strength of at least 18 MPa at three days and 35 MPa (5000 psi) at 28 days. Furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent bearing under a 1200 mm x 1200 mm (4 foot by 4 foot) base plate.
2. Where high fluidity or increased placing time is required, furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent under an 450 mm x 900 mm (18 inch by 36 inch) base plate.

Z. Adhesive Binder: ASTM C881.

AA. Not Used.

BB. Porous Backfill: Crushed stone or gravel graded from 25 mm to 20 mm (1 inch to 3/4 inch).

CC. Not Used

DD. Not Used.

EE. Bonding Admixture: Non-rewettable, polymer modified, bonding compound.

FF. Not Used.

2.3 CONCRETE MIXES:

A. Mix Designs: Proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318.

1. If trial mixes are used, make a set of at least 6 cylinders in accordance with ASTM C192 for test purposes from each trial mix; test three for compressive strength at 7 days and three at 28 days.
2. Submit a report of results of each test series, include a detailed listing of the proportions of trial mix or mixes, including cement, fly ash, admixtures, weight of fine and coarse aggregate per m³ (cubic yard) measured dry rodded and damp loose, specific gravity, fineness modulus, percentage of moisture, air content, water-cement-fly ash ratio, and consistency of each cylinder in terms of slump.
3. Prepare a curve showing relationship between water-cement -fly ash ratio at 7-day and 28-day compressive strengths. Plot each curve using at least three specimens.
4. If the field experience method is used, submit complete standard deviation analysis.

- B. Fly Ash Testing: Submit certificate verifying conformance with ASTM 618 initially with mix design and for each truck load of fly ash delivered from source. Submit test results performed within 6 months of submittal date. Notify Contracting Officer Representative immediately when change in source is anticipated.
1. Testing Laboratory used for fly ash certification/testing shall participate in the Cement and Concrete Reference Laboratory (CCRL) program. Submit most recent CCRL inspection report.
- C. After approval of mixes no substitution in material or change in proportions of approval mixes may be made without additional tests and approval of Contracting Officer Representative or as specified. Making and testing of preliminary test cylinders may be carried on pending approval of cement and fly ash, providing Contractor and manufacturer certify that ingredients used in making test cylinders are the same. Contracting Officer Representative may allow Contractor to proceed with depositing concrete for certain portions of work, pending final approval of cement and fly ash and approval of design mix.
- D. Cement Factor: Maintain minimum cement factors in Table I regardless of compressive strength developed above minimums. Use Fly Ash as an admixture with 20% replacement by weight in all structural work.

TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE

Concrete Strength		Non-Air-Entrained	Air-Entrained	
Min. 28 Day Comp. Str. MPa (psi)	Min. Cement kg/m ³ (lbs/c. yd)	Max. Water Cement Ratio	Min. Cement kg/m ³ (lbs/c. yd)	Max. Water Cement Ratio
35 (5000) ^{1,3}	375 (630)	0.45	385 (650)	0.40
30 (4000) ^{1,3}	325 (550)	0.55	340 (570)	0.50
25 (3000) ^{1,3}	280 (470)	0.65	290 (490)	0.55
25 (3000) ^{1,2}	300 (500)	*	310 (520)	*

1. If trial mixes are used, the proposed mix design shall achieve a compressive strength 8.3 MPa (1200 psi) in excess of f'c. For concrete strengths above 35 Mpa (5000 psi), the proposed mix design shall achieve a compressive strength 9.7 MPa (1400 psi) in excess of f'c.

2. Not Used
 3. For concrete exposed to high sulfate content soils maximum water cement ratio is 0.44.
 4. Determined by Laboratory in accordance with ACI 211.1 for normal concrete.
- E. Maximum Slump: Maximum slump, as determined by ASTM C143 with tolerances as established by ASTM C94, for concrete to be vibrated shall be as shown in Table II.

TABLE II - MAXIMUM SLUMP, MM (INCHES) *

Type of Construction	Normal Weight Concrete	Lightweight Structural Concrete
Reinforced Footings and Substructure Walls	75mm (3 inches)	75 mm (3 inches)
Slabs, Beams, Reinforced Walls, and Building Columns	100 mm (4 inches)	100 mm (4 inches)

- F. Slump may be increased by the use of the approved high-range water-reducing admixture (superplasticizer). Tolerances as established by ASTM C94. Concrete containing the high-range-water-reducing admixture may have a maximum slump of 225 mm (9 inches). The concrete shall arrive at the job site at a slump of 50 mm to 75 mm (2 inches to 3 inches). This should be verified, and then the high-range-water-reducing admixture added to increase the slump to the approved level.
- G. Air-Entrainment: Air-entrainment of normal weight concrete shall conform with Table III. Determine air content by either ASTM C173 or ASTM C231.

**TABLE III - TOTAL AIR CONTENT
 FOR VARIOUS SIZES OF COARSE AGGREGATES (NORMAL CONCRETE)**

Nominal Maximum Size of Total Air Content	Coarse Aggregate, mm (Inches) Percentage by Volume
10 mm (3/8 in).6 to 10	13 mm (1/2 in).5 to 9
20 mm (3/4 in).4 to 8	25 mm (1 in).3-1/2 to 6-1/2
40 mm (1 1/2 in).3 to 6	

- H. Not Used.

- I. Not Used.
- J. Concrete slabs placed at air temperatures below 10 degrees C (50 degrees Fahrenheit) use non-corrosive, non-chloride accelerator. Concrete required to be air entrained use approved air entraining admixture. Pumped concrete, and concrete with a water/cement ratio below 0.50 use high-range water-reducing admixture (superplasticizer).
- K. Durability: Use air entrainment for exterior exposed concrete subjected to freezing and thawing and other concrete shown or specified. For air content requirements see Table III or Table IV.
- L. Enforcing Strength Requirements: Test as specified in Section 01 45 29, TESTING LABORATORY SERVICES, during the progress of the work. Seven-day tests may be used as indicators of 28-day strength. Average of any three 28-day consecutive strength tests of laboratory-cured specimens representing each type of concrete shall be equal to or greater than specified strength. No single test shall be more than 3.5 MPa (500 psi) below specified strength. Interpret field test results in accordance with ACI 214. Should strengths shown by test specimens fall below required values, Contracting Officer Representative may require any one or any combination of the following corrective actions, at no additional cost to the Government:
 - 1. Require changes in mix proportions by selecting one of the other appropriate trial mixes or changing proportions, including cement content, of approved trial mix.
 - 2. Require additional curing and protection.
 - 3. If five consecutive tests fall below 95 percent of minimum values given in Table I or if test results are so low as to raise a question as to the safety of the structure, Contracting Officer Representative may direct Contractor to take cores from portions of the structure. Use results from cores tested by the Contractor retained testing agency to analyze structure.
 - 4. If strength of core drilled specimens falls below 85 percent of minimum value given in Table I, Contracting Officer Representative may order load tests, made by Contractor retained testing agency, on portions of building so affected. Load tests in accordance with ACI 318 and criteria of acceptability of concrete under test as given therein.

5. Concrete work, judged inadequate by structural analysis, by results of load test, or for any reason, shall be reinforced with additional construction or replaced, if directed by the COR.

2.4 BATCHING AND MIXING:

A. General: Concrete shall be "Ready-Mixed" and comply with ACI 318 and ASTM C94. With each batch of concrete, furnish certified delivery tickets listing information in Paragraph 16.1 and 16.2 of ASTM C94. Maximum delivery temperature of concrete is 38°C (100 degrees Fahrenheit). Minimum delivery temperature as follows:

Atmospheric Temperature	Minimum Concrete Temperature
-1. degrees to 4.4 degrees C (30 degrees to 40 degrees F)	15.6 degrees C (60 degrees F.)
-17 degrees C to -1.1 degrees C (0 degrees to 30 degrees F.)	21 degrees C (70 degrees F.)

1. Not Used.

PART 3 - EXECUTION

3.1 FORMWORK:

A. General: Design in accordance with ACI 347 is the responsibility of the Contractor. The Contractor shall retain a registered Professional Engineer to design the formwork.

1. Form boards and plywood forms may be reused for contact surfaces of exposed concrete only if thoroughly cleaned, patched, and repaired and Contracting Officer Representative approves their reuse.
2. Provide forms for concrete footings unless Contracting Officer Representative determines forms are not necessary.
3. Corrugated fiberboard forms: Place forms on a smooth firm bed, set tight, with no buckled cartons to prevent horizontal displacement, and in a dry condition when concrete is placed.

B. Treating and Wetting: Treat or wet contact forms as follows:

1. Coat plywood and board forms with non-staining form sealer. In hot weather, cool forms by wetting with cool water just before concrete is placed.
2. Clean and coat removable metal forms with light form oil before reinforcement is placed. In hot weather, cool metal forms by thoroughly wetting with water just before placing concrete.

3. Use sealer on reused plywood forms as specified for new material.
- C. Size and Spacing of Studs: Size and space studs, wales and other framing members for wall forms so as not to exceed safe working stress of kind of lumber used nor to develop deflection greater than $1/270$ of free span of member.
- D. Unlined Forms: Use plywood forms to obtain a smooth finish for concrete surfaces. Tightly butt edges of sheets to prevent leakage. Back up all vertical joints solidly and nail edges of adjacent sheets to same stud with 6d box nails spaced not over 150 mm (6 inches) apart.
- E. Lined Forms: May be used in lieu of unlined plywood forms. Back up form lining solidly with square edge board lumber securely nailed to studs with all edges in close contact to prevent bulging of lining. No joints in lining and backing may coincide. Nail abutted edges of sheets to same backing board. Nail lining at not over 200 mm (8 inches) on center along edges and with at least one nail to each square foot of surface area; nails to be 3d blued shingle or similar nails with thin flatheads.
- F. Not Used.
- G. Wall Form Ties: Locate wall form ties in symmetrically level horizontal rows at each line of wales and in plumb vertical tiers. Space ties to maintain true, plumb surfaces. Provide one row of ties within 150 mm (6 inches) above each construction joint. Space through-ties adjacent to horizontal and vertical construction joints not over 450 mm (18 inches) on center.
1. Tighten row of ties at bottom of form just before placing concrete and, if necessary, during placing of concrete to prevent seepage of concrete and to obtain a clean line. Ties to be entirely removed shall be loosened 24 hours after concrete is placed and shall be pulled from least important face when removed.
 2. Coat surfaces of all metal that is to be removed with paraffin, cup grease or a suitable compound to facilitate removal.
- H. Inserts, Sleeves, and Similar Items: Flashing reglets, steel strips, masonry ties, anchors, wood blocks, nailing strips, grounds, inserts, wire hangers, sleeves, drains, guard angles, forms for floor hinge boxes, inserts or bond blocks for elevator guide rails and supports, and other items specified as furnished under this and other sections of specifications and required to be in their final position at time

concrete is placed shall be properly located, accurately positioned, and built into construction, and maintained securely in place.

1. Not Used.
2. Install sleeves, inserts and similar items for mechanical services in accordance with drawings prepared specially for mechanical services. Contractor is responsible for accuracy and completeness of drawings and shall coordinate requirements for mechanical services and equipment.
3. Not Used.
4. Minimum clear distance of embedded items such as conduit and pipe is at least three times diameter of conduit or pipe, except at stub-ups and other similar locations.
5. Provide recesses and blockouts in floor slabs for door closers and other hardware as necessary in accordance with manufacturer's instructions.

I. Construction Tolerances:

1. Set and maintain concrete formwork to assure erection of completed work within tolerances specified and to accommodate installation of other rough and finish materials. Accomplish remedial work necessary for correcting excessive tolerances. Erected work that exceeds specified tolerance limits shall be remedied or removed and replaced, at no additional cost to the Government.
2. Permissible surface irregularities for various classes of materials are defined as "finishes" in specification sections covering individual materials. They are to be distinguished from tolerances specified which are applicable to surface irregularities of structural elements.

3.2 PLACING REINFORCEMENT:

- A. General: Details of concrete reinforcement in accordance with ACI 318 unless otherwise shown.
- B. Placing: Place reinforcement conforming to CRSI DA4, unless otherwise shown.
 1. Place reinforcing bars accurately and tie securely at intersections and splices with 1.6 mm (16 gauge) black annealed wire. Secure reinforcing bars against displacement during the placing of concrete by spacers, chairs, or other similar supports. Portions of supports, spacers, and chairs in contact with formwork shall be made of

- plastic in areas that will be exposed when building is occupied. Type, number, and spacing of supports conform to ACI 318. Where concrete slabs are placed on ground, use concrete blocks or other non-corrodible material of proper height, for support of reinforcement. Use of brick or stone supports will not be permitted.
2. Lap welded wire fabric at least 1 1/2 mesh panels plus end extension of wires not less than 300 mm (12 inches) in structural slabs. Lap welded wire fabric at least 1/2 mesh panels plus end extension of wires not less than 150 mm (6 inches) in slabs on grade.
 3. Not Used.
- C. Spacing: Minimum clear distances between parallel bars, except in columns and multiple layers of bars in beams shall be equal to nominal diameter of bars. Minimum clear spacing is 25 mm (1 inch) or 1-1/3 times maximum size of coarse aggregate.
- D. Splicing: Splices of reinforcement made only as required or shown or specified. Accomplish splicing as follows:
1. Lap splices: Do not use lap splices for bars larger than Number 36 (Number 11). Minimum lengths of lap as shown.
 2. Not Used.
 3. Not Used.
- E. Bending: Bend bars cold, unless otherwise approved. Do not field bend bars partially embedded in concrete, except when approved by COR.
- F. Cleaning: Metal reinforcement, at time concrete is placed, shall be free from loose flaky rust, mud, oil, or similar coatings that will reduce bond.
- G. Future Bonding: Protect exposed reinforcement bars intended for bonding with future work by wrapping with felt and coating felt with a bituminous compound unless otherwise shown.

3.3 VAPOR BARRIER:

- A. Except where membrane waterproofing is required, interior concrete slab on grade shall be placed on a continuous vapor barrier.
1. Place 100 mm (4 inches) of fine granular fill over the vapor barrier to act as a blotter for concrete slab.
 2. Vapor barrier joints lapped 150 mm (6 inches) and sealed with compatible waterproof pressure-sensitive tape.
 3. Patch punctures and tears.

3.4 SLABS RECEIVING RESILIENT COVERING

- A. Slab shall be allowed to cure for 6 weeks minimum prior to placing resilient covering. After curing, slab shall be tested by the Contractor for moisture in accordance with ASTM D4263 or ASTM F1869. Moisture content shall be less than 3 pounds per 1000 sf prior to placing covering.
- B. In lieu of curing for 6 weeks, Contractor has the option, at his own cost, to utilize the Moisture Vapor Emissions & Alkalinity Control Sealer as follows:
 - 1. Sealer is applied on the day of the concrete pour or as soon as harsh weather permits, prior to any other chemical treatments for concrete slabs either on grade, below grade or above grade receiving resilient flooring, such as, sheet vinyl, vinyl composition tile, rubber, wood flooring, epoxy coatings and overlays.
 - 2. Manufacturer's representative will be on the site the day of concrete pour to install or train its application and document. He shall return on every application thereafter to verify that proper procedures are followed.
 - a. Apply Sealer to concrete slabs as soon as final finishing operations are complete and the concrete has hardened sufficiently to sustain floor traffic without damage.
 - b. Spray apply Sealer at the rate of 20 m² (200 square feet) per gallon. Lightly broom product evenly over the substrate and product has completely penetrated the surface.
 - c. If within two (2) hours after initial application areas are subjected to heavy rainfall and puddling occurs, reapply Sealer product to these areas as soon as weather condition permits.

3.5 CONSTRUCTION JOINTS:

- A. Unless otherwise shown, location of construction joints to limit individual placement shall not exceed 24,000 mm (80 feet) in any horizontal direction, except slabs on grade which shall have construction joints shown. Allow 48 hours to elapse between pouring adjacent sections unless this requirement is waived by Contracting Officer Representative.

Not Used. Not Used Not Used. E. Not Used.

3.6 EXPANSION JOINTS AND CONTRACTION JOINTS:

- A. Clean expansion joint surfaces before installing premolded filler and placing adjacent concrete.
- B. Not Used.
- C. Provide contraction (control) joints in floor slabs as indicated on the contract drawings. Joints shall be either formed or saw cut, to the indicated depth after the surface has been finished. Complete saw joints within 4 to 12 hours after concrete placement. Protect joints from intrusion of foreign matter.

3.7 PLACING CONCRETE:

- A. Preparation:
 - 1. Remove hardened concrete, wood chips, shavings and other debris from forms.
 - 2. Remove hardened concrete and foreign materials from interior surfaces of mixing and conveying equipment.
 - 3. Have forms and reinforcement inspected and approved by Contracting Officer Representative before depositing concrete.
 - 4. Provide runways for wheeling equipment to convey concrete to point of deposit. Keep equipment on runways which are not supported by or bear on reinforcement. Provide similar runways for protection of vapor barrier on coarse fill.
- B. Bonding: Before depositing new concrete on or against concrete which has been set, thoroughly roughen and clean existing surfaces of laitance, foreign matter, and loose particles.
 - 1. Preparing surface for applied topping:
 - a. Remove laitance, mortar, oil, grease, paint, or other foreign material by sand blasting. Clean with vacuum type equipment to remove sand and other loose material.
 - b. Broom clean and keep base slab wet for at least four hours before topping is applied.
 - c. Use a thin coat of one part Portland cement, 1.5 parts fine sand, bonding admixture; and water at a 50: 50 ratio and mix to achieve the consistency of thick paint. Apply to a damp base slab by scrubbing with a stiff fiber brush. New concrete shall be placed while the bonding grout is still tacky.

- C. Conveying Concrete: Convey concrete from mixer to final place of deposit by a method which will prevent segregation. Method of conveying concrete is subject to approval of Contracting Officer Representative.
- D. Placing: For special requirements see Paragraphs, HOT WEATHER and COLD WEATHER.
1. Do not place concrete when weather conditions prevent proper placement and consolidation, or when concrete has attained its initial set, or has contained its water or cement content more than 1 1/2 hours.
 2. Deposit concrete in forms as near as practicable in its final position. Prevent splashing of forms or reinforcement with concrete in advance of placing concrete.
 3. Do not drop concrete freely more than 3000 mm (10 feet) for concrete containing the high-range water-reducing admixture (superplasticizer) or 1500 mm (5 feet) for conventional concrete. Where greater drops are required, use a tremie or flexible spout (canvas elephant trunk), attached to a suitable hopper.
 4. Discharge contents of tremies or flexible spouts in horizontal layers not exceeding 500 mm (20 inches) in thickness, and space tremies such as to provide a minimum of lateral movement of concrete.
 5. Continuously place concrete until an entire unit between construction joints is placed. Rate and method of placing concrete shall be such that no concrete between construction joints will be deposited upon or against partly set concrete, after its initial set has taken place, or after 45 minutes of elapsed time during concrete placement.
 6. On bottom of members with severe congestion of reinforcement, deposit 25 mm (1 inch) layer of flowing concrete containing the specified high-range water-reducing admixture (superplasticizer). Successive concrete lifts may be a continuation of this concrete or concrete with a conventional slump.
 7. Concrete on metal deck:
 - a. Concrete on metal deck shall be minimum thickness shown. Allow for deflection of steel beams and metal deck under the weight of wet concrete in calculating concrete quantities for slab.

- 1) The Contractor shall become familiar with deflection characteristics of structural frame to include proper amount of additional concrete due to beam/deck deflection.
- E. Consolidation: Conform to ACI 309. Immediately after depositing, spade concrete next to forms, work around reinforcement and into angles of forms, tamp lightly by hand, and compact with mechanical vibrator applied directly into concrete at approximately 450 mm (18 inch) intervals. Mechanical vibrator shall be power driven, hand operated type with minimum frequency of 5000 cycles per minute having an intensity sufficient to cause flow or settlement of concrete into place. Vibrate concrete to produce thorough compaction, complete embedment of reinforcement and concrete of uniform and maximum density without segregation of mix. Do not transport concrete in forms by vibration.
1. Use of form vibration shall be approved only when concrete sections are too thin or too inaccessible for use of internal vibration.
 2. Carry on vibration continuously with placing of concrete. Do not insert vibrator into concrete that has begun to set.

3.8 HOT WEATHER:

Follow the recommendations of ACI 305 or as specified to prevent problems in the manufacturing, placing, and curing of concrete that can adversely affect the properties and serviceability of the hardened concrete. Methods proposed for cooling materials and arrangements for protecting concrete shall be made in advance of concrete placement and approved by Contracting Officer Representative.

3.9 COLD WEATHER:

Follow the recommendations of ACI 306 or as specified to prevent freezing of concrete and to permit concrete to gain strength properly. Use only the specified non-corrosive, non-chloride accelerator. Do not use calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions. Methods proposed for heating materials and arrangements for protecting concrete shall be made in advance of concrete placement and approved by COR.

3.10 PROTECTION AND CURING:

- A. Conform to ACI 308: Initial curing shall immediately follow the finishing operation. Protect exposed surfaces of concrete from premature drying, wash by rain and running water, wind, mechanical

injury, and excessively hot or cold temperatures. Keep concrete not covered with membrane or other curing material continuously wet for at least 7 days after placing. Keep wood forms continuously wet to prevent moisture loss until forms are removed. Cure exposed concrete surfaces as described below. Other curing methods may be used if approved by Contracting Officer Representative.

1. Liquid curing and sealing compounds: Apply by power-driven spray or roller in accordance with the manufacturer's instructions. Apply immediately after finishing. Maximum coverage 10m²/L (400 square feet per gallon) on steel troweled surfaces and 7.5m²/L (300 square feet per gallon) on floated or broomed surfaces for the curing/sealing compound.
2. Plastic sheets: Apply as soon as concrete has hardened sufficiently to prevent surface damage. Utilize widest practical width sheet and overlap adjacent sheets 50 mm (2 inches). Tightly seal joints with tape.
3. Paper: Utilize widest practical width paper and overlap adjacent sheets 50 mm (2 inches). Tightly seal joints with sand, wood planks, pressure-sensitive tape, mastic or glue.

3.11 REMOVAL OF FORMS:

- A. Remove in a manner to assure complete safety of structure. after the following conditions have been met.
 1. Where structure as a whole is supported on shores, forms for beams and girder sides, columns, and similar vertical structural members may be removed after 24 hours, provided concrete has hardened sufficiently to prevent surface damage and curing is continued without any lapse in time as specified for exposed surfaces.
 2. Take particular care in removing forms of architectural exposed concrete to insure surfaces are not marred or gouged, and that corners and arises are true, sharp and unbroken.
- B. Control Test: Use to determine if the concrete has attained sufficient strength and curing to permit removal of supporting forms. Cylinders required for control tests taken in accordance with ASTM C172, molded in accordance with ASTM C31, and tested in accordance with ASTM C39. Control cylinders cured and protected in the same manner as the structure they represent. Supporting forms or shoring not removed until strength of control test cylinders have attained at least 70 percent of

minimum 28-day compressive strength specified. / Exercise care to assure that newly unsupported portions of structure are not subjected to heavy construction or material loading.

C. Not Used.

3.12 CONCRETE SURFACE PREPARATION:

- A. Metal Removal: Unnecessary metal items cut back flush with face of concrete members.
- B. Patching: Maintain curing and start patching as soon as forms are removed. Do not apply curing compounds to concrete surfaces requiring patching until patching is completed. Use cement mortar for patching of same composition as that used in concrete. Use white or gray Portland cement as necessary to obtain finish color matching surrounding concrete. Thoroughly clean areas to be patched. Cut out honeycombed or otherwise defective areas to solid concrete to a depth of not less than 25 mm (1 inch). Cut edge perpendicular to surface of concrete. Saturate with water area to be patched, and at least 150 mm (6 inches) surrounding before placing patching mortar. Give area to be patched a brush coat of cement grout followed immediately by patching mortar. Cement grout composed of one part Portland cement, 1.5 parts fine sand, bonding admixture, and water at a 50:50 ratio, mix to achieve consistency of thick paint. Mix patching mortar approximately 1 hour before placing and remix occasionally during this period without addition of water. Compact mortar into place and screed slightly higher than surrounding surface. After initial shrinkage has occurred, finish to match color and texture of adjoining surfaces. Cure patches as specified for other concrete. Fill form tie holes which extend entirely through walls from unexposed face by means of a pressure gun or other suitable device to force mortar through wall. Wipe excess mortar off exposed face with a cloth.
- C. Upon removal of forms, clean vertical concrete surface that is to receive bonded applied cementitious application with wire brushes or by sand blasting to remove unset material, laitance, and loose particles to expose aggregates to provide a clean, firm, granular surface for bond of applied finish.

3.13 CONCRETE FINISHES:

- A. Vertical and Overhead Surface Finishes:

1. Unfinished areas: Vertical and overhead concrete surfaces exposed in pipe basements, elevator and dumbwaiter shafts, pipe spaces, pipe trenches, above suspended ceilings, manholes, and other unfinished areas will not require additional finishing.
 2. Interior and exterior exposed areas to be painted: Remove fins, burrs and similar projections on surfaces flush, and smooth by mechanical means approved by COR, and by rubbing lightly with a fine abrasive stone or hone. Use ample water during rubbing without working up a lather of mortar or changing texture of concrete.
 3. Interior and exterior exposed areas finished: Give a grout finish of uniform color and smooth finish treated as follows:
 - a. After concrete has hardened and laitance, fins and burrs removed, scrub concrete with wire brushes. Clean stained concrete surfaces by use of a hone stone.
 - b. Apply grout composed of one part of Portland cement, one part fine sand, smaller than a 600 μm (No. 30) sieve. Work grout into surface of concrete with cork floats or fiber brushes until all pits, and honeycombs are filled.
 - c. After grout has hardened slightly, but while still plastic, scrape grout off with a sponge rubber float and, about 1 hour later, rub concrete vigorously with burlap to remove any excess grout remaining on surfaces.
 - d. In hot, dry weather use a fog spray to keep grout wet during setting period. Complete finish of area in same day. Make limits of finished areas at natural breaks in wall surface. Leave no grout on concrete surface overnight.
 4. Textured: Finish as specified. Maximum quantity of patched area 0.2 m^2 (2 square feet) in each 93 m^2 (1000 square feet) of textured surface.
- B. Slab Finishes:
1. Monitoring and Adjustment: Provide continuous cycle of placement, measurement, evaluation and adjustment of procedures to produce slabs within specified tolerances. Monitor elevations of structural steel in key locations before and after concrete placement to establish typical deflection patterns for the structural steel. Provide information to Contracting Officer Representative and floor

consultant for evaluation and recommendations for subsequent placements.

2. Set perimeter forms to serve as screed using either optical or laser instruments. For slabs on grade, wet screeds may be used to establish initial grade during strike-off, unless Contracting Officer Representative determines that the method is proving insufficient to meet required finish tolerances and directs use of rigid screed guides. Where wet screeds are allowed, they shall be placed using grade stakes set by optical or laser instruments. Use rigid screed guides, as opposed to wet screeds, to control strike-off elevation for all types of elevated (non slab-on-grade) slabs. Divide bays into halves or thirds by hard screeds. Adjust as necessary where monitoring of previous placements indicates unshored structural steel deflections to other than a level profile.
3. Place slabs monolithically. Once slab placement commences, complete finishing operations within same day. Slope finished slab to floor drains where they occur, whether shown or not.
4. Use straightedges specifically made for screeding, such as hollow magnesium straightedges or power strike-offs. Do not use pieces of dimensioned lumber. Strike off and screed slab to a true surface at required elevations. Use optical or laser instruments to check concrete finished surface grade after strike-off. Repeat strike-off as necessary. Complete screeding before any excess moisture or bleeding water is present on surface. Do not sprinkle dry cement on the surface.
5. Immediately following screeding, and before any bleed water appears, use a 3000 mm (10 foot) wide highway straightedge in a cutting and filling operation to achieve surface flatness. Do not use bull floats or darbys, except that darbying may be allowed for narrow slabs and restricted spaces.
6. Wait until water sheen disappears and surface stiffens before proceeding further. Do not perform subsequent operations until concrete will sustain foot pressure with maximum of 6 mm (1/4 inch) indentation.
7. Scratch Finish: Finish base slab to receive a bonded applied cementitious application as indicated above, except that bull floats and darbys may be used. Thoroughly coarse wire broom within two

hours after placing to roughen slab surface to insure a permanent bond between base slab and applied materials.

8. Float Finish: Slabs to receive unbonded toppings, steel trowel finish, fill, mortar setting beds, or a built-up roof, and ramps, stair treads, platforms (interior and exterior), and equipment pads shall be floated to a smooth, dense uniform, sandy textured finish. During floating, while surface is still soft, check surface for flatness using a 3000 mm (10 foot) highway straightedge. Correct high spots by cutting down and correct low spots by filling in with material of same composition as floor finish. Remove any surface projections and re-float to a uniform texture.
9. Steel Trowel Finish: Concrete surfaces to receive resilient floor covering or carpet, monolithic floor slabs to be exposed to view in finished work, , applied toppings, and other interior surfaces for which no other finish is indicated. Steel trowel immediately following floating. During final troweling, tilt steel trowel at a slight angle and exert heavy pressure to compact cement paste and form a dense, smooth surface. Finished surface shall be smooth, free of trowel marks, and uniform in texture and appearance.
10. Broom Finish: Finish exterior slabs, ramps, and stair treads with a bristle brush moistened with clear water after surfaces have been floated. Brush in a direction transverse to main traffic. Match texture approved by COR from sample panel.
11. Finished slab flatness (FF) and levelness (FL) values comply with the following minimum requirements:
 - a. Areas covered with carpeting, or not specified otherwise in b. below:
 - 1) Slab on Grade:

a) Specified overall value	FF 25/FL 20
b) Minimum local value	FF 17/FL 15
 - 2) Level suspended slabs (shored until after testing) and topping slabs:

a) Specified overall value	FF 25/FL 20
b) Minimum local value	FF 17/FL 15
 - 3) Unshored suspended slabs:

a) Specified overall value	FF 25
b) Minimum local value	FF 17

- 4) Level tolerance such that 80 percent of all points fall within a 20 mm (3/4 inch) envelope +10 mm, -10 mm (+3/8 inch, -3/8 inch) from the design elevation.
 - b. Areas that will be exposed, receive thin-set tile or resilient flooring, or roof areas designed as future floors:
 - 1) Slab on grade:
 - a) Specified overall value FF 36/FL 20
 - b) Minimum local value FF 24/FL 15
 - 2) Level suspended slabs (shored until after testing) and topping slabs
 - a) Specified overall value FF 30/FL 20
 - b) Minimum local value FF 24/FL 15
 - 3) Unshored suspended slabs:
 - a) Specified overall value FF 30
 - b) Minimum local value FF 24
 - 4) Level tolerance such that 80 percent of all points fall within a 20 mm (3/4 inch) envelope +10 mm, -10 mm (+3/8 inch, -3/8 inch) from the design elevation.
 - c. "Specified overall value" is based on the composite of all measured values in a placement derived in accordance with ASTM E1155.
 - d. "Minimum local value" (MLV) describes the flatness or levelness below which repair or replacement is required. MLV is based on the results of an individual placement and applies to a minimum local area. Minimum local area boundaries may not cross a construction joint or expansion joint. A minimum local area will be bounded by construction and/or control joints, or by column lines and/or half-column lines, whichever is smaller.
12. Measurements
- a. Department of Veterans Affairs retained testing laboratory will take measurements as directed by COR, to verify compliance with FF, FL, and other finish requirements. Measurements will occur within 72 hours after completion of concrete placement (weekends and holidays excluded). Make measurements before shores or forms are removed to insure the "as-built" levelness is accurately assessed. Profile data for above characteristics may be collected using a laser level or any Type II apparatus (ASTM E1155,

"profileograph" or "dipstick"). Contractor's surveyor shall establish reference elevations to be used by Department of Veterans Affairs retained testing laboratory.

- b. Contractor not experienced in using FF and FL criteria is encouraged to retain the services of a floor consultant to assist with recommendations concerning adjustments to slab thicknesses, finishing techniques, and procedures on measurements of the finish as it progresses in order to achieve the specific flatness and levelness numbers.

13. Acceptance/ Rejection:

- a. If individual slab section measures less than either of specified minimum local F_F/F_L numbers, that section shall be rejected and remedial measures shall be required. Sectional boundaries may be set at construction and contraction (control) joints, and not smaller than one-half bay.
- b. If composite value of entire slab installation, combination of all local results, measures less than either of specified overall F_F/F_L numbers, then whole slab shall be rejected and remedial measures shall be required.

14. Remedial Measures for Rejected Slabs: Correct rejected slab areas by grinding, planing, surface repair with underlayment compound or repair topping, retopping, or removal and replacement of entire rejected slab areas, as directed by COR, until a slab finish constructed within specified tolerances is accepted.

3.14 SURFACE TREATMENTS:

- A. Use on exposed concrete floors and concrete floors to receive carpeting except those specified to receive non-slip finish.
- B. Liquid Densifier/Sealer: Apply in accordance with manufacturer's directions just prior to completion of construction.
- C. Non-Slip Finish: Except where safety nosing and tread coverings are shown, apply non-slip abrasive aggregate to treads and platforms of concrete steps and stairs, and to surfaces of exterior concrete ramps and platforms. Broadcast aggregate uniformly over concrete surface at rate of application of 8% per 1/10th m² (7.5 percent per square foot) of area. Trowel concrete surface to smooth dense finish. After curing, rub treated surface with abrasive brick and water to slightly expose abrasive aggregate.

3.15 NOT USED

3.16 NOT USED

3.17 NOT USED

3.18 PRECAST CONCRETE ITEMS:

Precast concrete items, not specified elsewhere. Cast using 25 MPa (3000 psi) air-entrained concrete to shapes and dimensions shown. Finish to match corresponding adjacent concrete surfaces. Reinforce with steel for safe handling and erection.

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12-01-15
Renovate Tower of Building 1
VAMC, Sioux Falls, SD
VA Project #438-18-102

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SECTION 03 45 00
PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section includes the performance criteria, materials, production, and erection of architectural precast concrete units. The work performed under this section includes all labor, material, equipment, related services, and supervision required for the manufacture and erection of the architectural precast concrete work shown on the construction documents.

1.2 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Not Used.
- C. Concrete: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- D. Not Used.
- E. Mortar: Section 04 05 13, MASONRY MORTARING.
- F. Grout: Section 04 05 16, MASONRY GROUTING.
- G. Not Used.
- H. Not Used.
- I. Not Used.
- J. Sealants and Caulking: Section 07 92 00, JOINT SEALANTS.
- K. Size, Type and Color of Aggregate for Exposed Aggregate Finish and Matrix Color: Section 09 06 00, SCHEDULE FOR FINISHES.
- L. Repair of Abraded Galvanized and Painted Surfaces: Section 09 91 00, PAINTING.

1.3 QUALITY ASSURANCE:

- A. Fabricator Qualifications: A firm that complies with PCI MNL 117 and the following requirements and is experienced in producing units similar to those indicated for this Project and with a record of successful in-service performance:
 - 1. Provide engineering units to comply with performance requirements.
Furnish Comprehensive Engineering Analysis, performed by a qualified professional engineer who is legally qualified to practice in jurisdiction where Project is located, and who is experienced in providing engineering services of the kind indicated.

2. Participates in PCI's Plant Certification program at the time of bidding and is designated a PCI-certified plant for Group A, Category A1- Architectural Cladding and Load Bearing Units. Submit PCI certification.
 3. Fabricator must have a minimum of three (3) years' experience in Precast Architectural Concrete work comparable to that shown and specified in not less than three (3) projects of similar scope with the Government determining the suitability of experience.
- B. Erector Qualifications:
1. A precast concrete erector Qualified by the Precast/Prestressed Concrete Institute (PCI) prior to beginning work at the project site. Submit a current Certificate of Compliance furnished by PCI designating qualification in Category A (Architectural Systems) for non-load-bearing members. Submit qualifications.
 2. An erector with a minimum of two (2) years of experience who has completed architectural precast concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance and who meets the following requirements:
 - a. Retains a PCI Certified Field Auditor, at erector's expense, to conduct a field audit of a project in the same category as this Project prior to start of erection. Submit Erectors Post Audit Declaration.
 - b. The Basis of the Audit: PCI MNL 127.
- C. Testing Laboratory Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority. Submit a copy of the Certificate of Accreditation and Scope of Accreditation.
- D. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117.
- E. Sample Panels: Before fabricating units, produce a minimum of two (2) sample panels approximately 1.5 sq. m. (16 sq. ft.) in size for review by Contracting Officer Representative (COR). Incorporate full scale details of architectural features, finishes, textures, and transitions in the sample panels. Approved sample panel will be used for mockup and range sample.

1. Locate panels where indicated or, if not indicated, as directed by COR.
 2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
 3. After acceptance of repair technique by COR, maintain one (1) sample panel at the manufacturer's plant and one (1) at the project site in an undisturbed condition as a standard for judging the completed work.
 4. When back face of precast concrete unit is to be exposed, show samples of the workmanship, color, and texture of the backup concrete as well as the facing.
 5. Demolish and remove sample panels only when directed by COR.
- F. Range Samples: After sample panel approval and before production of units for installation, produce a minimum of three (3) samples, approximately 1.5 sq. m. (16 sq. ft.) in size, representing anticipated range of color and texture of project. Following range sample acceptance by the COR, maintain samples at the manufacturer's plant and the Project site as color and texture acceptability reference.
- G. Not Used.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01, GENERAL REQUIREMENTS.

1.4 PERFORMANCE REQUIREMENTS:

- A. Structural Performance: Provide units and connections capable of withstanding: the design criteria specified on the construction documents, self-weights and weights of materials supported or attached, for the conditions indicated.
1. Design Standards: Comply with ACI 318/ACI 318M and the design recommendations of PCI MNL 120 and PCI MNL 122 applicable to types of units indicated.
 2. Limit deflection of precast members as follows:
 - Vertical live load - $\text{Span} / 360$.
 - Wind load - $\text{Height} / 400$.
 3. Not Used.
 4. Not Used.

5. Not Used.

- B. Design concrete units and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live load deflection, shrinkage and creep of primary building structure, and other building movements.
- C. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 49 degrees C (120 degrees F).
- D. Calculated Fire-Test-Response Characteristics: Where indicated, provide units whose fire resistance has been calculated according to PCI MNL 124.

1.5 SOURCE QUALITY CONTROL:

- A. Quality-Control Testing: Test and inspect precast concrete according to Section 01 45 29, TESTING LABORATORY SERVICES and PCI MNL 117 requirements respectively. If using self-consolidating concrete also test and inspect according to PCI TR-6.
- B. Testing: When determined by the COR that there is evidence that the concrete strength of precast concrete units may be deficient, employ an independent testing agency at Contractor's expense to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to PCI MNL 117:
 - 1. Submit test results in writing on the same day that tests are performed, with copies to COR, Contractor, and precast concrete fabricator. Include the information required in Section 01 45 29, TESTING LABORATORY SERVICES and the following:
 - a. Identification mark and type of precast concrete units represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.
- D. Defective or Damaged Work: Units that do not comply with acceptability requirements, including concrete strength, manufacturing tolerances, and color and texture range are unacceptable. Chipped, spalled or cored units may be repaired, if repaired units match the visual mock-up. The COR will reject units that do not match the accepted samples and visual mock-up. Remove unacceptable units from the site and replace with precast concrete units that comply with requirements.

1.6 SUBMITTALS:

- A. Product Data: For each type of product indicated.

- B. Not Used.
- C. Design Mixes: For each concrete mix along with compressive strength and water-absorption tests.
- D. Shop (Erection) Drawings: Detail fabrication and installation of units.
 - 1. Indicate member locations with distinctive marks that match marks placed on the panels. Provide plans, elevations, dimensions, corner details, shapes, cross sections and relationships to adjacent materials.
 - 2. Indicate aesthetic characteristics including joints, reveals, and extent and location of each surface finish.
 - 3. Indicate separate face and backup mix locations, and thicknesses. Indicate locations, extent and treatment of dry joints if two-stage casting is proposed.
 - 4. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware, and connections.
 - 5. Indicate locations, tolerances and details of anchorage devices to be embedded in or attached to structure or other construction.
 - 6. Indicate sequence of erection.
 - 7. Indicate locations and details of facing materials, anchors, and joint widths.
 - 8. Design Modifications:
 - If design modifications are necessary to meet the performance requirements and field conditions, submit design calculations and drawings. Do not adversely affect the appearance, durability or strength of units when modifying details or materials and maintain the general design concept.
- E. Comprehensive Engineering Analysis: Submit calculations signed and sealed by a qualified professional engineer responsible for the product design who is registered in the state where the work is located. Show governing panel types, connections, and types of reinforcement, including special reinforcement. Indicate design criteria and loads. Indicate the location, type, magnitude and direction of all imposed loadings from the precast system to the building structural frame.
- F. Samples: Design reference samples for initial verification of design intent, approximately 305 by 305 by 50 mm (12 by 12 by 2 inches), representative of finishes, color, and textures of exposed surfaces of units.

- G. Samples for each facing unit required, showing the full range of color and texture expected. Supply sketch of each corner or special shape with dimensions. Supply sample showing color and texture of joint treatment.
- H. Welding Certificates: Copies of certificates for welding procedure specifications (WPS) and personnel.
- I. Qualification Data for fabricator, erector, and professional engineer: List of completed projects with project names and addresses, names and addresses of COR and owners, and PCI Certification documentation.
- J. Testing laboratory accreditations.
- K. Material Test Reports: From an accredited testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
 - 1. Concrete strengths and mix designs.
- L. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements.
 - 1. Cementitious materials.
 - 2. Reinforcing materials and prestressing tendons.
 - 3. Admixtures.
 - 4. Bearing pads.
 - 5. Structural-steel shapes and hollow structural sections.
 - 6. Insulation
 - 7. Facing units.
 - 8. Anchors.
- M. Description of stone anchor shear and tensile test assembly.
- N. Certificate of Compliance.
- O. Erectors Post Audit Declaration.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Comply with product handling requirements of PCI MNL 117 at the plant and project site.
- B. Deliver all units to the project site in such quantities and at such times to assure compliance with the agreed project schedule and proper setting sequence so as to limit unloading units temporarily on the ground.
- C. Lift and support units only at designated points shown on the shop drawings.
- D. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting

diagrams, templates, instructions, and directions, as required, for installation.

- E. Store units with adequate dunnage and bracing, and protect units to prevent contact with soil to prevent staining, and to prevent cracking, distortion, warping, and other physical damage. Place stored units so identification marks are clearly visible for inspection.

1.8 WARRANTY:

- A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".

1.9 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of specification to extent referenced. Publications are referenced in text by basic designation only.
- B. ASTM International (ASTM):
 - A27/A27M-13Steel Castings, Carbon, for General Application
 - A36/A36M-14Carbon Structural Steel
 - A47/A47M-99(R2014)Ferritic Malleable Iron Castings
 - A108-13Steel Bar, Carbon and Alloy, Cold-Finished
 - A123/A123M-13Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - A153/A153M-09Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - A184/A184M-06e1(R2011) .Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
 - A240/A240M-14.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and For General Applications
 - A276-13aStainless Steel Bars and Shapes
 - A283/A283M-13Low and Intermediate Tensile Strength Carbon Steel Plates
 - A307-14Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
 - A325-14Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
 - A325M-14Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength (Metric)
 - A416/A416M-12aSteel strand, Uncoated Seven-Wire for Prestressed Concrete

- A490-14aStructural Bolts, Alloy Steel, Heat Treated, 150
ksi Minimum Tensile Strength
- A490M-14aStructural Bolts, Alloy Steel, Heat Treated, 150
ksi Minimum Tensile Strength (Metric)
- A500/A500M-13Cold-Formed Welded and Seamless Carbon Steel
Structural Tubing in Rounds and Shapes
- A563-07 (R2014)Carbon and Alloy Steel Nuts
- A563M-07 (R2013)Carbon and Alloy Steel Nuts (Metric)
- A572/A572M-13aHigh-Strength Low-Alloy Columbium-Vanadium
Structural Steel
- A615/A615M-14Deformed and Plain Billet-Steel Bars for Concrete
Reinforcement
- A666-10Annealed or Cold-Worked Austenitic Stainless Steel
Sheet, Strip, Plate, and Flat Bar
- A675/A675M-14Steel Bars, Carbon, Hot-Wrought, Special Quality,
Mechanical Properties
- A706/A706M-14Low-Alloy Steel Deformed and Plain Bars for
Concrete Reinforcement
- A767/A767M-09Zinc-Coated (Galvanized) Steel Bars for Concrete
Reinforcement
- A775/A775M-07b (R2014) ..Epoxy-Coated Steel Reinforcing Bars
- A780/A780M-09Repair of Damaged and Uncoated Areas of Hot-Dip
Galvanized Coatings
- A884/A884M-14Epoxy-Coated Steel Wire and Welded Wire Fabric for
Reinforcement
- A934/A934M-13Epoxy-Coated Prefabricated Steel Reinforcing Bars
- A1064/A1064M-14Carbon-Steel Wire and Welded Wire Reinforcement,
Plain and Deformed, for Concrete
- B633-13Electrodeposited Coatings of Zinc on Iron and
Steel
- C33/C33M-13Concrete Aggregates
- C40/C40M-11Organic Impurities in Fine Aggregate for Concrete
- C144-11Aggregate for Masonry Mortar
- C150/C150M-12Portland Cement
- C260/C260M-10aAir-Entraining Admixtures for Concrete
- C330/C330M-14Lightweight Aggregates for Structural Concrete

- C373-14aTest Method for Water Absorption, Bulk Density,
Apparent Porosity, and Apparent Specific Gravity
of Fired Whiteware Products
- C494/C494M-13Chemical Admixtures for Concrete
- C618-12aCoal Fly Ash and Raw or Calcined Natural Pozzolan
for Use as a Mineral Admixture in Concrete
- C881/C881M-14for Epoxy-Resin-Base Bonding Systems for Concrete
- C920-14aElastomeric Joint Sealants
- C979/C979M-10Pigments for Integrally Colored Concrete
- C989/C989M-14Ground Granulated Blast-Furnace Slag for Use in
Concrete and Mortars
- C1017/C1017M-13Chemical Admixtures for Use in Producing Flowing
Concrete
- C1107/C1107M-14Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
- C1218/C1218M-99 (R2008) .Test Method for Water-Soluble Chloride in Mortar
and Concrete
- C1240-14Silica Fume Used in Cementitious Mixtures
- C1354/C1354M-09Test Method for Strength of Individual Stone
Anchorage in Dimension Stone
- D412-06a (R2013)Test Methods for Vulcanized Rubber and
Thermoplastic Elastomers—Tension
- D2240-05 (R2010)Test Method for Rubber Property—Durometer Hardness
- D4397-10Polyethylene Sheeting for Construction,
Industrial, and Agricultural Applications
- E165/E165M-12Standard Practice for Liquid Penetrant Examination
for General Industry
- E488/E488M-10Strength of Anchors in Concrete Elements
- E709-14Standard Guide for Magnetic Particle Testing
- F436-11Hardened Steel Washers
- F436M-11Hardened Steel Washers (Metric)
- F593-13aStainless Steel Bolts, Hex Cap Screws, and Studs
- F844-07a (R2013)Washers, Steel, Plain (Flat), Unhardened for
General Use

C. American Concrete Institute (ACI):

- ACI 211.1-91 (R2009)Selecting Proportions for Normal, Heavyweight and
Mass Concrete (Reapproved 2002)

- ACI 211.2-98 (R2004)Selecting Proportions for Structural Lightweight
Concrete
- ACI 318/318M-14Building Code Requirements for Structural Concrete
- D. American Association of State Highway and Transportation Officials
(AASHTO):
 - AASHTO LRFD-2014LRFD Bridge Design Specifications, U.S., 7th
Edition
 - AASHTO M251-06Elastomeric Bearings
- E. American Welding Society (AWS):
 - C5.4-93Recommended Practices for Stud Welding
 - D1.1/D1.1M(R2011)Structural Welding Code - Steel
 - D1.4/D1.4MStructural Welding Code - Reinforcing Steel
- F. American National Standards Institute (ANSI):
 - A108/A118/A136Installation of Ceramic Tile
 - A137.1-12Ceramic Tile
- G. Precast/Prestressed Concrete Institute (PCI):
 - Architectural Precast Concrete - Color and Texture Selection Guide
 - MNL-117-96Quality Control for Plants and Production of
Architectural Precast Concrete Products
 - MNL-120-10Design Handbook - Precast and Prestressed Concrete
 - MNL-122-07Architectural Precast Concrete
 - MNL-124-11Design for Fire Resistance of Precast Prestressed
Concrete
 - MNL-127-99Erector's Manual - Standards and Guidelines for
the Erection of Precast Concrete Products
 - MNL-135-00Tolerance Manual for Precast and Prestressed
Concrete Construction
 - TR-6-03Interim Guidelines for the Use of
Self-Consolidating Concrete
- H. Military Specifications (MIL. Spec):
 - MIL-C882E-89Cloth, Duck, Cotton or Cotton-Polyester Blend
Synthetic Rubber, Impregnated, and Laminated, Oil
Resistant
- I. Department of Veterans Affairs:
 - Physical Security Design Manual for VA Facilities-July 2007

PART 2 - PRODUCTS

2.1 MOLD MATERIALS:

- A. Molds: Rigid, dimensionally stable, nonabsorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; non-reactive with concrete and suitable for producing required finishes:
 - 1. Mold-Release Agent: Commercially produced form-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.
- B. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Provide solid backing and form supports to ensure that form liners remain in place during concrete placement. Use with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

2.2 REINFORCING MATERIALS:

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (Grade 420), deformed.
- B. Not Used
- C. Weldable Reinforcing Bars: ASTM A706/A706M, deformed.
 - 1. Galvanized Reinforcing Bars: ASTM A767/A767M, Class II zinc coated, hot-dip galvanized and chromate wash treated after fabrication and bending.
 - 2. Epoxy-Coated Reinforcing Bars: ASTM A775/A775M or ASTM A934/A934M.
 - 3. Steel Bar Mats: ASTM A184/A184M, assembled with clips.
 - a. Plain-Steel Welded Wire Reinforcement: ASTM A1064/A1064M, fabricated from as-drawn galvanized and chromate wash treated steel wire into flat sheets.
 - b. Deformed-Steel Welded Wire Reinforcement: ASTM A1064/A1064M, flat sheet.
- D. Epoxy-Coated-Steel Welded Wire Reinforcement: ASTM A884/A884M Class A coated, plain on flat sheet, Type 1 bendable coating.
- E. Prestressing Strand: ASTM A416/A416M, Grade 270 (Grade 1860), uncoated, 7-wire, low-relaxation strand.

- F. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

2.3 CONCRETE MATERIALS:

- A. Portland Cement: ASTM C150/C150M, Type I or III.
1. For surfaces exposed to view in finished structure, use color to match adjacent precast concrete units, same type, brand, and mill source throughout the precast concrete production.
 2. Standard gray Portland cement may be used for non-exposed backup concrete.
- B. Supplementary Cementitious Materials for unexposed surfaces (backup concrete) only.
1. Fly Ash Admixture: ASTM C618, Class C or F with maximum loss on ignition of 3 percent.
 2. Metakaolin Admixture: ASTM C618, Class N.
 3. Silica Fume Admixture: ASTM C1240 with optional chemical and physical requirement.
 4. Ground Granulated Blast-Furnace Slag: ASTM C989/C989M, Grade 100 or 120.
- C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C33/C33M, with coarse aggregates complying with Class 5S. Provide and stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for entire project.
1. Face-Mix Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
 - a. Gradation: To match design reference sample .
 - b. Not Used.
 - c. Eliminate off color material from exposed aggregate.
 2. Face-Mix Fine Aggregates: Selected, natural or manufactured sand of the same material as coarse aggregate, unless otherwise approved by COR.
 - a. Test sand for color value in accordance with ASTM C40/C40M. Sand producing darker than specified color standard is unacceptable.
 - b. Clean washed white sand.
 - c. Not Used.

- D. Lightweight Coarse Aggregate: Except as modified by PCI MNL 117, ASTM C330/C330M, with absorption less than 11 percent and free from expanded clay.
- E. Unexposed Surface (Backup) Concrete Aggregates: ASTM C33/C33M or ASTM C330/C330M.
- F. Admixtures: Admixtures containing calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture are not permitted.
 - 1. Coloring Admixture: ASTM C979/C979M, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable and non-fading.
 - 2. Air Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.
 - 3. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 - 4. Retarding Admixture: ASTM C494/C494M, Type B.
 - 5. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
 - 6. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 - 7. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
 - 8. Plasticizing Admixture for Flowable Concrete: ASTM C1017/C1017M.
- G. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

2.4 STEEL CONNECTION MATERIALS:

- A. Carbon-Steel Shapes and Plates: ASTM A36/A36M except silicon (Si) content in the range of 0 to 0.03% or 0.15 to 0.25% for materials to be galvanized. Steel with chemistry conforming to the formula $Si + 2.5P \leq 0.09$ is also acceptable.
- B. Carbon-Steel Headed Studs: ASTM A108, Grades 1018 through 1020, cold finished and bearing the minimum mechanical properties for studs as indicated under PCI MNL 117, Table 3.2.3.
 - 1. Make welds in accordance with AWS D1.1/D1.1M, Type A or B, with arc shields.
- C. Carbon-Steel Plate: ASTM A283/A283M.
- D. Malleable Iron Castings: ASTM A47/A47M. Grade 32510.
- E. Carbon-Steel Castings: ASTM A27/A27M, Grade U-60-30 (Grade 415-205).

- F. High-Strength, Low-Alloy Structural Steel: ASTM A572/A572M except silicon (Si) content in the range of 0 to 0.03% or 0.15 to 0.25% for materials to be galvanized. Steel with chemistry conforming to the formula $Si + 2.5P \leq 0.09$ is also acceptable.
- G. Carbon-Steel Structural Tubing: ASTM A500/A500M, Grade B.
- H. Wrought Carbon-Steel Bars: ASTM A675/A675M, Grade 65 (Grade 450).
- I. Deformed-Steel Wire or Bar Anchors: ASTM A1064/A1064M or ASTM A706/A706M.
- J. Carbon-Steel Bolts and Studs: ASTM A307, Grade A, carbon-steel, hex-head bolts and studs; carbon-steel nuts ASTM A563M (A563), Grade A; and flat, unhardened steel washers complying with ASTM F844.
- K. High-Strength Bolts and Nuts: ASTM A325M (A325) or ASTM A490M (A490), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, complying with ASTM A563M (A563) and hardened carbon-steel washers complying with ASTM F436M (F436).
- L. Finish: For exterior steel items and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A123/A123M, after fabrication, or ASTM A153/A153M, or electrodeposition according to ASTM B633, SC 3, Type 1, as applicable.
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint with minimum 2 mils (0.002 inch) dry film containing not less than 94 percent zinc dust by weight, and complying with SSPC-Paint 20.
- M. Welding Electrodes: Provide materials that comply with requirements of AWS D1.1/D1.1M. Submit product data on welding electrodes and rods.

2.5 STAINLESS-STEEL CONNECTION MATERIALS:

- A. Stainless-Steel Plate: ASTM A666, Type 304, of grade suitable for application.
- B. Stainless-Steel Bolts and Studs: ASTM F593, alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless steel washers. Lubricate threaded parts of stainless steel bolts with an anti-seize thread lubricant during assembly.
- C. Stainless-Steel Headed Studs: ASTM A276 and bearing the minimum mechanical properties for studs as indicated under PCI MNL 117, Table 3.2.3.

2.6 BEARING PADS AND OTHER ACCESSORIES:

- A. Provide bearing pads for units as follows:
 - 1. Elastomeric Pads: AASHTO M251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a

- molded sheet, 50 to 70 Shore A durometer according to ASTM D2240, minimum tensile strength 15.5 MPa (2250 psi) per ASTM D412.
2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Surface hardness of 70 to 90 Shore A durometer according to ASTM D2240. Capable of supporting a compressive stress of 20.7 MPa (3000 psi) with no cracking, splitting or delaminating in the internal portions of the pad. Test one specimen for each 200 pads used in the project. Submit test results.
 3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer. Surface hardness of 80 to 100 Shore A durometer according to ASTM D2240. Conforming to Division II, Section 18.10.2 of AASHTO LRFD, or MIL-C-882E.
 4. Frictionless Pads: Tetrafluoroethylene (teflon), glass-fiber reinforced, bonded to stainless or mild-steel plates, of type required for in-service stress.
 5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.
- B. Reglets: Stainless steel, ASTM A240/A240M, Type 302 felt or fiber filled or cover face opening of slots.
- C. Vents and Weeps: Polyvinyl chloride plastic tubing, 9.5 mm (3/8 inch) inside diameter.
- D. Provide sealant backings and sealant into stone-to-stone joints and stone-to-concrete joints in accordance with Section 07 92 00, JOINT SEALANTS.
- E. Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install units.

2.7 GROUT MATERIALS:

- A. Sand-Cement Grout: Portland Cement, ASTM C150/C150M, Type I, and clean, natural sand, ASTM C144, or ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107/C1107M, Grade A for drypack and Grades B and C for flowable grout and of a consistency suitable for application within a 30-minute working time.

C. Epoxy-resin grout: Two-component mineral-filled epoxy-resin: ASTM C881 of type, grade, and class to suit requirements.

2.8 NOT USED

2.9 NOT USED

2.10 NOT USED

2.11 CONCRETE MIXES:

- A. Prepare design mixes to match COR's sample for each type of concrete required.
 - 1. Limit use of fly ash and granulated blast-furnace slag to 20 percent replacement of Portland cement by weight;.
- B. Provide design mixes prepared by a qualified independent testing agency or by qualified precast plant personnel at fabricator's option.
- C. Limit water-soluble chloride ions to the maximum percentage by weight of cement permitted by ACI 318/318M or PCI MNL 117 when tested in accordance with ASTM C1218/C1218M.
- D. Normal Weight Concrete Face and Backup Mixtures: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 34.5 MPa (5000 psi).
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Release strength as required by design.
- E. Not Used.
- F. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.
- G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows.
- H. Total air content for various sizes of coarse aggregate for normal weight concrete.

Nominal Maximum Size of Aggregate mm (inch)	Total Air Content, Percent, by Volume	
	Severe Exposure	Moderate Exposure
Less than 9 (3/8)	9	7
9 (3/8)	7-1/2	6
13 (1/2)	7	5-1/2
19 (3/4)	6	5
25 (1)	6	5

38 (1-1/2)	5-1/2	4-1/2
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H. When included in design mixes, add other admixtures to concrete mixes according to manufacturer's written instructions.

PART 3 - EXECUTION

3.1 MOLD FABRICATION:

- A. Molds: Construct and maintain molds, mortar tight, within fabrication tolerances and of sufficient strength to withstand pressures due to concrete-placement, vibration operations, and temperature changes and for prestressing and detensioning operations.
1. Form joints are not acceptable on faces exposed to view in the finished work.
 2. Edge and Corner Treatment: Uniformly chamfered.

3.2 NOT USED

3.3 NOT USED

3.4 FABRICATION:

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Position anchors for attachment of loose hardware and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
1. Weld headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4.
- B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing units to supporting and adjacent construction.
- C. Provide cast-in reglets, slots, holes, and other accessories in units as indicated on contract documents.
- D. Provide cast-in openings larger than 254 mm (10 inches) in any dimension. Do not drill or cut openings or reinforcing without approval of COR.
- E. Reinforcement: Comply with recommendations in PCI MNL 117 for fabrication, placing, and supporting reinforcement.
1. Place reinforcing steel and prestressing strand to maintain at least 19 mm (3/4 inch) minimum concrete cover. Increase cover requirements for reinforcing steel to 38 mm (1-1/2 inches) when units are exposed to corrosive environment or severe exposure conditions. Arrange, space,

- and securely tie bars and bar supports to hold reinforcement in position while placing concrete.
2. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one (1) full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.
 3. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A775/A775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
 4. Accurately position, support, and secure reinforcement against displacement during concrete- placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
- F. Prestress tendons for units by pretensioning methods. Comply with PCI MNL 117.
1. Protect strand ends and anchorages with zinc-rich paint to prevent corrosion and rust spots.
 2. Delay detensioning or post-tensioning of precast, prestressed architectural precast concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under the same conditions as concrete member.
 3. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
 4. If concrete has been heat cured, detension while concrete is still warm and moist.
- G. Mix concrete according to PCI MNL 117 and requirements in PART 2. After concrete batching, no additional water may be added.
1. At the fabricator's option either of the following mix design/casting techniques may be used:
 - a. A single design mix throughout the entire thickness of panel.
 - b. Design mixes for facing and backup; using cement and aggregates for each type as indicated, for consecutive placement in the mold. Use cement and aggregate specified for facing mix, use cement and

aggregate for backup mix complying with criteria specified as selected by the fabricator.

- H. Place concrete in a continuous operation. Comply with requirements in PCI MNL 117.
 - 1. Place backup concrete to ensure bond with face mix concrete.
 - 2. Place self-consolidating concrete without vibration in accordance with PCI TR-6.
- I. Identify pickup points of units and orientation in structure with permanent markings, complying with markings indicated on shop drawings. Imprint or permanently mark casting date on each unit on a surface that will not show in finished structure.
- J. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat, accelerated heat curing using low-pressure live steam, or radiant heat and moisture.
- K. Repair damaged units to meet acceptability requirements of PCI MNL 117 and the COR.
- L. Reinforce architectural precast concrete units to resist handling, transportation and erection stresses, and specified in-place loads, whichever governs.
- M. Comply with requirements in PCI MNL 117 and requirements in this section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.
- N. Place face mixture to a minimum thickness after consolidation of the greater of 25 mm (1 inch) or 1.5 times the nominal maximum aggregate size, but not less than the minimum reinforcing cover of 38 mm (1-1/2 inches) .
 - 1. Use a single design mixture for those units in which more than one major face (edge) is exposed.
 - 2. Where only one (1) face of unit is exposed, at the fabricator's option, either of the following mixture design/casting techniques may be used:
 - a. A single design mix throughout the entire thickness of panel.
 - b. Separate mixtures for face and backup concrete; using cement and aggregates for each type as appropriate, for consecutive placement in the mold. Use cement and aggregate specified for face mixture. Use cement and aggregate for backup mixture complying with specified criteria or as selected by the fabricator.
- O. Thoroughly consolidate placed concrete by internal or external vibration without dislocating or damaging reinforcement and built-in items, and

minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 117.

1. Place self-consolidating concrete without vibration in accordance with PCI TR-6.

P. Comply with PCI MNL 117 procedures for hot- and cold-weather concrete placement.

3.5 NOT USED

3.6 FABRICATION TOLERANCES:

A. Fabricate units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

1. Additional Position Tolerances: For cast-in items measured from datum line location, as indicated on shop drawings.

a. Location of Bearing Surface from End of Member: Plus or Minus 6 mm (1/4 inch).

b. Position of Sleeve: Plus or Minus 13 mm (1/2 inch).

c. Location of Window Washer Track or Buttons: Plus or Minus 3 mm (1/8 inch).

B. Fabricate architectural trim units such as sills, lintels, coping, cornices, quoins, medallions, bollards, benches, planters, and pavers, with tolerances meeting PCI MNL 135.

C. Not Used.

D. Not Used.

3.7 FINISHES:

A. Provide exposed panel faces free of joint marks, grain, and other obvious defects. Corners, including false joints to be uniform, straight and sharp. Finish exposed-face surfaces of units to match approved design reference sample and as follows:

1. PCI's "Architectural Precast Concrete -Color and Texture Selection Guide," of plate numbers indicated.

2. As-Cast Surface Finish: Provide surfaces free of excessive air voids, sand streaks, and honeycombs.

3. Textured-Surface Finish: Impart by form liners to provide surfaces free of air voids, sand streaks, and honeycombs, with uniform color and texture.

4. Not Used.

5. Exposed Aggregate Finish: Use chemical retarding agents applied to concrete forms and washing and brushing procedures to expose aggregate and surrounding matrix surfaces after form removal.
 6. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.
 7. Acid-Etched Finish: Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces. Protect hardware, connections and insulation from acid attack.
 8. Honed Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
 9. Polished Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
 10. Sand-Embedment Finish: Use selected stones placed in a sand bed in bottom of mold, with sand removed after curing.
- B. Finish exposed top, bottom, and back surfaces of units to match face-surface finish.
 - C. Finish unexposed surfaces top, bottom, and back of units by smooth steel-trowel finish.
 - D. Finish unexposed surfaces of units by float finish.

3.8 ERECTION PREPARATION:

- A. Deliver anchorage devices that are embedded in or attached to the building structural frame or foundation before start of such work. Furnish locations, setting diagrams, and templates for the proper installation of each anchorage device.
- B. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Do not install units until supporting cast-in-place concrete building structural framing has attained minimum allowable design strength or supporting steel or other structure is structurally ready to receive loads from precast.

3.9 ERECTION:

- A. Erect units level, plumb and square within the specified allowable tolerances. Provide temporary supports and bracing as required to maintain

position, stability, and alignment of units until permanent connections are completed.

1. Install temporary steel or plastic spacing shims or bearing pads as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
 3. Remove projecting lifting devices and use sand-cement grout to fill voids within recessed lifting devices flush with surface of adjacent precast concrete surfaces when recess is exposed.
 4. Unless otherwise shown provide for uniform joint widths of 19 mm (3/4 inch).
- B. Connect units in position by bolting, welding, grouting, or as otherwise indicated on approved Erection Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting or grouting are completed.
1. Disruption of roof flashing continuity by connections is not permitted; concealment within roof insulation is acceptable.
 2. Welding: Comply with and AWS D1.1/D1.1M and AWS D1.4/1.4M requirements for welding, welding electrodes, appearance of welds, and methods used in connecting welding work.
 - a. Protect units and bearing pads from damage by field welding or cutting operations and provide noncombustible shields as required.
 - b. When welds are not specified, provide continuous fillet welds, using not less than the minimum fillet as specified by AWS.
 - c. Clean weld affected metal surfaces and apply a minimum 2 mils (0.002 inch) dry thickness coat of galvanized repair paint to galvanized surfaces in conformance with ASTM A780/A780M.
 - d. Visually inspect welds critical to precast connections. Visually check welds for completion and remove, reweld or repair defective welds.
 3. At bolted connections, provide lock washers, tack welding, or other acceptable means to prevent loosening of nuts after final adjustment.
 - a. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connection apply

specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.

4. Grouting Connections: Grout connections where required or indicated on shop (erection drawings). Retain flowable grout in place until strong enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.
- C. Attachments: Upon approval of COR, precast pre-stressed products may be drilled or "shot" for fasteners or small openings, provided reinforcing or pre-stressing steel is not damaged or cut.
1. Should spalling occur, repair according to this specification section.
- D. Venting and Weeps: Where precast concrete panels form the outer wythe of cavity wall construction, vent the cavity wall.
1. Use polyvinyl chloride plastic tubing to vent the cavity.
 2. Place plastic vent tubes "tilted down and out" in horizontal and vertical joints.
 3. Space vent tubes in accordance with shop drawings, but not less than two vents per panel or approximately 1219 mm (4 feet) on centers.
- E. Setting: Where shown, fill joints with cement mortar specified in this section.
1. Clean surfaces forming beds and other joints for precast concrete panels of dust, dirt, and other foreign matter, and wet thoroughly to prevent suction before precast concrete, elements are set.
 2. Set precast element level and true to line with uniform joints filled completely with mortar.
 3. Rake out joints 25 mm (1-inch) deep for pointing or sealants.
 4. Joints required to have only sealant to be kept free of mortar for full depth.
 5. Keep exposed faces of precast concrete elements free of mortar.
 6. Remove wedges, spacers, or other appliances which are likely to cause staining from joints.
 7. Where parging is shown, parge back of elements solid with mortar. Apply parging without skips or holidays.
- F. Pointing: Wash and brush clean, leaving joints free from loose mortar, dust and other foreign material.

1. Carefully point with a slightly concave joint.
 2. Mortar for pointing as specified in this section. Provide same material and color sand used in fabrication of precast concrete elements.
- G. Sealing of Joints: Where shown and where required to make work watertight: clean, dry and seal joints between precast concrete elements and between precast elements and adjoining materials as specified in Section 07 92 00, JOINT SEALANTS.

3.10 ERECTION TOLERANCES:

- A. Erect units level, plumb, square, true, and in alignment without exceeding the erection tolerances of PCI MNL 117, Appendix I.

3.11 FIELD QUALITY CONTROL:

- A. Special Inspections: Contractor engaged qualified special inspector approved by COR is to perform the following special inspections and prepare reports:
1. Erection of loadbearing precast concrete members.
- B. Testing Agency: Contractor engaged qualified testing agency approved by COR is to perform tests and inspections and prepare test reports.
- C. Visually inspect field welds and test according to ASTM E165 or to ASTM E709.
- D. Report test results directly from testing agency within 7 days after testing and in writing to Contractor and COR.
- E. As directed by COR, repair, or remove and replace work that does not comply with specified requirements.
- F. Perform additional testing and inspecting, at no additional cost, to determine compliance of corrected work with specified requirements.

3.12 REPAIRS:

- A. When permitted by COR, repair damaged units.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 6.1 m (20 feet).
- C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A780/A780M.
- D. Remove and replace damaged units when repairs do not meet requirements.
- E. Repair damaged units to meet acceptability of PCI MNL 117.
- F. Wire brush, clean, and paint damaged prime painted components with the same type of shop primer.

3.13 CLEANING:

- A. Clean surfaces of precast concrete to be exposed to view, as necessary, prior to shipping.
- B. Clean mortar, plaster, fireproofing, weld slag, and any other deleterious material from concrete surfaces and adjacent materials immediately.
- C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

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10-01-15
Renovate Tower of Building 1
VAMC, Sioux Falls, SD
VA Project #438-18-102

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SECTION 03 54 00
SELF-LEVELING CONCRETE FLOOR UNDERLAYMENT

PART 1 GENERAL

1.01 SUMMARY

- A. This section specifies the installation of Cement-Based Self-Leveling Floor Underlayment for topping concrete floors.

1.02 REFERENCES

- A. ASTM C109M Standard Test Method for Compressive Strength of Hydraulic Cement
- B. ASTM F2170 Relative Humidity in Concrete Floor Slabs Using in situ Probes
- C. ASTM F1869 Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

1.02 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data: Technical Data Sheet
- C. Manufacturer's Procedures for Installation of Finished Floor Goods over Underlayment
- D. Manufacturer's Building Conditions Guide

1.03 QUALITY ASSURANCE

- A. Installer's Qualifications: Installation of Self Leveling Underlayment shall be by an applicator authorized by the manufacturer and shall use manufacturer approved mixing and pumping equipment.

1.04 DELIVERY, STORAGE AND HANDLING

- A. General Requirements: Materials shall be delivered in their original, unopened packages and protected from exposure to the elements. Damaged or deteriorated materials shall be removed from the premises.

1.05 SITE CONDITIONS

- A. Environmental Requirements: Before, during and after installation of Self Leveling Underlayment, building interior shall be enclosed and maintained at

a temperature above 50 degrees F (10 degrees C) and below 100 degrees F (37.7 degrees C) until structure and subfloor temperature are stabilized.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cement-Based Self-Leveling Poured Floor Underlayment: Floor underlayment compound shall be Cement-Based Self-Leveling Floor Underlayment with the following characteristics:
1. Compressive strength of 5500 psi at 28 days when measured in compliance with ASTM C 109
 2. Flexural Strength of 1260 psi at 28 days when measured in compliance with ASTM C 348
 3. Tensile strength 720 psi at 28 days when measured in compliance with ASTM C 190
 4. Fire Performance ASTM E 84
Flame spread -0
Fuel Contribution - 0
 5. Smoke Density -0
- B. Mix Water: Potable, free from impurities.
- C. Concrete Primer: Manufacturer Approved Primer
- D. Sealer: Manufacturer Approved Sealer only if Self Leveling Underlayment is to be a wear-surface topping. Coordinate sealer with applied flooring material.

2.02 MIX DESIGNS

- A. General Requirements: Self Leveling Underlayment mix proportions and methods shall be in strict accordance with product manufacturer recommendations.

PART 3 EXECUTION

3.01 PREPARATION

- A. Condition and Cleaning of Subfloor: Subfloor shall be structurally sound. Steel troweled concrete, concrete sealed with curing compounds, or slick or smooth substrate surfaces must be shot-blast to a CSP of 5 or scarified.

General Contractor shall clean subfloor to remove mud, oil, grease, and other contaminating factors before arrival of the Self Leveling Underlayment crew.

- B. Leak Prevention: Fill cracks and voids with a quick setting patching or caulking material where leakage of Self Leveling Underlayment could occur.
- C. Expansion Joints: Allow joints to continue through the Level-Right Maxx at the same width.
- D. Self-Leveling Underlayment is not a vapor barrier. The general contractor, architect, specifier, or building owner shall test below grade, on grade, or elevated slabs for MVER (ASTM F1869-09) or RH (ASTM F2170). If the MVER or RH of the concrete substrate exceeds the floor covering manufacturer's respective requirements for the finished floor system, the concrete should be treated with a moisture vapor barrier before installing Self Leveling Underlayment.

3.02 APPLICATION OF SELF-LEVELING FLOORING

- A. Scheduling: Application of Self Leveling Underlayment shall not begin until the building is enclosed, including roof, windows, doors, and other fenestration. Install after drywall installation unless tenant finish requirements identify partitioning after the pour.
- B. Priming Subfloor: Prime concrete subfloor using the Manufacturer Approved Primer. Priming instructions vary according to the porosity of the concrete, multiple coats may be necessary.
- C. Application: Place Self Leveling Underlayment 1/8" - 1 1/4" (3 - 30 mm). Deeper areas can be poured in multiple lifts or by prefilling with stone per manufacturer's recommendations. Spread and float Self Leveling Underlayment to a smooth surface. Except at authorized joints, place Self Leveling Underlayment as continuously as possible until application is complete so that no Self Leveling Underlayment slurry is placed against Self Leveling Underlayment product that has obtained its initial set.
- D. Drying: General Contractor shall provide continuous ventilation and adequate heat until Self Leveling Underlayment is dry. General contractor shall provide mechanical ventilation if necessary.

3.03 PREPARATION FOR INSTALLATION OF GLUE DOWN FLOOR GOODS

- A. Floor Goods Attachment: Follow manufacturer's recommended "Procedures for Installing Finished Floor Goods over Self Leveling Underlayment " for

guidelines for installing finished floor goods. This procedure is not a warranty and is to be used as a guideline only.

3.04 FIELD QUALITY CONTROL

- A. Field Samples: At least one set of 3 molded cube samples shall be taken from each day's pour during the Self Leveling Underlayment. Cubes shall be tested as recommended by the manufacturer in accordance with ASTM C109M. Test results shall be available to architect and/or contractor upon request from applicator.

3.05 PROTECTION

- A. Protection from Heavy Loads: During construction, place temporary wood planking over Self Leveling Underlayment wherever it will be subject to heavy wheeled or concentrated loads.

END OF SECTION

**SECTION 04 01 00
MAINTENANCE OF MASONRY**

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Repointing existing damaged masonry joints.
2. Replacing existing damaged masonry units.

B. Work in this Contract includes:

1. Preparation, existing mortar joint removal, tuckpointing, and masonry unit replacement as necessary at any exterior brick masonry wall locations where cracking, spalling or masonry unit decomposition has occurred, at the following locations:
 - a. Existing five-story tower area of Building 1.
 - b. Existing surfaces in the area of the demolition / removal of the elevator tower at the center of Building 1
 - c. In all other existing areas areas where generally indicated on the drawings.

1.2 NOT USED

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. ASTM International (ASTM):

1. C67-14 - Sampling and Testing Brick and Structural Clay Tile.
2. C144-11 - Aggregate for Masonry Mortar.
3. C150/C150M-15 - Portland Cement.
4. C207-06(2011) - Hydrated Lime for Masonry Purposes.
5. C216-15 - Facing Brick (Solid Masonry Units Made from Clay or Shale).
6. C270-14a - Mortar for Unit Masonry.
7. C295/C295M-12 - Petrographic Examination of Aggregates for Concrete.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Description of each product.

2. Replacement units indicating manufacturer recommendation for each application.

C. Samples:

1. Pointing Mortar: Molded, 150 mm (6 inches) long for each type, texture, and color.

D. Test reports:

1. Not Used.
2. Recommended mortar mix and mortar materials sources.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Documented experience in completion of work, similar in design, material, and extent specified.

B. Not Used

C. Not Used.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Store materials covered, protected from weather, and elevated above grade.

1. Prevent contamination of aggregates.

B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

A. Environment:

1. Cold Weather Requirements: Maintain mortar ingredients and substrate within temperature range between 4 degrees C (40 degrees F) and 49 degrees C (120 degrees F) when outside temperature is less than 4 degrees C (40 degrees F).

2. Hot Weather Requirements: Protect mortar-joint from evaporation of moisture from mortar material. When required, provide adequately shaded work area.

1.9 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Mortar Components:
 - 1. Hydrated Lime: ASTM C207, Type S.
 - 2. Aggregate: ASTM C144.
 - 3. Portland Cement: ASTM C150/C150M, Type I.
 - 4. Water: Potable, free of substances that are detrimental to grout, masonry, and metal.

2.2 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide each product from one manufacturer

2.3 REPLACEMENT MASONRY UNITS

- A. Face Brick:
 - 1. ASTM C216, Grade SW, Type FBS matching existing .
 - 2. Efflorescence: Rated slight efflorescent when tested according to ASTM C67.
- B. Other Masonry Units: Match existing.

2.4 MIXES

- A. Tuck Pointing Mortar: ASTM C270;
 - 1. Type N.

2.5 ACCESSORIES

- A. Cleaning Agent: Soapless, non-acidic, detergent, specially prepared for cleaning brick, stone, concrete or masonry.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
 - 1. Protect from mortar droppings and cleaning operations.
- C. Remove existing fixtures and fittings concealing masonry joints to permit repointing and repair.

3.2 EXISTING MORTAR JOINTS

- A. Cut out existing bed and head mortar joints, to uniform depth of 19 mm (3/4 inches), or to sound mortar without damaging edges and faces of existing masonry units to remain.
- B. Remove dust and debris from joints.
 - 1. Do not rinse when temperature is below freezing.

3.3 TUCK POINTING

- A. Dampen joints immediately before tuck pointing. Allow masonry units to absorb surface water.
- B. Tightly pack tuck pointing mortar into joints in thin layers, 6 mm (1/4 inch) thick, maximum.
- C. Allow layer to become slightly hardened before applying next layer.
- D. Pack final layer flush with surfaces of masonry units.

3.4 MASONRY UNIT REPLACEMENT

- A. Cut out mortar joints surrounding masonry units requiring replacement.
 - 1. Remove existing masonry units creating opening for replacement masonry unit installation.
 - 2. Remove mortar, dust, and debris from opening perimeter surfaces.
 - 3. Prevent debris from falling into cavity.
- B. Dampen surfaces of surrounding existing masonry before installing replacement masonry units.
 - 1. Allow existing masonry to absorb surface moisture before installing replacement units.
 - 2. Butter contact surfaces of existing masonry and replacement masonry units with mortar.
 - 3. Center replacement masonry units in opening and press into position.
 - 4. Remove excess mortar.
 - 5. Tuck point replacement masonry units to ensure full head and bed joints.

3.5 JOINT TOOLING

- A. Tool repointed and replaced masonry joints when mortar becomes slightly hardened.
- B. Produce smooth, compacted, concave joint matching existing .

3.6 CLEANING

- A. Remove mortar splatter from exposed surfaces immediately.

- B. Clean exposed masonry surfaces on completion.
- C. Remove mortar droppings and other foreign substances from wall surfaces.
- D. Wet surfaces with clean water.
- E. Wash with cleaning agent.
- F. Brush masonry surfaces with stiff fiber brushes while washing.
- G. Immediately after washing, rinse with clean water.
 - 1. Remove traces of detergent, foreign streaks or stains.

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02-01-16
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VA Project #438-18-102

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**SECTION 04 05 13
MASONRY MORTARING**

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Masonry mortar installed by other concrete and masonry sections.

1.2 RELATED REQUIREMENTS

A. Mortar used in Section:

1. Section 03 45 00, PRECAST ARCHITECTURAL CONCRETE.
2. Section 04 01 00, MAINTENANCE OF MASONRY.
3. Section 04 05 16, MASONRY GROUTING.
4. Section 04 20 00, UNIT MASONRY.
5. Not Used.

B. Mortar Color: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. ASTM International (ASTM):

1. C40/C40M-11 - Organic Impurities in Fine Aggregates for Concrete.
2. C91/C91M-12 - Masonry Cement.
3. C144-11 -Aggregate for Masonry Mortar.
4. C150/C150M-15 - Portland Cement.
5. C207-06(2011) - Hydrated Lime for Masonry Purposes.
6. C270-14a - Mortar of Unit Masonry.
7. C595/C595M-15e1 - Blended Hydraulic Cements.
8. C780-15 - Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
9. C979/C979M-10 - Pigments for Integrally Colored Concrete.
10. C1329/C1329M-15 - Mortar Cement.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Description of each product.

C. Test Reports: Certify each product complies with specifications.

1. Mortar.

2. Admixtures.
- D. Certificates: Certify each product complies with specifications.
 1. Portland cement.
 2. Masonry cement.
 3. Mortar cement.
 4. Hydrated lime.
 5. Fine aggregate.
 6. Color admixture.
- E. Qualifications: Substantiate qualifications comply with specifications.
 1. Testing laboratory.

1.5 QUALITY ASSURANCE

- A. Preconstruction Testing:
 1. Engage independent testing laboratory to tests and submit reports.
 - a. Deliver samples to laboratory in number and quantity required for testing.
 2. Test mortar and materials specified.
 3. Mortar:
 - a. Test for compressive strength and water retention according to ASTM C270.
 - b. Minimum Mortar compressive strengths 28 days:
 - 1) Type M: 17.2 MPa (2,500 psi).
 - 2) Type S: 12.4 MPa (1,800 psi).
 - 3) Type N: 5.1 MPa (750 psi).
 4. Non Staining Cement: Test for water soluble alkali.
 - a. Water Soluble Alkali: Maximum 0.03 percent.
 5. Sand: Test for deleterious substances, organic impurities, soundness and grading.

1.6 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Store masonry materials under waterproof covers on planking clear of ground.
 - 1. Protect loose, bulk materials from contamination.
- B. Protect products from damage during handling and construction operations.

1.8 WARRANTY

- A. Construction Warranty: Contractor's one-year labor and material warranty. FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Hydrated Lime: ASTM C207, Type S.
- B. Aggregate for Masonry Mortar: ASTM C144 and as follows:
 - 1. Light colored sand for mortar for laying face brick.
 - 2. White plastering sand meeting sieve analysis for mortar joints for pointing and laying of structural facing tile units except that 100 percent passes No. 8 sieve, and maximum 5 percent retained on No. 16 sieve.
 - 3. Test sand for color value according to ASTM C40/C40M. Sand producing color darker than specified standard is unacceptable.
- C. Blended Hydraulic Cement: ASTM C595/C595M, Type IS, IP.
- D. Masonry Cement: ASTM C91/C91M. Type N, S, Or M.
 - 1. Use white masonry cement whenever white mortar is specified.
- E. Mortar Cement: ASTM C1329/C1329M, Type N, S or M.
- F. Portland Cement: ASTM C150/C150M, Type I.
 - 1. Use white Portland cement wherever white mortar is specified.
- G. Pigments: ASTM C979/C979M; inorganic, inert, mineral pigments only, unaffected by atmospheric conditions, nonfading, alkali resistant, and water insoluble.
- H. Water: Potable, free of substances that are detrimental to mortar, masonry, and metal.

2.2 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide each product from one manufacturer and from one production run.

2.3 MIXES

- A. Pointing Mortar for new work:
 - 1. For Precast Concrete: Proportion by volume; one part white Portland cement, two parts white sand, and 1/5 part hydrated lime.
 - 2. Not Used.

- B. Tuck Pointing Mortar for Repair Work: Tuck pointing mortar specified in Section 04 01 00, MAINTENANCE OF MASONRY.

- C. Masonry Mortar: ASTM C270.
 - 1. Admixtures:
 - a. Do not use mortar admixtures, and color admixtures unless approved by Contracting Officer's Representative.
 - b. Do not use antifreeze compounds.

- D. Colored Mortar:
 - 1. Maintain uniform mortar color for exposed work, throughout.
 - 2. Match mortar color in approved sample or sample panel specified in Section 04 20 00, UNIT MASONRY.
 - 3. Alteration Work Mortar Color: Match existing mortar.

- E. Color Admixtures:
 - 1. Proportion as specified by manufacturer.
 - 2. For color, see Section 09 06 00, SCHEDULE FOR FINISHES.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.

3.2 MIXING

- A. Measure ingredients by volume using known capacity container.
- B. Mix for 3 to 5 minutes in a mechanically operated mortar mixer.
- C. Mix water with dry ingredients in sufficient amount to provide a workable mixture which will adhere to vertical surfaces of masonry units.

- D. Mortar Stiffened Because of Water Loss Through Evaporation:
 - 1. Re-temper by adding water to restore to proper consistency and workability.

2. Discard mortar reaching initial set or unused within two hours of mixing.

E. Pointing Mortar:

1. Mix dry ingredients with enough water to produce damp mixture of workable consistency retaining shape when formed into ball.
2. Allow mortar to stand in dampened condition for 60 to 90 minutes.
3. Add water to bring mortar to a workable consistency before use.

3.3 MORTARING

- A. Type M Mortar: Use for precast concrete panels, and parging below grade .
- B. Type S Mortar: Use for masonry containing vertical reinforcing bars (non-engineered), masonry below grade, and engineered reinforced unit masonry work.
- C. Brick Veneer Over Frame Back Up Walls: Use Type S Portland cement-lime mortar.
- D. Type N Mortar: Use for other masonry work.
- E. Type N Mortar: Use for pointing items and tuck pointing specified.

3.4 FIELD QUALITY CONTROL

- A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.
 1. Take and test samples during progress of work according to ASTM C780.

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10-01-17
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VA Project #438-18-102

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SECTION 04 05 16
MASONRY GROUTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grout for filling hollow concrete masonry cores.

1.2 RELATED REQUIREMENTS

A. Grout used in Section:

1. Section 03 45 00, PRECAST ARCHITECTURAL CONCRETE.
2. Section 04 20 00, UNIT MASONRY.
3. Not Used.

B. Grout Color: Section 09 06 00, SCHEDULE FOR FINISHES.

C. Not Used.

D. Not Used.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American National Standards Institute (ANSI):

1. A118.6-10 - Standard Cement Grouts for Tile Installation.

C. ASTM International (ASTM):

1. C40/C40M-11 - Organic Impurities in Fine Aggregates for Concrete.
2. C150/C150M-15 - Portland Cement.
3. C207-06(2011) - Hydrated Lime for Masonry Purposes.
4. C404-11 - Aggregates for Masonry Grout.
5. C476-11 - Grout for Masonry.
6. C595/C595M-15e1 - Blended Hydraulic Cement.
7. C979/C979M-10 - Pigments for Integrally Colored Concrete.
8. C1019-14 - Sampling and Testing Grout.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Description of each product.

C. Not Used

D. Test Reports: Certify each product complies with specifications.

1. Grout, each type.

2. Cement.
 3. Aggregate.
- E. Certificates: Certify each product complies with specifications.
1. Blended hydraulic cement.
 2. Portland cement.
 3. Grout.
 4. Hydrated lime.
 5. Aggregate.
 6. Color admixture.

1.5 QUALITY ASSURANCE

- A. Preconstruction Testing: (When directed by Contracting Officer Representative)
1. Engage independent testing laboratory to perform tests and submit reports.
 - a. Deliver samples to laboratory in number and quantity required for testing.
 2. Grout:
 - a. Test compressive strength according to ASTM C1019 standard.
 3. Cement:
 - a. Test for water soluble alkali (nonstaining) when nonstaining cement is specified.
 - b. Nonstaining cement containing more than 0.03 percent water soluble alkali.
 4. Aggregate:
 - a. Test for deleterious substances, organic impurities, soundness and grading.

1.6 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.

1.7 STORAGE AND HANDLING

- A. Store masonry materials under waterproof covers on planking clear of ground, and protect damage from handling, dirt, stain, water and wind.
- B. Protect products from damage during handling and construction operations.

1.8 WARRANTY

- A. Construction Warranty: Contractor's one-year labor and material warranty. FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Grout Components:
 - 1. Hydrated Lime: ASTM C207, Type S.
 - 2. Aggregate For Masonry Grout: ASTM C404, Size 8.
 - 3. Blended Hydraulic Cement: ASTM C595, Type IS, IP.
 - 4. Portland Cement: ASTM C150, Type I.
 - 5. Liquid Acrylic Resin:
 - a. A formulation of acrylic polymers and modifiers in liquid form designed for use as an additive for mortar to improve physical properties.
 - 6. Water: Potable, free of substances that are detrimental to grout, masonry, and metal.

2.2 PRODUCTS - GENERAL

- A. Provide each product from one manufacturer.
- B. Not Used.

2.3 MIXES

- A. Grout: ASTM C476; fine grout and coarse grout.
 - 1. Color Admixture:
 - a. Pigments: ASTM C979, inert, stable to atmospheric conditions, nonfading, alkali resistant, and water insoluble.
 - b. Use mineral pigments only. Organic pigments are not acceptable.
- B. Ready-Mixed Grout: ANSI A118.8.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Clean mortar from masonry cells protruding more than 13 mm (1/2 inch) to permit grout flow.
- D. Remove debris from grout spaces.
- E. Verify reinforcement is correctly placed before placing grout.

3.2 MIXING

- A. Mix grout in mechanically operated mixer.
 - 1. Mix grout for five minutes, minimum.
- B. Measure ingredients by volume using container of known capacity.
- C. Mix water with grout dry ingredients.
 - 1. Slump Range: 200 to 275 mm (8 to 11 inches).

3.3 GROUTING

- A. Install grout according to Section 04 20 00, UNIT MASONRY.
- B. Use fine grout for filling wall cavities and hollow concrete masonry units where smallest cell dimension is 50 mm (2 inches) or less.
- C. Use either fine grout or coarse grout for filling wall cavities and hollow concrete masonry units where smallest cell dimension is greater than 50 mm (2 inches).
- D. Use grout for filling bond beam or lintel units.

- - E N D - -

SECTION 04 20 00
UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Concrete masonry unit (CMU) assemblies for:
1. Exterior walls.
 2. Interior walls and partitions.

1.2 RELATED REQUIREMENTS

- A. Mortars and grouts: Section 04 05 13, MASONRY MORTARING, Section 04 05 1
- B. Steel lintels and shelf angles: Section 05 50 00, METAL FABRICATIONS.
- C. Cavity insulation: Section 07 21 13, THERMAL INSULATION.
- D. Flashing: Section 07 60 00, FLASHING AND SHEET METAL.
6, MASONRY GROUTING.
- E. Sealants and Sealant Installation: Section 07 92 00, JOINT SEALANTS.
- F. Color and Texture of Masonry Units: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American Concrete Institute (ACI):
1. 315-99 - Details and Detailing of Concrete Reinforcement.
 2. 530.1/ASCE 6/TMS 602-13 - Specification for Masonry Structures.
- C. ASTM International (ASTM):
1. A615/A615M-15ae1 - Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 2. A951/A951M-14 - Steel Wire for Masonry Joint Reinforcement.
 3. A1064/A1064M-15 - Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 4. C55-14a - Concrete Building Brick.
 5. C62-13a - Building Brick (Solid Masonry Units Made from Clay or Shale).
 6. C67-14 - Sampling and Testing Brick and Structural Clay Tile.
 7. C90-14 - Load-Bearing Concrete Masonry Units.

8. C216-15 - Facing Brick (Solid Masonry Units Made From Clay or Shale).
 9. C612-14 - Mineral Fiber Block and Board Thermal Insulation.
 10. C744-14 - Prefaced Concrete and Calcium Silicate Masonry Units.
 11. D1056-14 - Flexible Cellular Materials - Sponge or Expanded Rubber.
 12. D2240-05(2010) - Rubber Property-Durometer Hardness.
 13. F1667-15 - Driven Fasteners: Nails, Spikes, and Staples.
- D. Brick Industry Association (BIA):
1. TN 11B-88 - Guide Specifications for Brick Masonry, Part 3.
- E. Federal Specifications (Fed. Spec.):
1. FF-S-107C(2) - Screws, Tapping and Drive.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
1. Fabrication, bending, and placement of reinforcing bars. Comply with ACI 315. Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies.
 2. Special masonry shapes, profiles, and placement.
 3. Masonry units for typical window and door openings, and, for special conditions as affected by structural conditions.
- C. Manufacturer's Literature and Data:
1. Description of each product.
 2. Installation instructions.
- D. Samples:
1. Face brick: Sample panel, 200 mm by 400 mm (8 inches by 16 inches,) showing full color range and texture of bricks, bond, and proposed mortar joints.
 2. Not Used.
 3. Concrete masonry units, when exposed in finish work.
 4. Anchors and Ties: Each type.
 5. Joint Reinforcing: 1200 mm (48 inches) long each type.
- E. Sustainable Construction Submittals:
1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

- F. Test reports: Certify products comply with specifications.
 - 1. Ceramic glazed facing brick.
- G. Certificates: Certify products comply with specifications.
 - 1. Face brick.
 - 2. Solid and load-bearing concrete masonry units, including fire-resistant rated units.

1.5 QUALITY ASSURANCE

- A. Welders and Welding Procedures Qualifications: AWS D1.4/D1.4M.
- B. Mockups:
 - 1. Before starting masonry, build a mockup panel minimum 1800 mm by 1800 mm (6 feet by 6 feet) with 600 mm (24 inch) 90 degree return for outside corner.
 - a. Use masonry units from random cubes of units delivered on site.
 - b. Include structural backup, reinforcing, ties, and anchors.
 - 2. Mockup panel approved by Contracting Officer's Representative set workmanship and aesthetic quality for masonry work.
 - 3. Clean sample panel to test cleaning methods.
 - 4. Remove mockup panel when directed by Contracting Officer's Representative.

1.6 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Store products above grade, protected from contamination.
- B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

- A. Hot and Cold Weather Requirements: Comply with ACI 530.1/ASCE 6/TMS 602.

1.9 WARRANTY

- A. Construction Warranty: Warrant exterior masonry walls against moisture leaks and subject to terms of FAR clause 52.246-21, "Warranty of Construction." Contractor's one-year labor and material warranty.

PART 2 - PRODUCTS

2.1 NOT USED

2.2 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
B. Provide each product from one manufacturer and from one production run.
C. Sustainable Construction Requirements:
1. Steel Recycled Content: 30 percent total recycled content, minimum.

2.3 UNIT MASONRY PRODUCTS

- A. Brick:
1. Face Brick:
a. ASTM C216, Grade SW, Type FBS.
b. Brick when tested according to ASTM C67: Classified slightly efflorescent or better.
c. Size:
1) "Standard" size:
a) Face Brick to match existing Building 1 facility.
b) Basis of Design manufacturer: (See 09 06 00 - Schedule for Finishes)
c) Basis of Design brick / color: (See 09 06 00 - Schedule for Finishes)
2) Thin Brick: 46 mm (1-13/16 inch) thick (1/2 normal thickness) with angle shapes for corners. To be used only in select areas as indicated in the Construction Drawings. One Face Exposed: Grade S, Type I.
3) Two Faces Exposed: Grade S, Type II.
B. Concrete Masonry Units (CMU):
1. Hollow and Solid Load-Bearing Concrete Masonry Units: ASTM C90.
a. Unit Weight: Normal weight.
b. Fire rated units for fire rated partitions.

2. Sizes: Modular, 200 mm by 400 mm (8 inches by 16 inches) nominal face dimension; thickness as indicated on drawings.
3. For molded faces used as a finished surface, use concrete masonry units with uniform fine to medium surface texture unless specified otherwise.
4. Use bullnose concrete masonry units at corners exposed in finished work with 25 mm (1 inch) minimum radius rounded vertical exterior corners (bullnose units).

C. Concrete Brick: ASTM C55.

2.4 ANCHORS, TIES, AND REINFORCEMENT

A. Steel Reinforcing Bars: ASTM A615/A615M; Grade 60, deformed bars.

B. Joint Reinforcement:

1. Form from wire complying with ASTM A951/A951M.
2. Hot dipped galvanized after fabrication.
3. Width of joint reinforcement 40 mm (1.6 inches) less than nominal thickness of masonry wall or partition.
4. Cross wires welded to longitudinal wires.
5. Joint reinforcement minimum 3000 mm (10 feet) long, factory cut.
6. Joint reinforcement with crimp formed drip is not acceptable.
7. Maximum spacing of cross wires 400 mm (16 inch) to longitudinal wires.
8. Ladder Design:
 - a. Longitudinal wires deformed 5 mm (0.20 inch) diameter wire .

9. Not Used

10. Multiple Wythes and Cavity Wall Ties:

- a. Longitudinal wires 4 mm (0.16 inch), two in each wythe with ladder truss wires 4 mm (0.16 inch) overlay, welded to each longitudinal wire.
- b. Longitudinal wires 4 mm (0.16 inch) with U shape 4 mm (0.16 inch) rectangular ties extending into other wythe minimum 75 mm (3 inches) spaced 400 mm on center (16 inches). Adjustable type with U shape tie designed to receive 4 mm (0.16 inch) pintle projecting into other wythe 75 mm (3 inches min.).

C. Adjustable Veneer Anchor:

1. Two piece, adjustable anchor and tie.

2. Anchor and tie may be either loop or angle type; provide only one type throughout.
 3. Loop Type:
 - a. Anchor: Screw-on galvanized steel anchor strap 2.75 mm (0.11 inch) by 19 mm (3/4 inch) wide by 225 mm (9 inches) long, with 9 mm (0.35 inch) offset and 100 mm (4 inch) adjustment. Provide 5 mm (0.20 inch) hole at each end for fasteners.
 - b. Ties: Triangular tie, fabricated of 5 mm (0.20 inch) diameter galvanized cold drawn steel wire. Ties long enough to engage anchor and be embedded minimum 50 mm (2 inches) into bed joint of masonry veneer.
 4. Angle Type:
 - a. Anchor: Minimum 2 mm (16 gage) thick galvanized steel angle shaped anchor strap. Provide hole in vertical leg for fastener. Provide hole near end of outstanding leg to suit upstanding portion of tie.
 - b. Tie: Fabricate from 5 mm (0.20 inch) diameter galvanized cold drawn steel wire. Form "L" shape to be embedded minimum 50 mm (2 inches) into the bed joint of masonry veneer and provide upstanding leg to fit through hole in anchor and be long enough to allow 50 mm (2 inches) of vertical adjustment.
- D. Dovetail Anchors:
1. Corrugated steel dovetail anchors formed of 1.5 mm (0.06 inch) thick by 25 mm (1 inch) wide galvanized steel, 90 mm (3-1/2 inches) long where used to anchor 100 mm (4 inch) nominal thick masonry units, 140 mm (5-1/2 inches) long for masonry units more than 100 mm (4 inches) thick.
 2. Triangular wire dovetail anchor 100 mm (4 inch) wide formed of 4 mm (9 gage) steel wire with galvanized steel dovetail insert. Anchor length to extend minimum 75 mm (3 inches) into masonry, 25 mm (1 inch) into 40 mm (1-1/2 inch) thick units.
 3. Form dovetail anchor slots from 0.6 mm (0.02 inch) thick galvanized steel (with felt or fiber filler).
- E. Individual Ties:

1. Rectangular ties: Form from 5 mm (3/16 inch) diameter galvanized steel rod to rectangular shape minimum 50 mm (2 inches) wide by sufficient length for ends of ties to extend within 25 mm (1 inch) of each face of wall. Ties that are crimped to form drip are not acceptable.
2. Adjustable Cavity Wall Ties:
 - a. Adjustable wall ties may be furnished at Contractor's option.
 - b. Two piece type permitting up to 40 mm (1-1/2 inch) adjustment.
 - c. Form ties from 5 mm (3/16 inch) diameter galvanized steel wire.
 - d. Form one piece to rectangular shape 105 mm (4-1/8 inches) wide by length required to extend into bed joint 50 mm (2 inches).
 - e. Form other piece to 75 mm (3 inch) long by 75 mm (3 inch) wide shape, having 75 mm (3 inch) long bent section for engaging 105 mm (4-1/8 inch) wide piece to form adjustable connection.

F. Wall Ties, (Mesh or Wire):

1. Mesh wall ties formed of ASTM A1064/A1064M, W0.5, 2 mm, (0.08 inch) galvanized steel wire 13 mm by 13 mm (1/2 inch by 1/2 inch) mesh, 75 mm (3 inches) wide by 200 mm (8 inches) long.
2. Rectangular wire wall ties formed of W1.4, 3 mm, (0.12 inch) galvanized steel wire 50 mm (2 inches) wide by 200 mm (8 inches) long.

G. Ridge Wall Anchors:

1. Form from galvanized steel minimum 25 mm (1 inch) wide by 5 mm (3/16 inch) thick by 600 mm (24 inches) long, plus 50 mm (2 inch) bends.
2. Other lengths as indicated on drawings.

2.5 ACCESSORIES

A. Shear Keys:

1. Solid extruded cross-shaped section of rubber, neoprene, or polyvinyl chloride, with durometer hardness of approximately 80 when tested according to ASTM D2240, and minimum shear strength of 3.5 MPa (500 psi).
2. Shear Key Dimensions: Nominal 70 mm by 8 mm for long flange and 38 mm by 16 mm for short flange (2-3/4 inches by 5/16 inch for long flange, and 1-1/2 inches by 5/8 inch for short flange).

B. Weeps:

1. Weep Hole Wicks: Glass fiber ropes, 10 mm (3/8 inch) minimum diameter, 300 mm (12 inches) long.
2. Weep Tubing: Round, polyethylene, 9 mm (3/8 inch) diameter, 100 mm (4 inches) long.
3. Weep Hole: Flexible PVC louvered configuration with rectangular closure strip at top.

C. Cavity Drain Material: Open mesh polyester sheets or strips to prevent mortar droppings from clogging the cavity.

D. Preformed Compressible Joint Filler:

1. Thickness and depth to fill joint.
2. Closed Cell Neoprene: ASTM D1056, Type 2, Class A, Grade 1, B2F1.
3. Non-Combustible Type: ASTM C612, Type 5, Max. Temp.1800 degrees F.

E. Box Board:

1. Mineral Fiber Board: ASTM C612, Type 1.
2. 25 mm (1 inch) thickness.
3. Other spacing material having similar characteristics is acceptable subject to Contracting Officer's Representative's approval.

F. Masonry Cleaner:

1. Detergent type cleaner selected for each type masonry.
2. Acid cleaners are not acceptable.
3. Use soapless type specially prepared for cleaning brick or concrete masonry as appropriate.

G. Fasteners:

1. Concrete Nails: ASTM F1667, Type I, Style 11, 19 mm (3/4 inch) minimum length.
2. Masonry Nails: ASTM F1667, Type I, Style 17, 19 mm (3/4 inch) minimum length.
3. Screws: FS-FF-S-107, Type A, AB, SF thread forming or cutting.

H. Welding Materials: AWS D1.4/D1.4M, type to suit application.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions.

1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Keep finish work free from mortar smears or spatters, and leave neat and clean.
- C. Wall Openings:
1. Fill hollow metal frames built into masonry walls and partitions solid with mortar as laying of masonry progresses.
 2. When items are not available when walls are built, prepare openings for subsequent installation.
- D. Tooling Joints:
1. Do not tool until mortar has stiffened enough to retain thumb print when thumb is pressed against mortar.
 2. Tool while mortar is soft enough to be compressed into joints and not raked out.
 3. Finish joints in exterior face masonry work with jointing tool, and provide smooth, water-tight concave joint unless specified otherwise.
 4. Tool Exposed interior joints in finish work concave unless specified otherwise.
- E. Partition Height:
1. Extend partitions minimum 100 mm (4 inches) above suspended ceiling or to overhead construction where no ceiling occurs.
 2. Extend following partitions to overhead construction.
 - a. Full height partitions, and fire partitions and smoke partitions indicated on drawings.
 - b. Both walls at expansion joints.
 - c. Corridor walls.
 - d. Walls at stairway and stair halls, elevators, dumbwaiters, trash and laundry chute shafts, and other vertical shafts.
 - e. Walls at refrigerator space.
 - f. Reinforced masonry partitions.
 3. Extend finished masonry partitions minimum 100 mm (4 inches) above suspended ceiling and continue with concrete masonry units or structural clay tile to overhead construction:

F. Lintels:

1. Not Used.
2. Openings up to 1600 mm (63 inches) wide without structural steel lintel or frames, require lintel formed of concrete masonry lintel or bond beam units filled with grout and reinforced with one No. 16 (No. 5) rod top and bottom for each 100 mm (4 inches) of nominal thickness unless shown otherwise.
3. Precast concrete lintels of 25 MPa (3,000 psi) (min) concrete, same thickness as partition, and with one No. 16 (No. 5) deformed bar top and bottom for each 100 mm (4 inches) of nominal thickness, is acceptable in lieu of reinforced CMU masonry lintels.
4. Use steel lintels, for openings greater than 1600 mm (63 inches) wide, brick masonry openings, and elevator openings unless shown otherwise.
5. Doors having overhead concealed door closers require steel lintel, and pocket for closer box.
6. Lintel Bearing Length: Minimum 100 mm (4 inches) at both ends.
7. Build masonry openings or arches over wood or metal centering and supports when steel lintels are not used.

G. Wall, Furring, and Partition Units:

1. Lay out field units to provide one-half running bond, unless indicated otherwise.
2. Align head joints of alternate vertical courses.
3. At sides of openings, balance head joints in each course on vertical center lines of openings.
4. Minimum Masonry Unit Length: 100 mm (4 inches).
5. On interior partitions provide 6 mm (1/4 inch) open joint for caulking between existing construction, exterior walls, concrete work, and abutting masonry partitions.
6. Use minimum 100 mm (4 inches) nominal thick masonry for free standing furring, unless indicated otherwise.
7. Do not abut existing plastered surfaces except suspended ceilings with new masonry partitions.

H. Not Used.

- I. Before connecting new masonry with previously laid masonry, remove loosened masonry or mortar, and clean and wet work in place as specified under wetting.
- J. When new masonry partitions start on existing floors, machine cut existing floor finish material down to concrete surface.
- K. Chases:
 - 1. Do not install chases in masonry walls and partitions exposed to view in finished work, including painted or coated finishes on masonry.
 - 2. Masonry 100 mm (4 inch) nominal thick may have electrical conduits 25 mm (1 inch) or less in diameter when covered with soaps, or other finishes.
 - 3. Fill recess chases after installation of conduit, with mortar and finish flush.
 - 4. When pipes or conduits, or both occur in hollow masonry unit partitions retain minimum one web of hollow masonry units.
- L. Wetting and Wetting Test:
 - 1. Test and wet brick according to BIA TN 11B.
 - 2. Do not wet concrete masonry units before laying.
- M. Temporary Formwork: Provide formwork and shores as required for temporary support of reinforced masonry elements.
- N. Construct formwork to conform to shape, line and dimensions indicated on drawings. Make sufficiently tight to prevent mortar, grout, or concrete leakage. Brace, tie and support formwork as required to maintain position and shape during construction and curing of reinforced masonry.
- O. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other reasonable temporary construction loads.
- P. Minimum Curing Times Before Removing Shores and Forms:
 - 1. Girders and Beams: 10 days.
 - 2. Slabs: 7 days.
 - 3. Reinforced Masonry Soffits: 7 days.

3.2 INSTALLATION - ANCHORAGE

- A. Veneer to Concrete Walls:

1. Install dovetail slots in concrete vertically at 400 mm (16 inches) on centers.
 2. Locate dovetail anchors at 400 mm (16 inch) maximum vertical intervals.
 3. Anchor new masonry facing to existing concrete with adjustable cavity wall ties spaced at 400 mm, (16 inches) maximum vertical intervals, and at 400 mm (16 inches) maximum horizontal intervals. Fasten ties to concrete with power actuated fasteners or concrete nails.
- B. Masonry Facing to Backup and Cavity Wall Ties:
1. Use individual ties for new work.
 2. Stagger ties in alternate courses, and space at 400 mm (16 inches) maximum vertically, and 400 mm (16 inches) horizontally.
 3. At openings, provide additional ties spaced maximum 900 mm (36 inches) apart vertically around perimeter of opening, and within 300 mm (12 inches) from edge of opening.
 4. Anchor new masonry facing to existing masonry with adjustable cavity wall ties spaced at 400 mm (16 inch) maximum vertical intervals and at every second masonry unit horizontally. Fasten ties to masonry with masonry nails.
 5. Option: Install joint reinforcing for multiple wythes and cavity wall ties spaced maximum 400 mm (16 inches) vertically.
 6. Tie interior and exterior wythes of reinforced masonry walls together with individual ties. Provide ties at intervals maximum 400 mm (16 inches) on center horizontally, and 400 mm (16 inches) on center vertically. Lay ties in the same line vertically in order to facilitate vibrating of the grout pours.
- C. Anchorage of Abutting Masonry:
1. Anchor interior 100 mm (4 inch) thick masonry partitions to exterior masonry walls with wall ties. Space ties at 600 mm (24 inches) maximum vertical intervals. Extend ties 100 mm (4 inches) minimum into masonry.
 2. Anchor interior masonry bearing walls or interior masonry partitions over 100 mm (4 inches) thick to masonry walls with rigid wall anchors spaced at 400 mm (16 inch) maximum vertical intervals.

3. Anchor abutting masonry walls and partitions to concrete with dovetail anchors. Install dovetail slots vertically in concrete at centerline of abutting wall or partition. Locate dovetail anchors at 400 mm (16 inch) maximum vertical intervals. Secure anchors to existing wall with two 9 mm (3/8 inch) by 75 mm (3 inch) expansion bolts or two power-driven fasteners.
 4. Anchor abutting interior masonry partitions to existing concrete and existing masonry construction, with adjustable wall ties. Extend ties minimum 100 mm (4 inches) into joints of new masonry. Fasten ties to existing concrete and masonry construction, with powder actuated drive pins, nail or other means that provides rigid anchorage. Install anchors at 400 mm (16 inch) maximum vertical intervals.
- D. Masonry Furring:
1. Anchor masonry furring less than 100 mm (4 inches) nominal thick to masonry walls or to concrete with adjustable wall ties or dovetail anchors.
 2. Space at maximum 400 mm (16 inches) on center in both directions.
- E. Not Used.

3.3 INSTALLATION - REINFORCEMENT

- A. Joint Reinforcement:
1. Install joint reinforcement in CMU wythe of combination brick and CMU, cavity walls, and single wythe concrete masonry unit walls or partitions.
 2. Reinforcing is acceptable in lieu of individual ties for anchoring brick facing to CMU backup in exterior masonry walls.
 3. Locate joint reinforcement in mortar joints at 400 mm (16 inch) maximum vertical intervals.
 4. Additional joint reinforcement is required in mortar joints at both 200 mm (8 inches) and 400 (16 inches) above and below windows, doors, louvers and similar openings in masonry.
 5. Wherever brick masonry is backed up with stacked bond masonry, install multiple wythe joint reinforcement in every two courses of CMU backup, and in corresponding joint of facing brick.

B. Steel Reinforcing Bars:

1. Install reinforcing bars in cells of hollow masonry units where required for vertical reinforcement and in bond beam units for horizontal reinforcement. Install in wall cavities of reinforced masonry walls where indicated on drawings.
2. Bond Beams:
 - a. Form Bond beams of load-bearing concrete masonry units filled with grout and reinforced with two No. 15m (No. 5) reinforcing bars unless shown otherwise. Do not cut reinforcement.
 - b. Brake bond beams only at expansion joints and at control joints, if shown.
3. Grout openings:
 - a. Leave cleanout holes in double wythe walls during construction by omitting units at base of one side of wall.
 - b. Locate 75 mm by 75 mm (3 inches. by 3 inches.) min. cleanout holes at location of vertical reinforcement.
 - c. Keep grout space clean of mortar accumulation and debris. Clean as work progresses and immediately before grouting.

3.4 INSTALLATION - BRICK EXPANSION AND CMU CONTROL JOINTS

- A. Provide brick expansion joint (EJ) and CMU control joints (CJ) where indicated on drawings.
- B. Keep joint free of mortar and other debris.
- C. Joints Occur In Masonry Walls:
 1. Install preformed compressible joint filler in brick wythe.
 2. Install cross shaped shear keys in concrete masonry unit wythe with preformed compressible joint filler on both sides of shear key.
- D. Use standard notched concrete masonry units (sash blocks) made in full and half-length units where shear keys are used to create a continuous vertical joint.
- E. Interrupt joint reinforcement at expansion and control joints.
- F. Fill opening in exposed face of expansion and control joints with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.5 INSTALLATION - ISOLATION JOINT

- A. Where full height walls and partitions lie parallel or perpendicular to and under structural beams and shelf angles, provide minimum 9 mm

(3/8 inch) separation between walls and partitions and bottom of beams and shelf angles.

- B. Insert continuous full width strip of non-combustible type compressible joint filler.
- C. Fill opening in exposed face of isolation joints with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.6 INSTALLATION - BRICKWORK

- A. Lay clay brick according to BIA TN 11B.
- B. Laying:
 - 1. Lay brick in one-half running bond with bonded corners, unless indicated otherwise. Match bond of existing building on alterations and additions.
 - 2. Maintain bond pattern throughout.
 - 3. Do not use brick smaller than half-brick at any angle, corner, break, and jamb.
 - 4. Where length of cut brick is greater than one half length, maintain vertical joint location.
 - 5. Lay exposed brickwork joints symmetrical about center lines of openings.
 - 6. Do not structurally bond multi-wythe brick walls, unless indicated on drawings.
 - 7. Before starting work, lay facing brick on foundation wall and adjust bond to openings, angles, and corners.
 - 8. Lay brick for sills with wash and drip.
 - 9. Build solid brickwork as required for anchorage of items.
- C. Joints:
 - 1. Exterior And Interior Joint Widths: Lay for three equal joints in 200 mm (8 inches) vertically, unless shown otherwise.
 - 2. Rake joints for pointing with colored mortar when colored mortar is not full depth.
- D. Weep Holes:
 - 1. Install weep holes at 600 mm (24 inches) on center in bottom of vertical joints of exterior masonry veneer or cavity wall facing over foundations, bond beams, and other water stops in wall.

2. Form weep holes using wicks made of mineral fiber insulation strips turned up 200 mm (8 inches) in cavity. Anchor top of strip to backup to securely hold in place.
3. Install sand or pea gravel in cavity approximately 75 mm (3 inches) high between weep holes.
4. Not Used

E. Cavity Walls:

1. Keep air space clean of mortar accumulations and debris.
2. Lay the interior wythe of the masonry wall full height where air barrier is required on cavity face. Coordinate to install air barrier and rigid insulation before laying outer wythe.
3. Insulated Cavity Type Exterior Walls:
 - a. Install insulation against cavity face of inner masonry wythe.
 - b. Place insulation between rows of ties or joint reinforcing. Adhere insulation to masonry surface with a bonding agent as recommended by insulation manufacturer.
 - c. Lay outer masonry wythe up with air space between insulation and masonry units.
4. Veneer Framed Walls:
 - a. Build with 100 mm (4 inches) of face brick over sheathed stud wall with air space.
 - b. Keep air space clean of mortar accumulations and debris.

3.7 INSTALLATION - CONCRETE MASONRY UNITS

A. Types and Uses:

1. Provide special concrete masonry shapes as required, including lintel and bond beam units, sash units, and corner units . Provide solid concrete masonry units, where full units cannot be installed, or where needed for anchorage of accessories.
2. Provide solid load-bearing concrete masonry units or grout cell of hollow units at jambs of openings in walls, where structural members impose loads directly on concrete masonry, and where shown.
3. Provide rounded corner (bullnose) shapes at opening jambs in exposed work and at exterior corners.
4. Do not install brick jambs in exposed finish work.

5. Install concrete building brick only as filler in backup material where not exposed.
6. Construct fire resistance in fire rated partitions meeting fire ratings indicated on drawings.

B. Laying:

1. Lay concrete masonry units with 9 mm (3/8 inch) joints, with a bond overlap of minimum 1/4 of unit length, except where stack bond is indicated on drawings.
2. Do not wet concrete masonry units before laying.
3. Bond external corners of partitions by overlapping alternate courses.
4. Lay first course in a full mortar bed.
5. Set anchorage items as work progress.
6. Where ends of anchors, bolts, and other embedded items, project into voids of units, completely fill voids with mortar or grout.
7. Provide 6 mm (1/4 inch) open joint for sealant between existing construction, exterior walls, concrete work and abutting masonry partitions.
8. Lay concrete masonry units with full face shell mortar beds and fill head joint beds for depth equivalent to face shell thickness.
9. Lay concrete masonry units so cores of units, that are to be filled with grout, are vertically continuous with joints of cross webs of such cores completely filled with mortar. Unobstructed core openings minimum 50 mm (2 inches) by 75 mm (3 inches).
10. Do not wedge masonry against steel reinforcing. Minimum 13 mm (1/2 inch) clear distance between reinforcing and masonry units.
11. Install deformed reinforcing bars of sizes indicated on drawings.
12. At time of placement, ensure steel reinforcement is free of loose rust, mud, oil, and other contamination capable of affecting bond.
13. Place steel reinforcement at spacing indicated on drawings before grouting.
14. Minimum clear distance between parallel bars: One bar diameter.
15. Hold vertical steel reinforcement in place vertically by centering clips, caging devices, tie wire, or other approved methods.

16. Support vertical bars near each end and at maximum 192 bar diameter on center.
 17. Splice reinforcement or attach reinforcement to dowels by placing in contact and securing with wire ties.
 18. Stagger splices in adjacent horizontal reinforcing bars. Lap reinforcing bars at splices a minimum of 40 bar diameters.
 19. Grout cells of concrete masonry units, containing reinforcing bars, solid as specified.
 20. Install cavity and joint reinforcement as masonry work progresses.
 21. Rake joints 6 to 10 mm (1/4 to 3/8 inch) deep for pointing with colored mortar when colored mortar is not full depth.
- C. Waterproofing Parging:
1. Parge earth side of concrete masonry unit basement walls with mortar applied in two coats, each coat 6 mm (1/4 inch) thick.
 2. Clean wall surfaces to receive parging of dirt, oil, or grease, and moisten before application of first coat.
 3. Roughen first coat when partially set, permit to hardened for 24 hours, and moisten before application of second coat.
 4. Keep second coat damp for minimum 48 hours.
 5. Thicken parging and round to form a cove at the junction of outside wall face and footing.

3.8 POINTING

- A. Fill joints with pointing mortar using rubber float trowel to apply mortar solidly into raked joints.
- B. Wipe off excess mortar from joints of glazed masonry units with dry cloth.
- C. Tool exposed joints to smooth concave joint.
- D. At joints with existing work, match existing joint.

3.9 GROUTING

- A. Preparation:
 1. Clean grout space of mortar droppings before placing grout.
 2. Close cleanouts.
 3. Install vertical solid masonry dams across grout space for full height of wall at intervals of maximum 9000 mm (30 feet). Do not bond dam units into wythes as masonry headers.

4. Verify reinforcing bars are installed as indicated on drawings.
- B. Placing:
1. Place grout in grout space in lifts as specified.
 2. Consolidate each grout lift after free water has disappeared but before plasticity is lost.
 3. Do not slush with mortar or use mortar with grout.
 4. Interruptions:
 - a. When grouting must be stopped for more than an hour, top off grout 40 mm (1-1/2 inches) below top of last masonry course.
 - b. Grout from dam to dam on high lift method.
 - c. Longitudinal run of masonry may be stopped off only by raking back one-half masonry unit length in each course and stopping grout 100 mm (4 inches) back of rake on low lift method.
- C. Puddling Method:
1. Consolidate by puddling with grout stick during and immediately after placing.
 2. Grout cores of concrete masonry units containing reinforcing bars solid as masonry work progresses.
- D. Low Lift Method:
1. Construct masonry to 1.5 m (5 feet) maximum height before grouting.
 2. Grout in one continuous operation and consolidate grout by mechanical vibration and reconsolidate after initial water loss and settlement has occurred.
- E. High Lift Method:
1. Do not pour grout until masonry wall has cured minimum of 4 hours.
 2. Place grout in 1.5 m (5 feet) maximum lifts.
 3. Exception:
 - a. Where following conditions are met, place grout in 3.86 m (12.67 feet) maximum lifts.
 - b. Masonry has cured minimum of 4 hours.
 - c. Grout slump is maintained between 250 and 275 mm (10 and 11 inches).
 - d. No intermediate reinforced bond beams are placed between top and bottom of grout lift.

4. When vibrating succeeding lifts, extend vibrator 300 to 450 mm (12 to 18 inches) into preceding lift.

3.10 PLACING REINFORCEMENT

- A. General: Clean reinforcement of loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on drawings or approved submittal drawings, or bars with reduced cross-section due to excessive rusting or other causes.
- B. Position reinforcement accurately at spacing indicated on drawings. Support and secure vertical bars against displacement. Install horizontal reinforcement as masonry work progresses. Where vertical bars are shown in close proximity, provide clear distance between bars of minimum one bar diameter or 25 mm (1 inch), whichever is greater.
- C. Splice reinforcement bars only where indicated on drawings, unless approved by Contracting Officer's Representative. Provide lapped splices. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.
- D. Provide minimum lap as indicated on approved submittal drawings, or if not indicated, minimum 48 bar diameters.
- E. Not Used.
- F. Embed metal ties in mortar joints as work progresses, with minimum mortar cover of 15 mm (5/8 inch) on exterior face of walls and 13 mm (1/2 inch) at other locations.
- G. Embed prefabricated horizontal joint reinforcement as work progresses, with minimum cover of 15 mm (5/8 inch) on exterior face of walls and 13 mm (1/2 inch) at other locations. Lap joint reinforcement minimum 150 mm (6 inches) at ends. Use prefabricated "L" and "T" sections to provide continuity at corners and intersections. Cut and bend joint reinforcement for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
- H. Anchoring: Anchor reinforced masonry work to supporting structure as indicated on drawings.
- I. Anchor reinforced masonry walls at intersections with non-reinforced masonry.

3.11 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY

- A. Do not wet concrete masonry units (CMU).
- B. Lay CMU units with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to distance behind face equal to thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed 9 mm (3/8 inch) joint widths.
- C. Where solid CMU units are shown, lay with full mortar head and bed joints.
- D. Walls:
 - 1. Pattern Bond: Lay CMU wall units in 1/2-running bond with vertical joints in each course centered on units in courses above and below, unless otherwise indicated. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.
 - 2. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimension indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
 - 3. Where horizontally reinforced beams (bond beams) are indicated on drawings, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.
- E. Grouting:
 - 1. Use fine grout for filling spaces less than 100 mm (4 inches) in one or both horizontal directions.
 - 2. Use coarse grout for filling 100 mm (4 inch) spaces or larger in both horizontal directions.
 - 3. Grouting Technique: At Contractor's option, use either low-lift or high-lift grouting techniques.
- F. Low-Lift Grouting:

1. Provide minimum clear dimension of 50 mm (2 inches) and clear area of 5160 sq. mm (8 sq. inches) in vertical cores to be grouted.
2. Place vertical reinforcement before grouting of CMU. Extend above elevation of maximum pour height as required for splicing. Support in position at vertical intervals not exceeding 192 bar diameters nor 3 m (10 feet).
3. Lay CMU to maximum pour height. Do not exceed 1.5 m (5 feet) height, or if bond beam occurs below 1.5 m (5 feet) height, stop pour 38 mm (1-1/2 inches) below top of bond beam.
4. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than one hour. Terminate grout pours 38 mm (1-1/2 inches) below top course of pour.
5. Bond Beams: Stop grout in vertical cells 38 mm (1-1/2 inches) below bond beam course. Place horizontal reinforcement in bond beams; lap at corners and intersections as indicated on drawings. Place grout in bond beam course before filling vertical cores above bond beam.

G. High-Lift Grouting:

1. Do not use high-lift grouting technique for grouting of CMU unless minimum cavity dimension and area is 75 mm (3 inches) and 6450 sq. mm (10 sq. inches), respectively.
2. Provide cleanout holes in first course at vertical cells which are to be filled with grout.
3. Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell.
4. Construct masonry to full height of maximum grout pour before placing grout.
5. Limit grout lifts to maximum height of 1.5 m (5 feet) and grout pour to maximum height of 7.3 m (24 feet), for single wythe hollow concrete masonry walls, unless otherwise indicated.
6. Place vertical reinforcement before grouting. Place before or after laying masonry units, to suit application. Tie vertical reinforcement to dowels at base of masonry where shown and thread CMU over or around reinforcement. Support vertical reinforcement at intervals not exceeding 192 bar diameters nor 3 m (10 feet).

7. Where individual bars are placed after laying masonry, place wire loops extending into cells as masonry is laid and loosen before mortar sets. After insertion of reinforcement bar, pull loops and bar to proper position and tie free ends.
8. Where reinforcement is prefabricated into cage units before placing, fabricate units with vertical reinforcement bars and lateral ties of the size and spacing indicated.
9. Place horizontal beam reinforcement as masonry units are laid.
10. Embed lateral tie reinforcement in mortar joints where indicated. Place as masonry units are laid, at vertical spacing shown.
11. Where lateral ties are shown in contact with vertical reinforcement bars, embed additional lateral tie reinforcement in mortar joints. Place as indicated on drawings, or if not shown, provide as required to prevent grout blowout or rupture of CMU face shells, but provide minimum 4.1 mm diameter (0.16 inch) wire ties spaced 400 mm (16 inches) on center for members with 500 mm (20 inches) or less side dimensions, and 200 mm (8 inches) on center for members with side dimensions exceeding 500 mm (20 inches).
12. Preparation of Grout Spaces: Before grouting, inspect and clean grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close cleanout holes and brace closures to resist grout pressures.
13. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.
14. Limit grout pours to sections which can be completed in one working day with maximum one hour interruption of pouring operation. Place grout in lifts which do not exceed 1.5 m (5 feet). Allow minimum 30 minutes and maximum one hour between lifts. Mechanically consolidate each lift.

15. Place grout in lintels or beams over openings in one continuous pour.
16. Where bond beam occurs more than one course below top of pour, fill bond beam course to within 25 mm (1 inch) of vertically reinforced cavities, during construction of masonry.
17. When more than one pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within 38 mm (1-1/2 inches) of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if more pours are required.

3.12 CONSTRUCTION TOLERANCES

- A. Lay masonry units plumb, level and true to line within tolerances according to ACI 530.1/ASCE 6/TMS 602 and as follows:
- B. Maximum variation from plumb:
 1. In 3000 mm (10 feet) - 6 mm (1/4 inch).
 2. In 6000 mm (20 feet) - 9 mm (3/8 inch).
 3. In 12,000 mm (40 feet) or more - 13 mm (1/2 inch).
- C. Maximum variation from level:
 1. In any bay or up to 6000 mm (20 feet) - 6 mm (1/4 inch).
 2. In 12,000 mm (40 feet) or more - 13 mm (1/2 inch).
- D. Maximum variation from linear building lines:
 1. In any bay or up to 6000 mm (20 feet) - 13 mm (1/2 inch).
 2. In 12,000 mm (40 feet) or more - 19 mm (3/4 inch).
- E. Maximum variation in cross-sectional dimensions of columns and thickness of walls from dimensions shown:
 1. Minus 6 mm (1/4 inch).
 2. Plus 13 mm (1/2 inch).
- F. Maximum variation in prepared opening dimensions:
 1. Accurate to minus 0 mm (0 inch).
 2. Plus 6 mm (1/4 inch).

3.13 CLEANING AND REPAIR

- A. General:
 1. Clean exposed masonry surfaces on completion.

2. Protect adjoining construction materials and landscaping during cleaning operations.
3. Cut out defective exposed new joints to depth of approximately 19 mm (3/4 inch) and repoint.
4. Remove mortar droppings and other foreign substances from wall surfaces.

B. Brickwork:

1. First wet surfaces with clean water, then wash down with detergent solution. Do not use muriatic acid.
2. Brush with stiff fiber brushes while washing, and immediately wash with clean water.
3. Remove traces of detergent, foreign streaks, or stains of any nature.

C. Concrete Masonry Units:

1. Immediately following setting, brush exposed surfaces free of mortar or other foreign matter.
2. Allow mud to dry before brushing.

3.14 FIELD QUALITY CONTROL

A. Water Penetration Testing:

1. Seven days before plastering or painting, in presence of Contracting Officer's Representative, test solid exterior masonry walls for water penetration.
2. Direct water on masonry for a period of one hour when wind velocity is less than five miles per hour.
3. Should moisture appear on inside of walls tested, make additional tests at other areas as directed by Contracting Officer's Representative.
4. Correct areas showing moisture on inside of walls, and repeat test at repaired areas, to ensure moisture penetration has been stopped.
5. Make water test at following locations:
 - a. Six places on Building Number 1.

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SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Structural steel shapes, plates, and bars.
 2. Structural pipe.
 3. Bolts, nuts, and washers.

1.2 RELATED REQUIREMENTS

- A. Materials Testing and Inspection During Construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Not Used.
- C. Not Used.
- D. Not Used.
- E. Steel Decking: Section 05 31 00, STEEL DECKING.
- F. Composite Steel Deck: Section 05 36 00, COMPOSITE METAL DECKING.
- G. Fireproofing: Section 07 81 00, APPLIED FIREPROOFING.
- H. Not Used.
- I. Steel Finishes: Section 09 06 00, SCHEDULE FOR FINISHES.
- J. Not Used.
- K. Painting: Section 09 91 00, PAINTING.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American Institute of Steel Construction (AISC):
1. AISC Manual - Steel Construction Manual, 14th Ed.
 2. 303-10 - Code of Structural Steel Buildings and Bridges.
 3. 360-10: Specification for Structural Steel Buildings.
- C. The American Society of Mechanical Engineers (ASME):
1. B18.22.1-09 - Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers.
- D. American Welding Society (AWS):
1. D1.1/D1.1M-15 - Structural Welding Code - Steel.
- E. ASTM International (ASTM):

1. A6/A6M-14 - General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
 2. A36/A36M-14 - Carbon Structural Steel.
 3. A53/A53M-12 - Pipe, Steel, Black and Hot-Dip, Zinc-Coated, Welded and Seamless.
 4. A123/A123M-15 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 5. Not Used.
 6. Not Used.
 7. A307-14 - Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
 8. A500/A500M-13 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing and Rounds and Shapes.
 9. Not Used.
 10. Not Used.
 11. A992/A992M-15 - Structural Shapes.
 12. F2329/F2329M-15 - Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy steel Bolts, Screws, washers, Nuts, and Special Threaded Fasteners.
 13. F3125/F3125M-15 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions
- F. Master Painters Institute (MPI):
1. No. 18 - Primer, Zinc Rich, Organic.
- G. Military Specifications (Mil. Spec.):
1. MIL-P-21035 - Paint, High Zinc Dust Content, Galvanizing, Repair.
- H. Occupational Safety and Health Administration (OSHA):
1. 29 CFR 1926.752(e) - Guidelines For Establishing The Components Of A Site-Specific Erection Plan.
 2. 29 CFR 1926-2001 - Safety Standards for Steel Erection.
- I. Research Council on Structural Connections (RCSC) of The Engineering Foundation:
1. Specification for Structural Joints Using ASTM F3125 Bolts.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and fabrication and installation details.
- C. Sustainable Construction Submittals:
 - 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
- D. Test Reports: Certify products comply with specifications.
 - 1. Welders' qualifying tests.
- E. Certificates: Certify each product complies with specifications.
 - 1. Structural steel.
 - 2. Steel connections.
 - 3. Welding materials.
 - 4. Shop coat primer paint.
- F. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Fabricator with project experience list .
 - 2. Installer with project experience list .
 - 3. Welders and welding procedures.
- G. Record Surveys: Signed and sealed by responsible surveyor or engineer.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: AISC Quality Certification participant designated as AISC Certified Plant, Category STD.
 - 1. Regularly fabricates specified products.
 - 2. Fabricated specified products with satisfactory service on five similar installations for minimum five years.
 - a. Project Experience List: Provide contact names and addresses for completed projects.
- B. Installer Qualifications: AISC Quality Certification Program participant designated as AISC-Certified Erector, Category ACSE.
 - 1. Regularly installs specified products.
 - 2. Installed specified products with satisfactory service on five similar installations for minimum five years.

- a. Project Experience List: Provide contact names and addresses for completed projects.
- C. Before commencement of Work, ensure steel erector provides written notification required by OSHA 29 CFR 1926.752(e). Submit a copy of the notification to Contracting Officer's Representative.
- D. Welders and Welding Procedures Qualifications: AWS D1.1/D1.1M.

1.6 WARRANTY

- A. Construction Warranty: Contractor's one-year labor and material warranty, FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 NOT USED

2.2 MATERIALS

- A. W-Shapes:
 - 1. ASTM A992/A992M.
- B. Channel and Angles:
 - 1. ASTM A36/A36M.
- C. Plates and Bars:
 - 1. ASTM A36/A36M.
- D. Hollow Structural Sections:
 - 1. ASTM A500/A500M.
- E. Structural Pipe: ASTM A53/A53M, Grade B.
- F. Bolts, Nuts and Washers: Galvanized for galvanized framing and plain finish for other framing .
 - 1. High-strength bolts, including nuts and washers: ASTM F3125.
 - 2. Bolts and nuts, other than high-strength: ASTM A307, Grade A.
 - 3. Plain washers, other than those in contact with high-strength bolt heads and nuts: ASME B18.22.1.
- G. Welding Materials: AWS D1.1, type to suit application.

2.3 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Sustainable Construction Requirements:

1. Steel Recycled Content: 30 percent total recycled content, minimum.
2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Paints and coatings.

2.4 FABRICATION

- A. Fabricate structural steel according to Chapter M, AISC 360.
- B. Shop and Field Connections:
 1. Weld connections according to AWS D1.1/D1.1M. Welds shall be made only by welders and welding operators who have been previously qualified by tests as prescribed in AWS D1.1 to perform type of work required.
 2. High-Strength Bolts: High-strength bolts tightened to a snug tight condition.

2.5 FINISHES

- A. Shop Priming:
 1. Prime paint structural steel according to AISC 303, Section 6.
 - a. Interstitial Space Structural Steel: Prime paint, unless indicated to receive sprayed on fireproofing.
- B. Shop Finish Painting: Apply primer and finish paint as specified in Section 09 91 00, PAINTING.
- C. Do not paint:
 1. Surfaces within 50 mm (2 inches) of field welded joints.
 2. Surfaces indicated to be encased in concrete.
 3. Surfaces receiving sprayed on fireproofing.
 4. Beam top flanges receiving shear connector studs applied.
- D. Structural Steel Galvanizing: ASTM A123/A123M, hot dipped, after fabrication. Touch-up after erection: Clean and wire brush any abraded and other spots worn through zinc coating, including threaded portions of bolts and welds and touch-up with galvanizing repair paint.
 1. Galvanize structural steel framing installed at exterior locations.
- E. Bolts, Nuts, and Washers Galvanizing: ASTM F2329, hot-dipped.

2.6 ACCESSORIES

- A. General: Shop paint steel according to AISC 303, Section 6.
- B. Finish Paint System: Primer and finish as specified in Section 09 91 00, PAINTING.
- C. Galvanizing Repair Paint: MPI No. 18.

PART 3 - EXECUTION

3.1 ERECTION

- A. Erect structural steel according to AISC 303 and AISC 360.
- B. Set structural steel accurately at locations and elevations indicated on drawings.
- C. Maintain erection tolerances of structural steel within AISC 303 requirements.
 - 1. Pour Stop Elevation Tolerance: 6 mm (1/4 inch), maximum, before concrete placement.
- D. Weld and bolt connections as specified for shop connections.

3.2 FIELD PAINTING

- A. After welding, clean and prime weld areas to match adjacent finish.
- B. Touch-up primer damaged by construction operations.
- C. Apply galvanizing repair paint to galvanized coatings damaged by construction operations.
- D. Finish Painting: As specified in Section 09 91 00, PAINTING.

3.3 FIELD QUALITY CONTROL

- A. Record Survey:
 - 1. Engage registered land surveyor or registered civil engineer as specified in Section 01 00 00, GENERAL REQUIREMENTS to perform survey.
 - 2. Measure and record structural steel framing plumbness, level, and alignment after completing bolting and welding and before installation of work supported by structural steel.
 - 3. Identify deviations from allowable tolerances specified in AISC Manual.

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SECTION 05 31 00
STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single pan fluted metal roof deck as roof substrate.

1.2 RELATED REQUIREMENTS

- A. Structural Steel Shapes: Section 05 21 00, STRUCTURAL STEEL FRAMING.
- B. Color: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Finish Painting: Section 09 91 00, PAINTING.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. AISI - American Iron and Steel Institute.
 1. S100-12 - Specification for the Design of Cold-formed Steel Structural Members.
- C. American Welding Society (AWS):
 1. D1.1/D1.1M-15 - Structural Welding Code - Steel.
 2. D1.3/D1.3M-08 - Structural Welding Code - Sheet Steel.
- D. ASTM International (ASTM):
 1. A36/A36M-14 - Carbon Structural Steel.
 2. A653/A653M-15 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 3. E119-15 - Fire Tests of Building Construction and Materials.
- E. FM Global (FM):
 1. 1-28-15 - Wind Design.
 2. Factory Mutual Research Approval Guide.
- F. Master Painters Institute (MPI):
 1. No. 18 - Primer, Zinc Rich, Organic.
- G. Military Specifications (Mil. Spec.):
 1. MIL-P-21035B - Paint, High Zinc Dust Content, Galvanizing Repair.
- H. Steel Deck Institute (SDI):
 1. No. 31-07 - Design Manual for Composite Deck, Form Decks, and Roof Decks.
- I. UL LLC (UL):
 1. Listed - Online Certifications Directory.

2. 580-13 - Tests for Uplift Resistance of Roof Assemblies.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show layout, connections to supporting members, anchorage, sump pans, accessories, deck openings and reinforcements.
 - 2. Show similar information necessary for completing installation as shown and specified, including supplementary framing, ridge and valley plates, cant strips, cut openings, special jointing or other accessories.
 - 3. Show welding, side lap, closure, deck reinforcing and closure reinforcing details.
 - 4. Show openings required for work of other trades, including openings not shown on structural drawings. Indicate where temporary shoring is required to satisfy design criteria.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Show steel decking section properties and structural characteristics.
- D. Sustainable Construction Submittals:
 - 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
- E. Certificates: Certify each product complies with specifications.
 - 1. Fire Resistance Product Listing: For each metal deck type and thickness supporting concrete slab or fill.
 - 2. Show steel decking is UL Listed for specified application.
 - 3. Show noise reduction coefficient test results.
- F. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Welders and welding procedures.
- G. Insurance Certification: Assist the Government in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance.

1.5 QUALITY ASSURANCE

- A. FM Listing: Provide metal roof deck units which have been evaluated by Factory Mutual Global and are listed in "Factory Mutual Research Approval Guide" for "Class 1" fire rated construction.
- B. Welders and Welding Procedures Qualifications: AWS D1.3/D1.3M.

1.6 WARRANTY

- A. Construction Warranty: Contractor's one-year labor and material warranty FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Design steel decking and accessories according to AISI S100.
 - 1. Wind Uplift Resistance and Corner Conditions:
 - a. Eave Overhang: 2.1 kPa (45 psf), minimum.
 - b. Other Roof Areas: 1.4 kPa (30 psf), minimum.
 - 2. Wind Uplift Resistance and Corner Conditions: UL 580, Class 60.
 - 3. Wind Uplift Resistance and Corner Conditions: FM 1-28; Class1-60 .
 - 4. Fire Resistance: ASTM E119; as component of 1 hour rated roof assembly.
 - 5. Design side and end closures and attachment to supporting steel to safely support wet weight of concrete and construction loads.
 - a. Cantilever Closure Deflection: 3 mm (1/8 inch), maximum.

2.2 MATERIALS

- A. Galvanized Steel Sheet: ASTM A653/A653M; G60 coating.
- B. Painted Steel Sheet: ASTM A1008/A1008M, Grade C or D, shop primed.
- C. Primer for Shop Painted Sheets: Manufacturer's standard primer (2 coats). When finish painting of steel decking is specified in Section 09 91 00, PAINTING primer coating shall be compatible with specified finish painting.
- D. Steel Shapes: ASTM A36/A36M.

2.3 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Sustainable Construction Requirements:
 - 1. Steel Recycled Content: 30 percent total recycled content, minimum.

2.4 METAL ROOF DECK

- A. Metal Roof Deck: FM Global approved as metal roof deck panels.
 - 1. Steel decking of the type, depth, thickness, and section properties as shown.
- B. Metal Roof Deck: Single pan fluted units with flat horizontal top surfaces as permanent support for superimposed loads.
 - 1. Deck Style:
 - a. Wide Rib (Type B) deck.
 - 2. Depth and Thickness: As indicated on drawings.
 - 3. Material: Galvanized sheet steel.
- C. Do not use steel deck for hanging supports of building components including suspended ceilings, electrical light fixtures, plumbing, heating, or air conditioning pipes or ducts or electrical conduits.
- D. Include integral system for steel decking units used for interstitial levels.
 - 1. Provide system suitable for simple point of attachment for light duty hanger devices.
 - 2. Provide system suitable to allow for flexibility for attaching hangers for support of suspended ceilings, electrical, plumbing, heating, or air conditioning items, weight not to exceed 50 kg/m² (10 psf).
 - 3. Provide a minimum spacing pattern of 300 mm (12 inches) on centers longitudinally and 600 mm (24 inches) on centers transversely.
 - 4. Maximum allowable load suspended from any hanger: 23 kg (50 pounds).
 - 5. System consisting of fold-down type hanger tabs or lip hanger is acceptable.

2.5 FABRICATION

- A. Fabricate steel decking in sufficient lengths to extend over 3 or more supports, except for interstitial levels.
 - 1. Cut metal deck units to proper length in shop.
- B. Fabricate accessories required to complete installation of steel decking.
 - 1. Exposed to View: Fabricate from sheet steel matching metal decking.
 - 2. Concealed from View: Fabricate from galvanized sheet steel.
- C. Sheet Metal Accessories:

1. Metal Cover Plates: For end-abutting decking, to close gaps at changes in deck direction, columns, walls and openings.
 - a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.
2. Continuous Sheet Metal Edging: At openings, concrete slab edges and roof deck edges.
 - a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.
3. Metal Closure Strips: For openings between decking and other construction. Form to configurations required to provide tight-fitting closures at open ends of flutes and sides of decking.
 - a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.
4. Ridge and Valley Plates: Minimum 100 mm (4 inch) wide ridge and valley plates where roof slope exceeds 1/24 (1/2 inch per foot).
 - a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.
5. Cant Strips: Provide bent metal 45 degree leg cant strips where indicated on the drawings. Fabricate cant strips with minimum 125 mm (5 inch) face width.
 - a. Sheet Steel: Minimum 0.8 mm (0.03 inch) thick.
6. Seat Angles for Deck: Provide where beam does not frame into column.
7. Sump Pans for Roof Drains: Fabricated from single piece galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain. Provide sump pans of adequate size to receive roof drains and with bearing flanges minimum 75 mm (3 inches) wide. Recess pans minimum 38 mm (1-1/2 inches) below roof deck surface, unless otherwise shown or required by deck configuration. Drain holes will be field cut.
 - a. Sheet Steel: Minimum 1.7 mm (0.06 inch) thick.

2.6 FINISHES

- A. Shop prime painted sheet steel with two coats of primer.

2.7 ACCESSORIES

- A. Primer: Manufacturer's standard primer compatible with finish painting specified in Section 09 91 00, PAINTING.
- B. Welding Materials: AWS D1.1, type to suit application.
- C. Galvanizing Repair Paint: MPI No. 18.
- D. Touch-Up Paint: Match shop finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Remove contaminants from structural steel surfaces where steel decking will be welded.
- D. Verify structural steel framing installation is completed, plumbed, and aligned with temporary bracing installed where required.
- E. Coordinate with structural steel erector to prevent overloading of structural members when placing steel decking for installation.

3.2 ERECTION

- A. Do not use floor deck units for storage or working platforms until permanently secured. Do not overload deck units once placed. Replace deck units that become damaged after erection and before casting concrete at no cost additional to the Government.
- B. Place steel decking at right angles to supporting members with ends located over supports.
- C. Lap end joints 50 mm (2 inches), minimum.
- D. Roof Deck Fastening:
 - 1. Fasten decking to steel supporting members by welding.
 - a. Welds: 16 mm (5/8 inch) diameter puddle welds or elongated welds of equal strength.
 - b. Weld Spacing: Maximum 300 mm (12 inches) on center at every support. Use closer spacing where required for lateral force resistance by diaphragm action.
 - 2. Fasten split or partial decking panels to structure in every valley.
 - 3. Fasten decking to each supporting member at ribs where side laps occur.
 - a. Power driven fasteners is acceptable in lieu of welding if strength equivalent to welding specified above is provided. Submit test data and design calculations verifying equivalent design strength.
 - 4. Mechanically fasten decking side laps with self-tapping No. 8 or larger machine screws.
 - a. Fastener Locations: Mid-span and maximum 900 mm (3 feet) on center.

5. Provide additional fastening necessary to comply with UL Listing or FM Approval for specified performance.
- E. Cutting and Fitting:
1. Coordinate openings for other penetrations shown on approved submittal drawings but not shown on Structural Drawings.
 - a. Cut and reinforce required opening.
 2. Make cuts neat and trim using metal saw, drill or punch-out device. Cutting with torches is prohibited.
 3. Do not make cuts in the metal deck that are not shown on the approved metal decking submittal drawings.
 - a. When additional openings are required, submit scaled drawing, locating required opening and other openings and supports in immediate area.
 - b. Do not cut the opening until drawing is approved by Contracting Officer's Representative.
 - c. Provide additional reinforcing and framing required for opening.
 - d. Failure to comply with these requirements is cause for rejection of the work and removal and replacement of the affected steel decking.
 4. Opening Reinforcement: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work.
- F. Touch up damaged factory finishes.
1. Apply galvanizing repair paint to damaged galvanized surfaces.
 2. Apply touch up paint to damaged shop painted surfaces.

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**SECTION 05 36 00
COMPOSITE METAL DECKING**

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies material and services required for installation of composite steel decking including miscellaneous closures required to prepare deck for concrete placement as shown and specified.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.

1.3 DESIGN REQUIREMENTS:

- A. Design steel decking in accordance with AISI S-100, except as otherwise shown or specified.
- B. Design steel decking to comply with applicable codes.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Combined recycled content as specified in PART 2 - PRODUCTS.
- C. Shop Drawings: Shop and erection drawings showing decking unit layout, connections to supporting members, and information necessary to complete the installation as shown and specified, including supplementary framing, cant strips, cut openings, special jointing or other accessories.
 - 1. Show welding, side lap, closure, deck reinforcing and closure reinforcing details.
 - 2. Show openings required for work of other trades, including openings not shown on structural drawings.
- D. Manufacturer's Literature and Data: Showing steel decking section properties and specifying required structural characteristics.
- E. Manufacturer's written recommendations for:
 - 1. Shape of decking section.
 - 2. Cleaning of steel decking prior to concrete placement.

- F. Test Report - Establishing structural characteristics of composite concrete and steel decking system.
- G. Not Used.
- H. Not Used
- I. Not Used
- J. Certification: For each type and gauge of metal deck supporting concrete slab or fill, submit certification of specified fire ratings. Certify that units supplied are UL listed as a "Steel Floor and Form Unit".
- K. Manufacturers Certificates for deck units attesting compliance with specified requirements.
- L. Submit manufacturer's catalog data for Welding Equipment and Welding Rods and Accessories intended use.
- M. Power Actuated Tool Operator Certificates.
- N. Welders qualifications.

1.5 QUALITY ASSURANCE:

- A. Fire Safety
 - 1. Underwriters' Label: Provide composite metal floor deck units listed in Underwriters' Laboratories "Building Materials Directory", with each deck unit bearing the UL label and marking for specific system detailed.
 - 2. FM Listing: Provide composite metal roof deck units which have been evaluated by Factory Mutual Global and are listed in "Factory Mutual Research Approval Guide" for "Class 1" fire rated construction.
 - 3. Insurance Certification: Assist the Government in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance.
- B. Wind Storm Resistance: Provide roof construction assembly capable of withstanding an uplift pressure of 3 kPa (60 pounds per square foot) when tested in accordance with the uplift pressure test described in the FM DS 1-28 or as described in the UL 580.
- C. Deck Units: Provide deck units and accessory products from a manufacturer engaged in the manufacture of steel decking for more than three (3) years. Submit manufacturer's certificates attesting that the decking material complies with the specified requirements.

- D. Certification of Powder-Actuated Tool Operator: Manufacturer's certificate attesting that the operators are authorized to use the low velocity powder-actuated tool.
- E. Qualifications for Welding Work: Submit qualified welder qualifications in accordance with AWS D1.1/D1.1M or under an approved qualification test.

1.6 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only. Refer to the latest edition of referenced Standards and codes.
- B. American Iron and Steel Institute (AISI):
 - S-100-12North American Specification for the Design of Cold-Formed Steel Structural Members
- C. ASTM International (ASTM):
 - A36/A36M-14Carbon Structural Steel
 - A108-13Steel Bars, Carbon, Cold Finished, Standard Quality
 - A653/A653M-13Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process
- D. American Institute of Steel Construction (AISC):
 - 1. Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design (Latest Edition)
 - 2. Load and Resistance Factor Design Specification for Structural Steel Buildings (Latest Edition)
- E. American Welding Society (AWS):
 - D1.1/D1.1M-11Structural Welding Code - Steel
 - D1.3/D1.3M-05(R2008) ...Structural Welding Code - Sheet Steel
- F. FM Global (FM):
 - APP GuideApproval Guide
 - DS 1-28-2012Design Wind Loads
- G. Military Specifications (Mil. Spec.):
 - MIL-P-21035BPaint, High Zinc Dust Content, Galvanizing Repair
- H. Underwriters Laboratories (UL):
 - Bld Mat Dir(Annually) ..Building Materials Directory

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Steel Decking and Flashings: ASTM A653/A653M, Structural.
- B. Recycled Content of Steel Products: Combined recycled content not less than 75 percent.
- C. Galvanizing: ASTM A653/A653M, G60. Thickness not less than indicated on drawings.
- D. Not Used.
- E. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035B.
- F. Miscellaneous Steel Shapes: ASTM A36/A36M.
- G. Welding Electrode: E60XX minimum.
- H. Sheet Metal Accessories: ASTM A653/A653M, galvanized, unless noted otherwise. Provide accessories of every kind required to complete the installation of metal decking in the system shown. Finish sheet metal items to match deck including, but not limited to, the following items:
 - 1. Metal Cover Plates: For end-abutting deck units, to close gaps at changes in deck direction, columns, walls and openings. Same quality as deck units but not less than 1.3 mm (18 gauge) sheet steel.
 - 2. Continuous sheet metal edging: at openings and concrete slab edges. Same quality as deck units but not less than 1.3 mm (18 gauge) steel. Side and end closures supporting concrete and their attachment to supporting steel to be designed by the manufacturer to safely support the wet weight of concrete and construction loads. The deflection of cantilever closures to be limited to a total of 3 mm (1/8 inch) maximum.
 - 3. Metal Closure Strips: For openings between decking and other construction, of not less than 1.3 mm (18 gauge) sheet steel of the same quality as the deck units. Form to the configuration required to provide tight-fitting closures at open ends of flutes and sides of decking.
 - 4. Seat angles for deck: Where a beam does not frame into a column.

2.2 REQUIREMENTS:

- A. Steel decking depth, gage, and section properties to be as shown on contract documents. Provide edges of deck with vertical interlocking male and female lip providing for a positive mechanical connection.

- B. Fabricate deck units with integral embossments to provide mechanical bond with concrete slab. Deck units combined with concrete slab to be capable of supporting total design loads.
- C. Provide integral system with single point of attachment for light duty hanger devices for flexibility for attaching hangers for support of acoustical, lathing, plumbing, heating, air conditioning electrical and similar items.
 - 1. Provide a minimum spacing pattern of 305 mm (12 inches) on centers longitudinally and 610 mm or 914 mm (24 or 36 inches) on centers transversely.
 - 2. Provide suspension system capable of safely supporting a maximum allowable load of 45 kg (100 pounds) concentrated at one hanger attachment point.
 - 3. System may consist of fold-down type hanger tabs or a lip hanger.

PART 3 - EXECUTION

3.1 ERECTION:

- A. Do not start installation of metal decking until corresponding steel framework has been plumbed, aligned and completed, and until temporary shoring, where required, has been installed.
 - 1. Remove oil, dirt, paint, ice, water and rust from steel surfaces to which metal decking will be welded.
- B. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
- C. Do not use floor deck units for storage or working platforms until permanently secured.
 - 1. Do not overload deck units once placed.
 - 2. Replace deck units that become damaged after erection and prior to casting concrete at no additional cost to the Government.
- D. Erect steel deck in accordance with manufacturer's printed instructions.
- E. Ship steel deck units in standard widths and fabricated to proper length.
- F. Provide steel decking in sufficient lengths to extend over 3 or more spans, except where structural steel layout does not permit.
- G. Place steel decking units on supporting steel framework and adjust to final position before being permanently fastened.

1. Bring each unit to proper bearing on supporting beams.
 2. Place deck units in straight alignment for entire length of run of flutes and with close registration of flutes of one unit with those of abutting unit.
 3. Maximum space between ends of abutting units is 13 mm (1/2 inch). If space exceeds 13 mm (1/2 inch), install closure plates.
- H. Ceiling hanger loops, if provided, must be flattened or removed to obtain bearing of units on structural steel.
- I. Fastening Deck Units:
1. Fasten floor deck units to steel supporting members by not less than 16 mm (5/8 inch) diameter puddle welds or elongated welds of equal strength, spaced not more than 305 mm (12 inches) on center with a minimum of two welds per unit at each support. Where two units abut, fasten each unit individually to the supporting steel framework.
 2. Tack weld or use self-tapping No. 8 or larger machine screws at 914 mm (3 feet) on center for fastening end closures. Only use welds to attach longitudinal end closures.
 3. Weld side laps of adjacent floor deck units that span more than 1524 mm (5 feet). Fasten at midspan or 914 mm (3 feet) on center, whichever is smaller.
- J. Weld in conformance to AWS D1.3/D1.3M and done by qualified experienced welding mechanics.
- K. Clean and touch-up area and welds scarred during erection, and repair with zinc rich galvanizing repair paint.
1. Paint touch-up is not required for welds or scars that are to be in direct contact with concrete.
- L. Provide metal concrete stops at edges of deck.
- M. Cutting and Fitting:
1. Fabricate metal deck units to proper length prior to shipping.
 2. Field cutting by the metal deck erector is restricted to bevel cuts, notching to fit around columns and similar items, and cutting openings that are located and dimensioned on the structural drawings.
 3. Other penetrations shown on the approved metal deck shop drawings but not shown on the structural drawings are to be located, cut and reinforced.

4. Make cuts and penetrations neat and trim using a metal saw, drill or punchout device; cutting with torches is prohibited.
5. Do not make cuts in the metal deck that are not shown on the approved metal deck drawings.
6. If an additional opening not shown on the approved shop drawings is required, submit a sketch, to scale, locating the required new opening and other openings and supports in the immediate area. Do not cut the opening until the sketch has been reviewed and accepted by the Contracting Officer Representative (COR). Provide additional reinforcing or framing required for the opening at no additional cost to the Government.
7. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work shown.

3.2 CLEANING:

- A. Clean deck in accordance with manufacturer's recommendation before concrete placement.

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Renovate Tower of Building 1
VAMC, Sioux Falls, SD
VA Project #438-18-102

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SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies materials and services required for installation of cold-formed steel, including tracks and required accessories as shown and specified. This Section includes the following:

1. Exterior load-bearing steel stud walls and roof framing.
2. Not Used.
3. Not Used.
4. Steel joists.

1.2 RELATED WORK:

- A. Structural steel framing: Section 05 12 00, STRUCTURAL STEEL FRAMING.
- B. Not Used.
- C. Non-load-bearing metal stud framing assemblies: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- D. Gypsum board assemblies: Section 09 29 00, GYPSUM BOARD.

1.3 DESIGN REQUIREMENTS:

- A. Not Used.
- B. Not Used.
- C. Not Used.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Shop and erection drawings showing steel unit layout, connections to supporting members, and information necessary to complete installation as shown and specified.
- C. Manufacturer's Literature and Data: Showing steel component sections and specifying structural characteristics.

D. Not Used.

1.5 APPLICABLE PUBLICATIONS:

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.

B. American Iron and Steel Institute (AISI):

Specification and Commentary for the Design of Cold-Formed Steel Structural Members (1996)

C. American Society of Testing and Materials (ASTM):

A36/A36M-08Standard Specifications for Carbon Structural Steel

A123/A123M-09Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A153/A153M-09Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

A307-10Standard Specifications for Carbon Steel Bolts and Studs

A653/A653M-10Standard Specifications for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

C955Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases

C1107/C1107M-08Standard Specifications for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)

E488-96 (R2003)Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements

E1190-95 (R2007)Standard Test Methods for Strength of Power-
Actuated Fasteners Installed in Structural
Members

D. American Welding Society (AWS):

D1.3/D1.3M-08Structural Welding Code-Sheet Steel

E. Military Specifications (Mil. Spec.):

MIL-P-21035BPaint, High Zinc Dust Content, Galvanizing
Repair

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Sheet Steel for joists, studs and accessories 16 gage and heavier: ASTM A653, structural steel, zinc coated G90, with a yield of 340 MPa (50 ksi) minimum.
- B. Sheet Steel for joists, studs and accessories 18 gage and lighter: ASTM A653, structural steel, zinc coated G90 , with a yield of 230 MPa (33 ksi) minimum.
- C. Galvanizing Repair Paint: MIL-P-21035B.
- D. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and a 30 minute working time.

2.2 WALL FRAMING:

- A. Steel Studs: Complying with ASTM C 955. Manufacturer's standard C-shaped steel studs of web depth indicated, with lipped flanges, and complying with the following:
 - 1. Minimum Base-Steel Thickness (uncoated):
1.37 mm (0.0538 inch)

2. Flange Width:

(1-5/8 inches)

3. Web: Unpunched.

B. Steel Track: Manufacturer's standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges, and complying with the following:

1. Design Uncoated-Steel Thickness: Matching steel studs.

2. Flange Width: Manufacturer's standard deep flange where indicated, standard flange elsewhere.

2.3 JOIST FRAMING:

A. Steel Joists: Manufacturer's standard C-shaped steel joists, unpunched, of web depths indicated, with lipped flanges, and complying with the following:

1. Minimum Base-Steel Thickness: 1.37 mm (0.0538 inch)..

Design Thickness: 1.45 mm (0.0566 inch).

2. Flange Width: 41 mm (1 5/8 inches) minimum.

B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, unpunched, of web depths indicated, with straight flanges, and complying with the following:

1. Design Thickness: Matching steel joists.

2. Flange Width: 41 mm (1 5/8-inches) minimum.

2.4 FRAMING ACCESSORIES:

A. Fabricate steel framing accessories of the same material and finish used for framing members, with a minimum yield strength of 230 MPa (33 ksi).

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.

2. Bracing, bridging, and solid blocking.

3. Not Used.

4. Not Used.
5. Not Used.
6. Stud kickers and girts.
7. Joist hangers and end closures.
8. Reinforcement plates.

2.5 ANCHORS, CLIPS, AND FASTENERS:

- A. Steel Shapes and Clips: ASTM A36, zinc coated by the hot-dip process according to ASTM A123.
- B. Not Used.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times the design load, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times the design load, as determined by testing per ASTM E1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws. Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.6 REQUIREMENTS:

- A. Welding in accordance with AWS D1.3
- B. Furnish members and accessories by one manufacturer only.

PART 3 - EXECUTION

3.1 FABRICATION:

- A. Framing components may be preassembled into panels. Panels shall be square with components attached.
- B. Cut framing components squarely or as required for attachment. Cut framing members by sawing or shearing; do not torch cut.
- C. Hold members in place until fastened.

- D. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
 - 1. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - 2. Locate mechanical fasteners and install according to cold-formed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
- E. Where required, provide specified insulation in double header members and double jamb studs which will not be accessible after erection.

3.2 ERECTION:

- A. Handle and lift prefabricated panels in a manner as to not distort any member.
- B. Securely anchor tracks to supports as shown.
- C. At butt joints, securely anchor two pieces of track to same supporting member or butt-weld or splice together.
- D. Plumb, align, and securely attach studs to flanges or webs of both upper and lower tracks.
- E. All axially loaded members shall be aligned vertically to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections.
- F. Install jack studs above and below openings and as required to furnish support. Securely attach jack studs to supporting members.
- G. Install headers in all openings that are larger than the stud spacing in that wall.
- H. Attach bridging for studs in a manner to prevent stud rotation. Space bridging rows as shown.
- I. Studs in one piece for their entire length, splices will not be permitted.
- J. Provide a load distribution member at top track where joist is not located directly over bearing stud.

- K. Provide joist bridging and web stiffeners at reaction points where shown.
- L. Provide end blocking where joist ends are not restrained from rotation.
- M. Not Used.
- N. Provide temporary bracing and leave in place until framing is permanently stabilized.
- O. Do not bridge building expansion joints with cold-formed metal framing. Independently frame both sides of joints.
- P. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.

3.3 TOLERANCES:

- A. Vertical alignment (plumbness) of studs shall be within 1/960th of the span.
- B. Horizontal alignment (levelness) of walls shall be within 1/960th of their respective lengths.
- C. Spacing of studs shall not be more than 3 mm (1/8 inch) +/- from the designed spacing providing that the cumulative error does not exceed the requirements of the finishing materials.
- D. Prefabricated panels shall be not more than 3 mm (1/8 inch) +/- out of square within the length of that panel.

3.4 FIELD REPAIR:

Touch-up damaged galvanizing with galvanizing repair paint.

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**SECTION 05 50 00
METAL FABRICATIONS**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies items and assemblies fabricated from structural steel shapes and other materials as shown and specified.
- B. Items specified.
 - 1. Support for Wall and Ceiling Mounted Items:(SD055000-02)
 - 2. Frames
 - 3. Guards
 - 4. Covers and Frames for Pits and Trenches.
 - 5. Gratings
 - 6. Loose Lintels
 - 7. Shelf Angles
 - 8. Not Used
 - 9. Not Used
 - 10. Not Used
 - 11. Ladders
 - 12. Not Used
 - 13. Not Used
 - 14. Not Used
 - 15. Not Used
 - 16. Not Used
 - 17. Not Used
 - 18. Not Used

1.2 RELATED WORK

- A. Not Used
- B. Colors, finishes, and textures: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Prime and finish painting: Section 09 91 00, PAINTING.
- D. Not Used

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data.

C. Shop Drawings:

1. Each item specified, showing complete detail, location in the project, material and size of components, method of joining various components and assemblies, finish, and location, size and type of anchors.
2. Mark items requiring field assembly for erection identification and furnish erection drawings and instructions.
3. Provide templates and rough-in measurements as required.

D. Manufacturer's Certificates:

1. Anodized finish as specified.
2. Live load designs as specified.

E. Design Calculations for specified live loads including dead loads.

F. Furnish setting drawings and instructions for installation of anchors to be preset into concrete and masonry work, and for the positioning of items having anchors to be built into concrete or masonry construction.

1.4 QUALITY ASSURANCE

- A. Each manufactured product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.
- B. Each product type shall be the same and be made by the same manufacturer.
- C. Assembled product to the greatest extent possible before delivery to the site.
- D. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Mechanical Engineers (ASME):
B18.6.1-97Wood Screws
B18.2.2-87(R2010)Square and Hex Nuts
- C. American Society for Testing and Materials (ASTM):
A36/A36M-14Structural Steel
A47-99(R2014)Malleable Iron Castings
A48-03(R2012)Gray Iron Castings

- A53-12Pipe, Steel, Black and Hot-Dipped, Zinc-Coated
Welded and Seamless
- A123-15Zinc (Hot-Dip Galvanized) Coatings on Iron and
Steel Products
- A240/A240M-15Standard Specification for Chromium and
Chromium-Nickel Stainless Steel Plate, Sheet
and Strip for Pressure Vessels and for General
Applications.
- A269-15Seamless and Welded Austenitic Stainless Steel
Tubing for General Service
- A307-14Carbon Steel Bolts and Studs, 60,000 PSI
Tensile Strength
- A391/A391M-07 (R2015) ...Grade 80 Alloy Steel Chain
- A786/A786M-15Rolled Steel Floor Plate
- B221-14Aluminum and Aluminum-Alloy Extruded Bars,
Rods, Wire, Shapes, and Tubes
- B456-11Electrodeposited Coatings of Copper Plus Nickel
Plus Chromium and Nickel Plus Chromium
- B632-08Aluminum-Alloy Rolled Tread Plate
- C1107-13Packaged Dry, Hydraulic-Cement Grout
(Nonshrink)
- D3656-13Insect Screening and Louver Cloth Woven from
Vinyl-Coated Glass Yarns
- F436-16Hardened Steel Washers
- F468-06 (R2015)Nonferrous Bolts, Hex Cap Screws, Socket Head
Cap Screws and Studs for General Use
- F593-13Stainless Steel Bolts, Hex Cap Screws, and
Studs
- F1667-15Driven Fasteners: Nails, Spikes and Staples
- D. American Welding Society (AWS):
 - D1.1-15Structural Welding Code Steel
 - D1.2-14Structural Welding Code Aluminum
 - D1.3-18Structural Welding Code Sheet Steel
- E. National Association of Architectural Metal Manufacturers (NAAMM)
 - AMP 521-01 (R2012)Pipe Railing Manual
 - AMP 500-06Metal Finishes Manual
 - MBG 531-09 (R2017)Metal Bar Grating Manual

- MBG 532-09Heavy Duty Metal Bar Grating Manual
- F. Structural Steel Painting Council (SSPC)/Society of Protective Coatings:
- SP 1-15No. 1, Solvent Cleaning
 - SP 2-04No. 2, Hand Tool Cleaning
 - SP 3-04No. 3, Power Tool Cleaning
- G. Federal Specifications (Fed. Spec):
- RR-T-650ETreads, Metallic and Nonmetallic, Nonskid

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

- A. In addition to the dead loads, design fabrications to support the following live loads unless otherwise specified.
- B. Ladders and Rungs: 120 kg (250 pounds) at any point.
- C. Railings and Handrails: 900 N (200 pounds) in any direction at any point.
- D. Floor Plates, Gratings, Covers, Trap Doors, Catwalks, and Platforms: 500 kg/m² (100 pounds per square foot).
- E. Not Used

2.2 MATERIALS

- A. Structural Steel: ASTM A36.
- B. Stainless Steel: ASTM A240, Type 302 or 304.
- C. Aluminum, Extruded: ASTM B221, Alloy 6063-T5 unless otherwise specified. For structural shapes use alloy 6061-T6 and alloy 6061-T4511.
- D. Floor Plate:
 - 1. Steel ASTM A786.
 - 2. Aluminum: ASTM B632.
- E. Steel Pipe (Bollard): ASTM A53.
 - 1. Galvanized for exterior locations.
 - 2. Type S, Grade A unless specified otherwise.
 - 3. NPS (inside diameter) as shown.
- F. Cast-Iron: ASTM A48, Class 30, commercial pattern.
- G. Malleable Iron Castings: A47.
- H. Primer Paint: As specified in Section 09 91 00, PAINTING.
- I. Stainless Steel Tubing: ASTM A269, type 302 or 304.
- J. Modular Channel Units:

1. Factory fabricated, channel shaped, cold formed sheet steel shapes, complete with fittings bolts and nuts required for assembly.
2. Form channel within turned pyramid shaped clamping ridges on each side.
3. Provide case hardened steel nuts with serrated grooves in the top edges designed to be inserted in the channel at any point and be given a quarter turn so as to engage the channel clamping ridges. Provide each nut with a spring designed to hold the nut in place.
4. Factory finish channels and parts with oven baked primer when exposed to view. Channels fabricated of ASTM A525, G90 galvanized steel may have primer omitted in concealed locations. Finish screws and nuts with zinc coating.
5. Fabricate snap-in closure plates to fit and close exposed channel openings of not more than 0.3 mm (0.0125 inch) thick stainless steel.

K. Grout: ASTM C1107, pourable type.

L. Insect Screening: ASTM D3656.

2.3 HARDWARE

A. Rough Hardware:

1. Furnish rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electro-galvanizing process. Galvanized G-90 where specified.
2. Use G90 galvanized coating on ferrous metal for exterior work unless non-ferrous metal or stainless is used.

B. Fasteners:

1. Bolts with Nuts:
 - a. ASME B18.2.2.
 - b. ASTM A307 for 415 MPa (60,000 psi) tensile strength bolts.
 - c. ASTM F468 for nonferrous bolts.
 - d. ASTM F593 for stainless steel.
2. Screws: ASME B18.6.1.
3. Washers: ASTM F436, type to suit material and anchorage.
4. Nails: ASTM F1667, Type I, style 6 or 14 for finish work.

2.4 FABRICATION GENERAL

A. Material

1. Use material as specified. Use material of commercial quality and suitable for intended purpose for material that is not named or its standard of quality not specified.
2. Use material free of defects which could affect the appearance or service ability of the finished product.

B. Size:

1. Size and thickness of members as shown.
2. When size and thickness is not specified or shown for an individual part, use size and thickness not less than that used for the same component on similar standard commercial items or in accordance with established shop methods.

C. Connections

1. Except as otherwise specified, connections may be made by welding, riveting or bolting.
2. Field riveting will not be approved.
3. Design size, number and placement of fasteners, to develop a joint strength of not less than the design value.
4. Holes, for rivets and bolts: Accurately punched or drilled and burrs removed.
5. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.
6. Use Rivets and bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.
7. Use stainless steel connectors for removable members machine screws or bolts.

D. Fasteners and Anchors

1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.
2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.
3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.

4. Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.
5. Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self drilling and tapping screws or bolts.

E. Workmanship

1. General:

- a. Fabricate items to design shown.
- b. Furnish members in longest lengths commercially available within the limits shown and specified.
- c. Fabricate straight, true, free from warp and twist, and where applicable square and in same plane.
- d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.
- e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.
- f. Prepare members for the installation and fitting of hardware.
- g. Cut openings in gratings and floor plates for the passage of ducts, sumps, pipes, conduits and similar items. Provide reinforcement to support cut edges.
- h. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.

2. Welding:

- a. Weld in accordance with AWS.
- b. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.
- c. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.
- d. Finish welded joints to match finish of adjacent surface.

3. Joining:

- a. Miter or butt members at corners.

- b. Where frames members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.
4. Anchors:
- a. Where metal fabrications are shown to be preset in concrete, weld 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 150 mm (6 inches) long with 25 mm (one inch) hooked end, to back of member at 600 mm (2 feet) on center, unless otherwise shown.
 - b. Where metal fabrications are shown to be built into masonry use 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 250 mm (10 inches) long with 50 mm (2 inch) hooked end, welded to back of member at 600 mm (2 feet) on center, unless otherwise shown.
5. Cutting and Fitting:
- a. Accurately cut, machine and fit joints, corners, copes, and miters.
 - b. Fit removable members to be easily removed.
 - c. Design and construct field connections in the most practical place for appearance and ease of installation.
 - d. Fit pieces together as required.
 - e. Fabricate connections for ease of assembly and disassembly without use of special tools.
 - f. Joints firm when assembled.
 - g. Conceal joining, fitting and welding on exposed work as far as practical.
 - h. Do not show rivets and screws prominently on the exposed face.
 - i. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common tools.
- F. Finish:
- 1. Finish exposed surfaces in accordance with NAAMM AMP 500 Metal Finishes Manual.
 - 2. Aluminum: NAAMM AMP 501.
 - a. Mill finish, AA-M10, as fabricated, use unless specified otherwise.
 - b. Clear anodic coating, AA-C22A41, chemically etched medium matte, with Architectural Class 1, 0.7 mils or thicker.

- c. Colored anodic coating, AA-C22A42, chemically etched medium matte with Architectural Class 1, 0.7 mils or thicker.
 - d. Painted: AA-C22R10.
3. Steel and Iron: NAAMM AMP 504.
- a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.
 - b. Surfaces exposed in the finished work:
 - 1) Finish smooth rough surfaces and remove projections.
 - 2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.
 - c. Shop Prime Painting:
 - 1) Surfaces of Ferrous metal:
 - a) Items not specified to have other coatings.
 - b) Galvanized surfaces specified to have prime paint.
 - c) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.
 - d) Clean of oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.
 - e) After cleaning and finishing apply one coat of primer as specified in Section 09 91 00, PAINTING.
 - 2) Non ferrous metals: Comply with MAAMM-500 series.
4. Stainless Steel: NAAMM AMP-504 Finish No. 4.
5. Not Used

G. Protection:

- 1. Insulate aluminum surfaces that will come in contact with concrete, masonry, plaster, or metals other than stainless steel, zinc or white bronze by giving a coat of heavy-bodied alkali resisting bituminous paint or other approved paint in shop.
- 2. Spot prime all abraded and damaged areas of zinc coating which expose the bare metal, using zinc rich paint on hot-dip zinc coat items and zinc dust primer on all other zinc coated items.

2.5 SUPPORTS

A. General:

- 1. Fabricate ASTM A36 structural steel shapes as shown.
- 2. Use clip angles or make provisions for welding hangers and braces to overhead construction.
- 3. Field connections may be welded or bolted.

B. Not Used.

C. For Wall Mounted Items:

1. For items supported by metal stud partitions.
2. Steel strip or hat channel minimum of 1.5 mm (0.0598 inch) thick.
3. Steel strip minimum of 150 mm (6 inches) wide, length extending one stud space beyond end of item supported.
4. Steel hat channels where shown. Flange cut and flatted for anchorage to stud.
5. Structural steel tube or channel for grab bar at water closets floor to structure above with clip angles or end plates formed for anchors.
6. Use steel angles for thru wall counters. Drill angle for fasteners at ends and not over 100 mm (4 inches) on center between ends.

D. Not Used.

E. Not Used.

F. Not Used.

G. Not Used.

H. Not Used.

I. Supports for Automatic Sliding Door, , and Items at Various Conditions at Suspended Ceilings:

1. Fabricate of structural steel shapes as shown.
2. Drill for anchor bolts of suspended item.

J. Not Used.

2.6 FRAMES

A. Elevator Entrance Wall Opening.

1. Fabricate of channel shapes, plates, and angles as shown.
2. Weld or bolt head to jamb as shown.
3. Weld clip angles to bottom of frame and top of jamb members extended to structure above for framed construction.
 - a. Provide holes for anchors.
 - b. Weld head to jamb members.

B. Not Used.

C. Not Used.

D. Not Used.

2.7 NOT USED

2.8 COVERS AND FRAMES FOR PITS AND TRENCHES

- A. Fabricate covers to support live loads specified.
- B. Galvanized steel members after fabrication in accordance with ASTM A123, G-90 coating.
- C. Steel Covers:
 - 1. Use 6 mm (1/4 inch) thick floor plate for covers unless otherwise shown. Use gratings where shown as specified in paragraph GRATINGS. Use smooth floor plate unless noted otherwise.
 - 2. Provide clearance at all sides to permit easy removal of covers.
 - 3. Make cutouts within 6 mm (1/4 inch) of penetration for passage of pipes and ducts.
 - 4. Drill covers for flat head countersunk screws.
 - 5. Make cover sections not to exceed 2.3 m² (25 square feet) in area and 90 kg (200 pounds) in weight.
 - 6. Fabricate trench cover sections not be over 900 mm (3 feet) long and if width of trench is more than 900 mm (3 feet) or over, equip one end of each section with an angle or "T" bar stiffener to support adjoining plate.
 - 7. Use two, 13 mm (1/2 inch) diameter steel bar flush drop handles for each cover section.
- D. Cast Iron Covers
 - 1. Fabricate covers to support live loads specified.
 - 2. Fabricate from ASTM A48, cast-iron, 13 mm (1/2 inch) minimum metal thickness, cast with stiffeners as required.
 - 3. Fabricate as flush type with frame, reasonably watertight and be equipped with flush type lifting rings. Provide seals where watertight covers noted.
 - 4. Make covers in sections not over 90 kg (200 pounds) except round covers.
- E. Steel Frames:
 - 1. Form frame from structural steel angles as shown. Where not shown use 63 x 63 x 6 mm (2-1/2 x 2-1/2 x 1/4 inch) angles for frame openings over 1200 mm (4 feet) long and 50 x 50 x 6 mm (2 ix 2 x 1/4 inch) for frame openings less than 1200 mm (4 feet).
 - 2. Fabricate intermediate supporting members from steel "T's" or angles; located to support cover section edges.

3. Where covers are required use steel border bars at frames so that top of cover will be flush with frame and finish floor.
4. Weld steel strap anchors to frame. Space straps not over 600 mm (24 inches) o.c., not shown otherwise between end anchors. Use 6 x 25 x 200 mm (1/4 x 1 x 8 inches) with 50 mm (2 inch) bent ends strap anchors unless shown otherwise.
5. Drill and tap frames for screw anchors where plate covers occur.

F. Not Used.

2.9 GRATINGS

- A. Fabricate gratings to support live loads specified and a concentrated load as specified.
- B. Provide clearance at all sides to permit easy removal of grating.
- C. Make cutouts in gratings with 6 mm (1/4 inch) minimum to 25 mm (one inch) maximum clearance for penetrations or passage of pipes and ducts. Edge band cutouts.
- D. Fabricate in sections not to exceed 2.3 m² (25 square feet) in area and 90 kg (200 pounds) in weight.
- E. Fabricate sections of grating with end-banding bars.
- F. Fabricate angle frames and supports, including anchorage as shown.
 1. Fabricate intermediate supporting members from "T's" or angles.
 2. Locate intermediate supports to support grating section edges.
 3. Fabricate frame to finish flush with top of grating.
 4. Locate anchors at ends and not over 600 mm (24 inches) o.c.
 5. Butt or miter, and weld angle frame at corners.
- G. Not Used
- H. Aluminum Bar Gratings:
 1. Fabricate grating and frame assembly from aluminum as shown in accordance with Metal Bar Grating Manual.
 2. Use 25 x 5 mm (1 x 3/16 inch) minimum size bearing bars.
 3. Mill finish unless specified otherwise.
- I. Not Used.
- J. Not Used.

2.10 LOOSE LINTELS

- A. Furnish lintels of sizes shown. Where size of lintels is not shown, provide the sizes specified.

- B. Fabricate lintels with not less than 150 mm (6 inch) bearing at each end for nonbearing masonry walls, and 200 mm (8 inch) bearing at each end for bearing walls.
- C. Provide one angle lintel for each 100 mm (4 inches) of masonry thickness as follows except as otherwise specified or shown.
 - 1. Openings 750 mm to 1800 mm (2-1/2 feet to 6 feet) - 100 x 90 x 8 mm (4 x 3-1/2 x 5/16 inch).
 - 2. Openings 1800 mm to 3000 mm (6 feet to 10 feet) - 150 x 90 x 9 mm (6 x 3-1/2 x 3/8 inch).
- D. For 150 mm (6 inch) thick masonry openings 750 mm to 3000 mm (2-1/2 feet to 10 feet) use one angle 150 x 90 x 9 mm (6 x 3-1/2 x 3/8 inch).
- E. Provide bearing plates for lintels where shown.
- F. Weld or bolt upstanding legs of double angle lintels together with 19 mm (3/4 inch bolts) spaced at 300 mm (12 inches) on centers.
- G. Insert spreaders at bolt points to separate the angles for insertion of metal windows, louver, and other anchorage.
- H. Where shown or specified, punch upstanding legs of single lintels to suit size and spacing of anchor bolts.
- I. Elevator Entrance:
 - 1. Fabricate lintel from plate bent to channel shape, and provide a minimum of 100 mm (4 inch) bearing each end.
 - 2. Cut away the front leg of the channel at each end to allow for concealment behind elevator hoistway entrance frame.

2.11 SHELF ANGLES

- A. Fabricate from steel angles of size shown.
- B. Fabricate angles with horizontal slotted holes for 19 mm (3/4 inch) bolts spaced at not over 900 mm (3 feet) on centers and within 300 mm (12 inches) of ends.
- C. Provide adjustable malleable iron inserts for embedded in concrete framing.

2.12 NOT USED

2.13 NOT USED

2.14 LADDERS

- A. Steel Ladders:
 - 1. Fixed-rail type with steel rungs shouldered and headed into and welded to rails.

2. Fabricate angle brackets of 50 mm (2 inch) wide by 13 mm (1/2 inch) thick steel; brackets spaced maximum of 1200 mm (4 feet) apart and of length to hold ladder 175 mm (7 inches) from wall to center of rungs. Provide turned ends or clips for anchoring.
3. Provide holes for anchoring with expansion bolts through turned ends and brackets.
4. Where shown, fabricate side rails curved, twisted and formed into a gooseneck.
5. Galvanize exterior ladders after fabrication, ASTM A123, G-90.

B. Not Used

C. Ladder Rungs:

1. Fabricate from 25 mm (one inch) diameter steel bars.
2. Fabricate so that rungs will extend at least 100 mm (4 inches) into wall with ends turned 50 mm (2 inches), project out from wall 175 mm (7 inches), be 400 mm (16 inches) wide and be designed so that foot cannot slide off end.
3. Galvanized after fabrication, ASTM A123, G-90 rungs for exterior use and for access to pits.

2.15 RAILINGS

A. In addition to the dead load design railing assembly to support live load specified.

B. Fabrication General:

1. Provide continuous welded joints, dressed smooth and flush.
2. Standard flush fittings, designed to be welded, may be used.
3. Exposed threads will not be approved.
4. Form handrail brackets to size and design shown.
5. Exterior Post Anchors.
 - a. Fabricate tube or pipe sleeves with closed ends or plates as shown.
 - b. Where inserts interfere with reinforcing bars, provide flanged fittings welded or threaded to posts for securing to concrete with expansion bolts.
 - c. Provide heavy pattern sliding flange base plate with set screws at base of pipe or tube posts. // Base plates are not required on pipe sleeves where ornamental railings occur. //

6. Interior Post Anchors:

- a. Provide flanged fittings for securing fixed posts to floor with expansion bolts, unless shown otherwise.
 - b. Weld or thread flanged fitting to posts at base.
 - c. For securing removable posts to floor, provide close fitting sleeve insert or inverted flange base plate with stud bolts or rivets concrete anchor welded to the base plate.
 - d. Provide sliding flange base plate on posts secured with set screws.
 - e. Weld flange base plate to removable posts set in sleeves.
- C. Handrails:
1. Close free ends of rail with flush metal caps welded in place except where flanges for securing to walls with bolts are shown.
 2. Make provisions for attaching handrail brackets to wall, posts, and handrail as shown.
- D. Steel Pipe Railings:
1. Fabricate of steel pipe with welded joints.
 2. Number and space of rails as shown.
 3. Space posts for railings not over 1800 mm (6 feet) on centers between end posts.
 4. Form handrail brackets from malleable iron.
 5. Fabricate removable sections with posts at end of section.
 6. Removable Rails:
 - a. Provide "U" shape brackets at each end to hold removable rail as shown. Use for top and bottom horizontal rail when rails are joined together with vertical members.
 - b. Secure rail to brackets with 9 mm (3/8 inch) stainless steel through bolts and nuts at top rail only when rails joined with vertical members.
 - c. Continuously weld brackets to post.
 - d. Provide slotted bolt holes in rail bracket.
 - e. Weld bolt heads flush with top of rail.
 - f. Weld flanged fitting to post where posts are installed in sleeves.
 7. Opening Guard Rails:
 - a. Fabricate rails with flanged fitting at each end to fit between wall opening jambs.

- b. Design flange fittings for fastening with machine screws to steel plate anchored to jambs.
- c. Fabricate rails for floor openings for anchorage in sleeves.

8. Gates:

- a. Fabricate from steel pipe as specified for railings.
- b. Fabricate gate fittings from either malleable iron or wrought steel.
- c. Hang each gate on suitable spring hinges of clamp on or through bolted type. Use bronze hinges for exterior gates.
- d. Provide suitable stops, so that gate will swing as shown.

9. Not Used

E. Not Used

F. Not Used

G. Not Used

2.16 NOT USED

2.17 NOT USED

2.18 NOT USED

2.19 NOT USED

2.20 NOT USED

2.21 NOT USED

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set work accurately, in alignment and where shown, plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Items set into concrete or masonry.
 - 1. Provide temporary bracing for such items until concrete or masonry is set.
 - 2. Place in accordance with setting drawings and instructions.
 - 3. Build strap anchors, into masonry as work progresses.
- C. Set frames of gratings, covers, corner guards, trap doors and similar items flush with finish floor or wall surface and, where applicable, flush with side of opening.
- D. Field weld in accordance with AWS.
 - 1. Design and finish as specified for shop welding.
 - 2. Use continuous weld unless specified otherwise.

- E. Install anchoring devices and fasteners as shown and as necessary for securing metal fabrications to building construction as specified. Power actuated drive pins may be used except for removable items and where members would be deformed or substrate damaged by their use.
- F. Spot prime all abraded and damaged areas of zinc coating as specified and all abraded and damaged areas of shop prime coat with same kind of paint used for shop priming.
- G. Isolate aluminum from dissimilar metals and from contact with concrete and masonry materials as required to prevent electrolysis and corrosion.
- H. Secure escutcheon plate with set screw.

3.2 INSTALLATION OF SUPPORTS

- A. Anchorage to structure.
 - 1. Secure angles or channels and clips to overhead structural steel by continuous welding unless bolting is shown.
 - 2. Secure supports to concrete inserts by bolting or continuous welding as shown.
 - 3. Secure supports to mid height of concrete beams when inserts do not exist with expansion bolts and to slabs, with expansion bolts. unless shown otherwise.
 - 4. Secure steel plate or hat channels to studs as detailed.
- B. Not Used
- C. Supports for Wall Mounted items:
 - 1. Locate center of support at anchorage point of supported item.
 - 2. Locate support at top and bottom of wall hung cabinets.
 - 3. Locate support at top of floor cabinets and shelving installed against walls.
 - 4. Locate supports where required for items shown.
- D. Not Used
- E. Not Used
- F. Not Used
- G. Not Used
- H. Not Used
- I. Not Used

3.3 COVERS AND FRAMES FOR PITS AND TRENCHES

- A. Set frame and cover flush with finish floor.
- B. Secure plates to frame with flat head countersunk screws.

- C. Set gratings loose in drainage trenches or over pits unless shown anchored.

3.4 NOT USED

3.5 NOT USED

3.6 OTHER FRAMES

- A. Set frame flush with surface unless shown otherwise.
- B. Anchor frames at ends and not over 450 mm (18 inches) on centers unless shown otherwise.
- C. Set in formwork before concrete is placed.

3.7 NOT USED

3.8 GRATINGS

- A. Set grating flush with finish floor; top of curb, or areaway wall. Set frame so that horizontal leg of angle frame is flush with face of wall except when frame is installed on face of wall.
- B. Set frame in formwork before concrete is placed.
- C. Where grating terminates at a wall bolt frame to concrete or masonry with expansion bolts unless shown otherwise.
- D. Secure removable supporting members in place with stainless steel bolts.
- E. Bolt gratings to supports.

3.9 STEEL LINTELS

- A. Use lintel sizes and combinations shown or specified.
- B. Install lintels with longest leg upstanding, except for openings in 150 mm (6 inch) masonry walls install lintels with longest leg horizontal.
- C. Install lintels to have not less than 150 mm (6 inch) bearing at each end for nonbearing walls, and 200 mm (8 inch) bearing at each end for bearing walls.

3.10 SHELF ANGLES

- A. Anchor shelf angles with 19 mm (3/4 inch) bolts unless shown otherwise in adjustable malleable iron inserts, set level at elevation shown.
- B. Provide expansion space at end of members.

3.11 NOT USED

3.12 NOT USED

3.13 LADDERS

- A. Anchor ladders to walls and floors with expansion bolts through turned lugs or angle clips or brackets.

- B. In elevator pits, set ladders to clear all elevator equipment where shown on the drawings.
 - 1. Where ladders are interrupted by division beams, anchor ladders to beams by welding, and to floors with expansion bolts.
 - 2. Where ladders are adjacent to division beams, anchor ladders to beams with bent steel plates, and to floor with expansion bolts.
- C. Ladder Rungs:
 - 1. Set ladder rungs into formwork before concrete is placed.
 - 2. Set step portion of rung 150 mm (6 inches) from wall.
 - 3. Space rungs approximately 300 mm (12 inches) on centers.
 - 4. Where only one rung is required, locate it 400 mm (16 inches) above the floor.

3.14 RAILINGS

- A. Steel Posts:
 - 1. Secure fixed posts to concrete with expansion bolts through flanged fittings except where sleeves are shown with pourable grout.
 - 2. Install sleeves in concrete formwork.
 - 3. Set post in sleeve and pour grout to surface. Apply beveled bead of urethane sealant at perimeter of post or under flange fitting as specified in Section 07 92 00, JOINT SEALANTS—on exterior posts.
 - 4. Secure removable posts to concrete with either machine screws through flanged fittings which are secured to inverted flanges embedded in and set flush with finished floor, or set posts in close fitting pipe sleeves without grout.
 - 5. Secure sliding flanged fittings to posts at base with set screws.
 - 6. Secure fixed flanged fittings to concrete with expansion bolts.
 - 7. Secure posts to steel with welds.
- B. Not Used
- C. Anchor to Walls:
 - 1. Anchor rails to concrete or solid masonry with machine screws through flanged fitting to steel plate.
 - a. Anchor steel plate to concrete or solid masonry with expansion bolts.
 - b. Anchor steel plate to hollow masonry with toggle bolts.
 - 2. Anchor flanged fitting with toggle bolt to steel support in frame walls.
- D. Not Used

E. Not Used

F. Not Used

G. Not Used

3.15 NOT USED

3.16 NOT USED

3.17 NOT USED

3.18 STEEL COMPONENTS FOR MILLWORK ITEMS

Coordinate and deliver to Millwork fabricator for assembly where millwork items are secured to metal fabrications.

3.19 NOT USED

3.20 CLEAN AND ADJUSTING

- A. Adjust movable parts including hardware to operate as designed without binding or deformation of the members centered in the opening or frame and, where applicable, contact surfaces fit tight and even without forcing or warping the components.
- B. Clean after installation exposed prefinished and plated items and items fabricated from stainless steel, aluminum and copper alloys, as recommended by the metal manufacture and protected from damage until completion of the project.

- - - E N D - - -

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies wood blocking, framing, sheathing, furring, nailers, sub-flooring, rough hardware, and light wood construction.

1.2 RELATED WORK:

- A. Sustainable design requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Milled woodwork: Section 06 20 00, FINISH CARPENTRY.
- C. Gypsum sheathing: Section 09 29 00, GYPSUM BOARD.
- D. Not Used

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Postconsumer and preconsumer recycled content as specified in PART 2 - PRODUCTS.
 - 2. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
 - 3. For composite wood products, submit documentation indicating that product contains no added urea formaldehyde.
- C. Shop Drawings showing framing connection details, fasteners, connections and dimensions.
- D. Manufacturer's Literature and Data:
 - 1. Submit data for lumber, panels, hardware and adhesives.
 - 2. Submit data for wood-preserved treatment from chemical treatment manufacturer and certification from treating plants that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 3. Submit data for fire retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.

4. For products receiving a waterborne treatment, submit statement that moisture content of treated materials was reduced to levels specified before shipment to project site.

E. Manufacturer's certificate for unmarked lumber.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Protect lumber and other products from dampness both during and after delivery at site.
- B. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.
- C. Stack plywood and other board products so as to prevent warping.
- D. Locate stacks on well drained areas, supported at least 152 mm (6 inches) above grade and cover with well-ventilated sheds having firmly constructed over hanging roof with sufficient end wall to protect lumber from driving rain.

1.5 QUALITY ASSURANCE:

- A. Installer: A firm with a minimum of three (3) years' experience in the type of work required by this section.

1.6 GRADING AND MARKINGS:

- A. Any unmarked lumber or plywood panel for its grade and species will not be allowed on VA Construction sites for lumber and material not normally grade marked, provide manufacturer's certificates (approved by an American Lumber Standards approved agency) attesting that lumber and material meet the specified the specified requirements.

1.7 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation only.
- B. American Forest and Paper Association (AFPA):
 - NDS-15National Design Specification for Wood Construction
 - WCD1-01Details for Conventional Wood Frame Construction
- C. American Institute of Timber Construction (AITC):
 - A190.1-07Structural Glued Laminated Timber
- D. American Society of Mechanical Engineers (ASME):
 - B18.2.1-12 (R2013)Square and Hex Bolts and Screws
 - B18.2.2-10Square and Hex Nuts

- B18.6.1-81 (R2008)Wood Screws
- E. American Plywood Association (APA):
- E30-11Engineered Wood Construction Guide
- F. ASTM International (ASTM):
- A653/A653M-13Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process
- C954-11Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs from 0.033 inch (2.24 mm) to 0.112-inch (2.84 mm) in thickness
- C1002-14Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Metal Studs
- D198-14Test Methods of Static Tests of Lumber in Structural Sizes
- D2344/D2344M-13Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates
- D2559-12aAdhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions
- D3498-03 (R2011)Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems
- D6108-13Test Method for Compressive Properties of Plastic Lumber and Shapes
- D6109-13Test Methods for Flexural Properties of Unreinforced and Reinforced Plastic Lumber and Related Products
- D6111-13aTest Method for Bulk Density and Specific Gravity of Plastic Lumber and Shapes by Displacement
- D6112-13Test Methods for Compressive and Flexural Creep and Creep-Rupture of Plastic Lumber and Shapes
- F844-07a (R2013)Washers, Steel, Plain (Flat) Unhardened for General Use
- F1667-13Nails, Spikes, and Staples
- G. American Wood Protection Association (AWPA):

AWPA Book of Standards

H. Commercial Item Description (CID):

A-A-55615Shield, Expansion (Wood Screw and Lag Bolt Self
Threading Anchors)

I. Forest Stewardship Council (FSC):

FSC-STD-01-001(Ver. 4-0)FSC Principles and Criteria for Forest
Stewardship

J. Military Specification (Mil. Spec.):

MIL-L-19140ELumber and Plywood, Fire-Retardant Treated

K. Environmental Protection Agency (EPA):

40 CFR 59(2014)National Volatile Organic Compound Emission
Standards for Consumer and Commercial Products

L. Truss Plate Institute (TPI):

TPI-85Metal Plate Connected Wood Trusses

M. U.S. Department of Commerce Product Standard (PS)

PS 1-95Construction and Industrial Plywood

PS 20-10American Softwood Lumber Standard

N. ICC Evaluation Service (ICC ES):

AC09Quality Control of Wood Shakes and Shingles

AC174Deck Board Span Ratings and Guardrail Systems
(Guards and Handrails)

PART 2 - PRODUCTS

2.1 LUMBER:

A. Unless otherwise specified, each piece of lumber must bear grade mark, stamp, or other identifying marks indicating grades of material, and rules or standards under which produced.

1. Identifying marks are to be in accordance with rule or standard under which material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.

2. Inspection agency for lumber approved by the Board of Review, American Lumber Standards Committee, to grade species used.

B. Structural Members: Species and grade as listed in the AFPA NDS having design stresses as shown.

C. Lumber Other Than Structural:

1. Unless otherwise specified, species graded under the grading rules of an inspection agency approved by Board of Review, American Lumber Standards Committee.
2. Framing lumber: Minimum extreme fiber stress in bending of 7584 kPa (1100 PSI).
3. Furring, blocking, nailers and similar items 101 mm (4 inches) and narrower Standard Grade; and, members 152 mm (6 inches) and wider, Number 2 Grade.
4. Board Sub-flooring: Shiplap edge, 25 mm (1 inch) thick, not less than 203 mm (8 inches) wide.

D. Sizes:

1. Conforming to PS 20.
2. Size references are nominal sizes, unless otherwise specified, actual sizes within manufacturing tolerances allowed by standard under which produced.

E. Moisture Content:

1. Maximum moisture content of wood products is to be as follows at the time of delivery to site.
 - a. Boards and lumber 50 mm (2 inches) and less in thickness: 19 percent or less.
 - b. Lumber over 50 mm (2 inches) thick: 25 percent or less.

F. Fire Retardant Treatment:

1. Comply with Mil Spec. MIL-L-19140.
2. Treatment and performance inspection, by an independent and qualified testing agency that establishes performance ratings.

G. Preservative Treatment:

1. Do not treat Heart Redwood and Western Red Cedar.
2. Treat wood members and plywood exposed to weather or in contact with plaster, masonry or concrete, including framing of open roofed structures; sills, sole plates, furring, and sleepers that are less than 610 mm (24 inches) from ground; nailers, edge strips, blocking, crickets, curbs, cant, vent strips and other members provided in connection with roofing and flashing materials.
3. Treat other members specified as preservative treated (PT).
4. Preservative treat by the pressure method complying with AWPA Book use category system standards U1 and T1, except any process involving the use of Chromated Copper Arsenate (CCA) or other agents

classified as carcinogenic for pressure treating wood is not permitted.

2.3 PLYWOOD:

- A. Comply with PS 1.
- B. Bear the mark of a recognized association or independent inspection agency that maintains continuing control over quality of plywood which identifies compliance by veneer grade, group number, span rating where applicable, and glue type.
- C. Sheathing:
 - 1. APA rated Exposure 1 or Exterior; panel grade CD or better.
 - 2. Wall sheathing:
 - a. Minimum 9 mm (11/32 inch) thick with supports 406 mm (16 inches) on center and 12 mm (15/32 inch) thick with supports 610 mm (24 inches) on center unless specified otherwise.
 - b. Minimum 1200 mm (48 inches) wide at corners without corner bracing of framing.
 - 3. Roof sheathing:
 - a. Minimum 9 mm (11/32 inch) thick with span rating 24/0 or 12 mm (15/32 inch) thick with span rating for supports 406 mm (16 inches) on center unless specified otherwise.
 - b. Minimum 15 mm (19/32 inch) thick or span rating of 40/20 or 18 mm (23/32 inch) thick or span rating of 48/24 for supports 610 mm (24 inches) on center.

2.4 STRUCTURAL-USE PANELS:

- A. Comply with APA E30.
- B. Bearing the mark of a recognized association or independent agency that maintains continuing control over quality of panel which identifies compliance by end use, Span Rating, and exposure durability classification.
- C. Wall and Roof Sheathing:
 - 1. APA Rated sheathing panels, durability classification of Exposure 1 or Exterior Span Rating of 16/0 or greater for supports 406 mm (16 inches) on center and 24/0 or greater for supports 610 mm (24 inches) on center.

- b. Span Rating of 16 or greater for supports 406 mm (16 inches) on center and 24 or greater for supports 610 mm (24 inches) on center.
- E. Underlayment:
 - 1. APA rated Exposure 1.
 - 2. Minimum 6 mm (1/4 inch) thick or greater over subfloor.

2.5 ROUGH HARDWARE AND ADHESIVES:

- A. Anchor Bolts:
 - 1. ASME B18.2.1 and ASME B18.2.2 galvanized, 13 mm (1/2 inch) unless shown otherwise.
 - 2. Extend at least 203 mm (8 inches) into masonry or concrete with ends bent 50 mm (2 inches).
- B. Miscellaneous Bolts: Expansion Bolts: C1D A-A-55615; lag bolt, long enough to extend at least 65 mm (2-1/2 inches) into masonry or concrete. Provide 13 mm (1/2 inch) bolt unless shown otherwise.
- C. Washers
 - 1. ASTM F844.
 - 2. Provide zinc or cadmium coated steel or cast iron for washers exposed to weather.
- D. Screws:
 - 1. Wood to Wood: ASME B18.6.1 or ASTM C1002.
 - 2. Wood to Steel: ASTM C954, or ASTM C1002.
- E. Nails:
 - 1. Size and type best suited for purpose unless noted otherwise. Provide aluminum-alloy nails, plated nails, or zinc-coated nails, for nailing wood work exposed to weather and on roof blocking.
 - 2. ASTM F1667:
 - a. Common: Type I, Style 10.
 - b. Concrete: Type I, Style 11.
 - c. Barbed: Type I, Style 26.
 - d. Underlayment: Type I, Style 25.
 - e. Masonry: Type I, Style 27.
 - f. Provide special nails designed for use with ties, strap anchors, framing connectors, joists hangers, and similar items. Nails not less than 32 mm (1-1/4 inches) long, 8d and deformed or annular ring shank.

PART 3 - EXECUTION

3.1 INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS:

- A. Conform to applicable requirements of the following:
1. AFPA NDS for timber connectors.
 2. AITC A190.1 Timber Construction Manual for heavy timber construction.
 3. AFPA WCD1 for nailing and framing unless specified otherwise.
 4. APA for installation of plywood or structural use panels.
 5. TPI for metal plate connected wood trusses.
- B. Fasteners:
1. Nails.
 - a. Nail in accordance with the Recommended Nailing Schedule as specified in AFPA WCD1 where detailed nailing requirements are not specified in nailing schedule. Select nail size and nail spacing sufficient to develop adequate strength for the connection without splitting the members.
 - b. Use special nails with framing connectors.
 - c. For sheathing and subflooring, select length of nails sufficient to extend 25 mm (1 inch) into supports.
 - d. Use 8d or larger nails for nailing through 25 mm (1 inch) thick lumber and for toe nailing 50 mm (2 inch) thick lumber.
 - e. Use 16d or larger nails for nailing through 50 mm (2 inch) thick lumber.
 - f. Select the size and number of nails in accordance with the Nailing Schedule except for special nails with framing anchors.
 - g. Nailing Schedule; Using Common Nails:
 - 1) Joist bearing on sill or girder, toe nail three (3) 8d nails or framing anchor.
 - 2) Bridging to joist, toe nail each end two (2) 8d nails.
 - 3) Ledger strip to beam or girder three (3) 16d nails under each joint.
 - 4) Subflooring or Sheathing:
 - a) 152 mm (6 inch) wide or less to each joist face nail two (2) 8d nails.
 - b) Subflooring, more than 152 mm (6 inches) wide, to each stud or joint, face nail three (3) 8d nails c) Plywood or

structural use panel to each stud or joist face nail 8d, at supported edges 152 mm (6 inches) on center and at intermediate supports 254 mm (10 inches) on center. When gluing plywood to joint framing increase nail spacing to 305 mm (12 inches) at supported edges and 508 mm (20 inches) o.c. at intermediate supports.

- 5) Built-up girders and beams 20d at 812 mm (32 inches) on center along each edge.

2. Bolts:

- a. Fit bolt heads and nuts bearing on wood with washers.
 - b. Countersink bolt heads flush with the surface of nailers.
 - c. Embed in concrete and solid masonry or provide expansion bolts. Special bolts or screws designed for anchor to solid masonry or concrete in drilled holes may be used.
 - d. Provide toggle bolts to hollow masonry or sheet metal.
 - e. Provide bolts to steel over 2.84 mm (0.112 inch, 11 gage) in thickness. Secure wood nailers to vertical structural steel members with bolts, placed one at ends of nailer and 610 mm (24 inch) intervals between end bolts. Provide clips to beam flanges.
3. Drill Screws to steel less than 2.84 mm (0.112 inch) thick.
- a. ASTM C1002 for steel less than 0.84 mm (0.033 inch) thick.
 - b. ASTM C954 for steel over 0.84 mm (0.033 inch) thick.
4. Power actuated drive pins may be provided where practical to anchor to solid masonry, concrete, or steel.
5. Do not anchor to wood plugs or nailing blocks in masonry or concrete. Provide metal plugs, inserts or similar fastening.
6. Screws to Join Wood:
- a. Where shown or option to nails.
 - b. ASTM C1002, sized to provide not less than 25 mm (1 inch) penetration into anchorage member.
 - c. Spaced same as nails.

E. Blocking Nailers, and Furring:

1. Install furring, blocking, nailers, and grounds where shown.
2. Provide longest lengths practicable.

3. Provide fire retardant treated wood blocking where shown at openings and where shown or specified.
4. Layers of Blocking or Plates:
 - a. Stagger end joints between upper and lower pieces.
 - b. Nail at ends and not over 610 mm (24 inches) between ends.
 - c. Stagger nails from side to side of wood member over 127 mm (5 inches) in width.

K. Rough Bucks:

1. Install rough wood bucks at opening in masonry or concrete where wood frames or trim occur.
2. Brace and maintain bucks plumb and true until masonry has been built around them or concrete cast in place.
3. Cut rough bucks from 50 mm (2 inch) thick stock, of same width as partitions in which they occur and of width shown in exterior walls.
4. Extend bucks full height of openings and across head of openings; fasten securely with anchors specified.

N. Sheathing:

1. Provide plywood or structural-use panels for sheathing.
2. Lay panels with joints staggered, with edge and ends 3 mm (1/8 inch) apart and nailed over bearings as specified.
3. Set nails not less than 9 mm (3/8 inch) from edges.
4. Install 50 mm by 101 mm (2 inch by 4 inch) blocking spiked between joists, rafters and studs to support edge or end joints of panels.
5. Match and align sheathing which is an extension of work in place to existing.

- - - E N D - - -

SECTION 06 20 00
FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This section specifies interior millwork.

- B. Items specified:
 - 1. Counter Shelf.
 - 2. Counter or Work Tops.
 - 3. Mounting Strips, Shelves, and Rods

1.2 RELATED REQUIREMENTS

- A. Adhesive, Paint, and Finish VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Woodwork Finish and Color: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Not Used .
- D. Framing, furring and blocking: Section 06 10 00, ROUGH CARPENTRY.
- E. Wood doors: Section 08 14 00, WOOD DOORS.
- F. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- G. Stock Casework: Section 12 32 00, MANUFACTURED WOOD CASEWORK.
- H. Other Countertops: Division 12, FURNISHINGS.
- I. Electrical light fixtures and duplex outlets: Division 26, ELECTRICAL.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International:
 - 1. A36/A36M-14 - Carbon Structural Steel.
 - 2. A53/A53M-12 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
 - 3. A240/A240M-15b - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - 4. B26/B26M-14e1 - Aluminum-Alloy Sand Castings.
 - 5. B221-14 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 6. E84-15b - Surface Burning Characteristics of Building Materials.
- C. American Hardboard Association (AHA):
 - 1. A135.4-04 - Basic Hardboard.
- D. Architectural Woodwork Institute (AWI):

1. AWI-09 - Architectural Woodwork Quality Standards and Quality Certification Program.
- E. Builders Hardware Manufacturers Association (BHMA):
 1. A156.9-10 - Cabinet Hardware.
 2. A156.11-14 - Cabinet Locks.
 3. A156.16-13 - Auxiliary Hardware.
- F. Federal Specifications (Fed. Spec.):
 1. A-A-1922A - Shield Expansion (Calking Anchors, Single Lead).
 2. A-A-1936A - Adhesive, Contact, Neoprene Rubber.
 3. FF-N-836E- Nut: Square, Hexagon, Cap, Slotted, Castle, Knurled, Welding.
 4. FF-S-111D(1) - Screw, Wood (Notice 1 inactive for new design).
 5. MM-L-736C(1) - Lumber, Hardwood.
- G. Hardwood Plywood and Veneer Association (HPVA):
 1. HP1-09 - Hardwood and Decorative Plywood.
- H. Military Specification (Mil. Spec):
 1. MIL-L-19140E - Lumber and Plywood, Fire-Retardant Treated.
- I. National Particleboard Association (NPA):
 1. A208.1-09 - Wood Particleboard.
- J. National Electrical Manufacturers Association (NEMA):
 1. LD 3-05 - High-Pressure Decorative Laminates.
- K. U.S. Department of Commerce, Product Standard (PS):
 1. PS1-07 - Construction and Industrial Plywood.
 2. PS20-10 - American Softwood Lumber Standard.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.
 1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Not Used.
 - c. Not Used.
 - d. Contractor.
 - e. Installer.
 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Installation schedule.

- b. Installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.
 - e. Installation.
 - f. Terminations.
 - g. Transitions and connections to other work.
 - h. Other items affecting successful completion.
3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and fabrication and installation details.
 - 2. Millwork items - Half full size scale for sections and details 1: 50 (1/4 inch) for elevations and plans.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - a. Finish hardware.
 - b. Electrical components.
 - 2. List of acceptable sealers for fire retardant materials.
 - 3. Installation instructions.
- D. Samples:
 - 1. Plastic Laminate Finished Plywood and Particleboard: 150 mm by 300 mm (6 by 12 inches) long, each type and color .
 - a. Submit quantity required to show full color and texture range.
 - 2. Approved samples may be incorporated into work.
- E. Sustainable Construction Submittals:
 - 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
 - 2. Low Pollutant-Emitting Materials:
 - a. Show volatile organic compound types and quantities.
 - b. Certify each composite wood and agrifiber product contains no added urea formaldehyde.
- F. Certificates: Certify each product complies with specifications.
 - 1. Fire retardant treatment of materials.

2. Moisture content of materials.
- G. Qualifications: Substantiate qualifications comply with specifications.
 1. Fabricator with project experience list .
 2. Installer with project experience list .

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications:
 1. Regularly fabricates specified products.
 2. Fabricated specified products with satisfactory service on five similar installations for minimum five years.
 - a. Project Experience List: Provide contact names and addresses for completed projects.
- B. Installer Qualifications:
 1. Regularly installs specified products.
 2. Installed specified products with satisfactory service on five similar installations for minimum five years.
 - a. Project Experience List: Provide contact names and addresses for completed projects.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.
- D. Store products indoors in dry, weathertight conditioned facility.
- E. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

- A. Environment:
 1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.
 2. Work Area Ambient Conditions: HVAC systems are complete, operational, and maintaining facility design operating conditions continuously, beginning 48 hours before installation until Government occupancy.
 3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

4. Do not install finish lumber or millwork in any room or space where wet process systems such as concrete, masonry, or plaster work is not complete and dry.

B. Field Measurements: Verify field conditions affecting fabrication and installation. Show field measurements on Submittal Drawings.

1. Coordinate field measurement and fabrication schedule to avoid delay.

1.9 WARRANTY

A. Construction Warranty: Contractor's one-year labor and material warranty, FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 NOT USED

2.2 MATERIALS

A. Grading and Marking: Factory mark with grade stamp lumber and plywood of inspection agency approved by the Board of Review, American Lumber Standard Committee.

B. Lumber:

1. Sizes:

a. Lumber Size references, unless otherwise specified, are nominal sizes, and actual sizes within manufacturing tolerances allowed by the standard under which product is produced.

b. Millwork, standing and running trim, and rails: Actual size as shown or specified.

2. Hardwood: MM-L-736, species as specified for each item.

3. Softwood: PS-20, exposed to view appearance grades:

a. Use C select or D select, vertical grain for transparent finish including stain transparent finish.

b. Use Prime for painted or opaque finish.

4. Use edge grain Wood members exposed to weather.

5. Moisture Content:

a. 32 mm (1-1/4 inches) or less nominal thickness: 12 percent on 85 percent of the pieces and 15 percent on the remainder.

b. Other materials: According to standards under which the products are produced.

6. Fire Retardant Treatment: Mil. Spec. MIL-L-19140E.

- a. Treatment and performance inspection by an independent and qualified testing agency that establishes performance ratings.
 - b. Each piece of treated material bear identification of the testing agency and indicate performance according to such rating of flame spread and smoke developed.
 - c. Treat wood for maximum flame spread of 25 and smoke developed of 25.
 - d. Fire Resistant Softwood Plywood:
 - 1) Grade A, Exterior, plywood for treatment.
 - 2) Surface Burning Characteristics: When tested according to ASTM E84.
 - a) Flame spread: 0 to 25.
 - b) Smoke developed: 100 maximum.
 - e. Fire Resistant Hardwood Plywood:
 - 1) Core: Fire retardant treated softwood plywood.
 - 2) Hardwood face and back veneers untreated.
 - 3) Factory seal panel edges.
- C. Plywood:
- 1. Softwood Plywood: DOC PS1.
 - a. Plywood, 13 mm (1/2 inch) and thicker; minimum five ply construction, except 32 mm (1-1/4 inch) thick plywood minimum seven ply.
 - b. Plastic Laminate Plywood Cores:
 - 1) Exterior Type, and species group.
 - 2) Veneer Grade: A-C.
 - c. Shelving Plywood:
 - 1) Interior Type, any species group.
 - 2) Veneer Grade: A-B or B-C.
 - d. Other: As specified for item.
 - 2. Hardwood Plywood: HPVA: HP.1.
 - a. Species of Face Veneer: As shown or as specified with each particular item.
 - b. Grade:
 - 1) Transparent Finish: Type II (interior) A grade veneer.
 - 2) Paint Finish: Type II (interior) Sound Grade veneer.
 - c. Species and Cut: Plain sliced red oak unless specified otherwise.

- D. Particleboard: NPA A208.1, Type 1, Grade 1-M-3.
 - 1. Plastic Laminate Particleboard Cores:
 - a. Type 1, Grade 1-M-3, unless otherwise specified.
 - b. Type 2, Grade 2-M-2, exterior bond, for tops with sinks.
- E. Building Board (Hardboard):
 - 1. ANSI/AHA A135.4, 6 mm (1/4 inch) thick unless specified otherwise.
- F. Plastic Laminate: NEMA LD-3.
 - 1. Exposed Laminate Surfaces including Countertops, and Sides of Cabinet Doors: Grade HGL.
 - 2. Cabinet Interiors including Shelving: NEMA, CLS as a minimum, with the following:
 - a. Plastic laminate clad plywood or particle board.
 - b. Resin impregnated decorative paper thermally fused to particle board.
 - 3. Plastic Laminate Covered Wood Tops Backing: Grade HGP.
 - 4. Postformed Surfaces: Grade HGP.
- G. Stainless Steel: ASTM A240, Type 302 or 304.
- H. Cast Aluminum: ASTM B26.
- I. Extruded Aluminum: ASTM B221.

2.3 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide each product from one manufacturer and from one production run .
- C. Sustainable Construction Requirements:
 - 1. Not Used
 - 2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS for the following products:
 - a. Non-flooring adhesives and sealants.
 - b. Aerosol adhesives.
 - c. Paints and coatings.
 - d. Wall base and accessories.
 - e. Composite wood and agrifiber.

2.4 FABRICATION

- A. General:
 - 1. AWI Custom Grade for interior millwork.

2. Finish woodwork, free from pitch pockets.
3. Trim, standard stock molding and members of same species, except where special profiles are shown.
4. Plywood, minimum 13 mm (1/2 inch), unless otherwise shown on Drawings or specified.
5. Edges of members in contact with concrete or masonry having a square corner caulking rebate.
6. Fabricate members less than 4 m (14 feet) in length from one piece of lumber, back channeled and molded as shown.
7. Fabricate interior trim and items of millwork to be painted from jointed, built-up, or laminated members, unless otherwise shown on Drawings or specified.
8. Plastic Laminate Work:
 - a. Factory glued to either a plywood or a particle board core, thickness as shown on Drawings or specified.
 - b. Cover exposed edges with plastic laminate, except where aluminum, stainless steel, or plastic molded edge strips are shown on drawings or specified. Use plastic molded edge strips on 19 mm (3/4 inch) thick or thinner core material.
 - c. Provide plastic backing sheet on underside of countertops, vanity tops, thru-wall counter // and sills // including back splashes and end splashes of countertops.
 - d. Use backing sheet on concealed large panel surface when decorative face does not occur.

B. Plastic Laminate Counter or Work Tops:

1. Thickness: 32 mm (1-1/4 inch) thick core unless shown otherwise.
 - a. Edges:
 - 1) Decorative laminate for exposed edges of tops, back, and endsplash, 38 mm (1-1/2 inches) wide.
 - 2) Plastic or metal edges for top edges less than 38 mm (1-1/2 inches) wide.
 - b. Assemble backsplash and end splash to counter top.
 - c. Use one piece counters for straight runs.
 - d. Miter corners for field joints with overlapping blocking on underside of joint.

2. Fabricate wood counter for work benches as shown on Drawings.

C. Wood Handrails:

1. AWI Premium Grade.
2. Species: Maple or Birch.
3. Fabricate in one piece and one length when practical.
4. Fabricate curved sections for ends of rails to return to wall and where rails change slope or direction.
5. Joints are permitted only where rail changes direction or slope, or where necessary for field erection or shipping.
6. Scarf or dowel all joints to provide a smooth and rigid connection. Glue all joints.
7. Fit joints, to produce a hair-line crack.
8. Completely shop fabricated according to approved shop drawings.

2.5 ACCESSORIES

A. Hardware:

1. Rough Hardware:
 - a. Provide rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electric-galvanizing process. Galvanized where specified.
 - b. Fasteners:
 - 1) Bolts with Nuts: FF-N-836.
 - 2) Expansion Bolts: A-A-1922A.
 - 3) Screws: Fed. Spec. FF-S-111.
2. Finish Hardware:
 - a. Cabinet Hardware: ANSI A156.9.
 - 1) Door/Drawer Pulls: B02011. Door in seismic zones: B03182.
 - 2) Drawer Slides: B05051 for drawers over 150 mm (6 inches) deep, B05052 for drawers 75 mm to 150 mm (3 to 6 inches) deep, and B05053 for drawers less than 75 mm (3 inches) deep.
 - 3) Sliding Door Tracks: B07063.
 - 4) Adjustable Shelf Standards: B4061 with shelf rest B04083.
 - 5) Concealed Hinges: B1601, minimum 110 degree opening.
 - 6) Butt Hinges: B01361, for flush doors, B01381 for inset lipped doors, and B01521 for overlay doors.
 - 7) Cabinet Door Catch: B0371 or B03172.

- 8) Vertical Slotted Shelf Standard: B04103 with shelf brackets
B04113, sized for shelf depth.
 - b. Cabinet Locks: ANSI A156.11.
 - 1) Drawers and Hinged Door: E07262.
 - 2) Sliding Door: E07162.
 - c. Auxiliary Hardware: ANSI A156.16.
 - 1) Shelf Bracket: B04041, japanned or enameled finish.
 - 2) Combination Garment rod and Shelf Support: B04051 japanned or enamel finish.
 - 3) Closet Bar: L03131 chrome finish of required length.
 - 4) Handrail Brackets: L03081 or L03101.
 - a) Cast Aluminum, satin polished finish.
 - b) Cast Malleable Iron, japanned or enamel finish.
 - d. Steel Channel Frame and Leg supports for Counter top. Fabricated under Section 05 50 00, METAL FABRICATIONS.
 - e. Thru-Wall Counter Brackets:
 - 1) Steel angles drilled for fasteners on 100 mm (4 inches) centers.
 - 2) Baked enamel prime coat finish.
 - 3)
 - f. Primers: Manufacturer's standard primer for steel providing baked enamel finish.
- B. Adhesive:
- 1. Plastic Laminate: Fed. Spec. A-A-1936.
 - 2. Interior Millwork: Unextended urea resin, unextended melamine resin, phenol resin, or resorcinol resin.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Remove existing to permit new installation.
 - 1. Dispose of other removed materials.
- D. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.

3.2 INSTALLATION

A. Installation:

1. Prime millwork receiving transparent finish and back-paint concealed surfaces.
2. Fasten trim with fine finishing nails, screws, or glue as required.
3. Set nails for putty stopping. Provide washers under bolt heads where no other bearing plate occurs.
4. Seal cut edges of fire retardant treated wood materials with a certified acceptable sealer.
5. Coordinate with plumbing and electrical work for installation of fixtures and service connections in millwork items.
6. Plumb and level items unless shown otherwise.
7. Nail finish at each blocking, lookout, or other nailer and intermediate points; toggle or expansion bolt in place where nails are not suitable.
8. Not Used.

B. Shelves:

1. Install mounting strip at back wall and end wall for shelves in closets where shown secured with toggle bolts at each end, not over 600 mm (24 inch) centers between ends.
 - a. Nail Shelf to mounting strip at ends and to back wall strip at not over 900 mm (36 inches) on center.
 - b. Install metal bracket, ANSI A156.16, B04041, not over 1200 mm (4 feet) centers when shelves exceed 1800 mm (6 feet) in length.
 - c. Install metal bracket, ANSI A156.16, B04051, not over 1200 mm (4 feet) on centers where shelf length exceeds 1800 mm (6 feet) in length with metal rods, clothes hanger bars ANSI A156.16, L03131, of required length, full length of shelf.
2. Install vertical slotted shelf standards to studs with toggle bolts through each fastener opening. Double slotted shelf standards is acceptable where adjacent shelves terminate.
 - a. Install brackets providing supports for shelf not over 900 mm (36 inches) on center and within 13 mm (1/2 inch) of shelf end unless shown otherwise.
 - b. Install shelves on brackets so front edge is restrained by bracket.

C. Handrails:

1. Install in one piece and one length when practical.
 2. Where rails change slope or direction, install special curved sections and ends of rails to return to wall, glue all field joints.
 3. Secure rails with wood screws at 450 mm (18 inches) on centers to metal balustrades top rail.
 4. Install brackets within 300 mm (12 inches) of ends of handrails and at every spaced intervals between not exceeding 1500 mm (5 feet) on centers at intervals between as shown. Anchor brackets as detailed and rails to brackets with screws.
- D. Install with butt joints in straight runs and miter at corners.

3.3 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Clean exposed surfaces. Remove contaminants and stains.
- C. Touch up damaged factory finishes.
 1. Repair painted surfaces with touch up primer.

3.4 PROTECTION

- A. Protect finish carpentry from traffic and construction operations.
- B. Cover finish carpentry with reinforced kraft paper, and plywood or hardboard.
- C. Remove protective materials immediately before acceptance.
- D. Repair damage.

- - - E N D - - -

SECTION 07 01 50.19
PREPARATION FOR RE-ROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Complete roof removal for new roof system installation.
 - 2. Partial roof removal for new roof system installation.
 - 3. Roofing membrane and selective roofing system component removal for new roof membrane installation.
 - 4. Existing roofing membrane preparation for new roofing membrane system installation.
- B. Existing Roofing System: EPDM, Slate Shingles. System components include:
 - 1. Not Used
 - 2. Roofing membrane.
 - 3. Cover board.
 - 4. Roof insulation.
 - 5. Vapor retarder.
 - 6. Substrate board.
 - 7. Slate Shingles.

1.2 RELATED REQUIREMENTS

- A. Not Used
- B. Replacement Roof Deck: Section 05 31 00, STEEL DECKING.
- C. Replacement Roof Deck and Parapet Sheathing: Section 06 10 00, ROUGH CARPENTRY.
- D. New Roofing System: Section 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING
- E. Sheet Metal Counterflashing: Section 07 60 00, SHEET METAL FLASHING AND TRIM.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):

1. FX-1-01(R2006) Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
- C. American Society for Nondestructive Testing (ASNT):
1. SNT-TC-1A - Personnel Qualification and Certification for Nondestructive Testing.
- D. ASTM International (ASTM):
1. C208-12 - Cellulosic Fiber Insulating Board.
 2. C578-15 - Rigid, Cellular Polystyrene Thermal Insulation.
 3. C728-15 - Perlite Thermal Insulation Board.
 4. C1177/C1177M-13 - Glass Mat Gypsum Substrate for Use as Sheathing.
 5. C1153-97(2003)e1 - Location of Wet Insulation in Roofing Systems Using Infrared Imaging.
 6. C1278/C1278M-07a(2015) - Fiber-Reinforced Gypsum Panel.
 7. D4263-83(2012) - Indicating Moisture in Concrete by the Plastic Sheet Method.
- E. U.S. Department of Commerce National Institute of Standards and Technology (NIST):
1. DOC PS 1-09 - Structural Plywood.
 2. DOC PS 2-04 - Performance Standard for Wood-Based Structural-Use Panels.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting minimum 30 days before beginning Work of this section.
1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Contractor.
 - c. Installer.
 - d. Other installers responsible for adjacent and intersecting work, including mechanical and electrical equipment installers.
 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Removal and installation schedule.
 - b. Removal and installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.

- e. Removal and installation.
 - f. Temporary roofing including daily terminations.
 - g. Transitions and connections to other work.
 - h. Inspecting and testing.
 - i. Other items affecting successful completion.
3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and installation details.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Description of temporary roof system and components.
 - 3. List of patching materials.
 - 4. Recover board fastening requirements.
 - 5. Temporary roofing installation instructions and removal instructions and preparation instructions to receive new roofing.
 - 6. Existing roofing warrantor's instructions.
- D. Photographs: Document existing conditions potentially affected by roofing operations before work begins.
- E. Field Inspection Reports:
 - 1. Certify warrantor inspected completed roofing and existing warranty remains in effect.
- F. Infrared Roof Moisture Survey Report.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Same installer as Section 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING
 - 2. Not Used.
 - 3. Approved by existing roofing system warrantor when work affects existing roofing system under warranty.

1.7 FIELD CONDITIONS

- A. Building Occupancy: Perform work to minimize disruption to normal building operations.
 - 1. Verify occupants are evacuated from affected building areas when working on structurally impaired roof decking above occupied areas.
 - 2. Provide notice minimum 72 hours before beginning activities affecting normal building operations.
- B. Existing Roofing Available Information:
 - 1. The following are available for Contractor reference:
 - a. Roof moisture survey.
 - b. Test cores analysis.
 - c. Construction drawings and project manual.
 - 2. Examine available information before beginning work of this section.
- C. Weather Limitations: Proceed with reroofing preparation only during dry weather conditions as specified for new roofing installation in Section 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING
 - 1. Remove only as much roofing in one day as can be made watertight in same day.
- D. Hazardous materials are not expected in existing roofing system.
 - 1. Known hazardous materials were removed before start of work.
 - 2. Do not disturb suspected hazardous materials. When discovered, notify Contracting Officer's Representative.
 - 3. Hazardous materials discovered during execution of the work will be removed by Government as work of a separate contract.
- E. Not Used

1.8 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."
- B. Existing Warranties: Perform work to maintain existing roofing warranty in effect.
 - 1. Notify warrantor before beginning, and upon completion of reroofing.
 - 2. Obtain warrantor's instructions for maintaining existing warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Patching Materials: Match existing roofing system materials.
- B. Plywood Sheathing: See Section 06 10 00, ROUGH CARPENTRY.
- C. Metal Flashing: See Section 07 60 00, SHEET METAL FLASHING AND TRIM.
- D. Temporary Protection Materials:
 - 1. Expanded Polystyrene (EPS) Insulation: ASTM C578.
 - 2. Plywood: NIST DOC PS 1, Grade CD Exposure 1.
 - 3. Oriented Strand Board (OSB): NIST DOC PS 2, Exposure 1.
- E. Temporary Roofing System Materials: Contractor's option.
- F. Recover Board: One of the following:
 - 1. Insulation: See Section 07 22 00, ROOF AND DECK INSULATION.
 - 2. Fiber Board: ASTM C208, Type II, fiber board; 13 mm (1/2 inch) thick.
 - 3. Glass Mat Gypsum Board: ASTM C1177/C1177M, water-resistant; Type X, 16 mm (5/8 inch) thick.
 - 4. Fiber Reinforced Gypsum Board: ASTM C1278/C1278M, water-resistant; 16 mm (5/8 inch) thick.
- G. Fasteners: Type and size required by roof membrane manufacturer to resist wind uplift.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Infrared Roof Moisture Survey: Ground-based, walk-over type performed according to ASTM C1153.
 - 1. Record the entire survey on DVD and provide one copy to Contracting Officer's Representative with report.
 - 2. Include in report thermograms of suspect areas and corresponding daytime photos of same locations.
 - 3. Conduct inspection by NDT test technician certified to at least Level 2 in Thermal/Infrared test method according to ASNT SNT-TC-1A.
 - 4. Mark out roof areas determined to be wet to indicate minimum areas to be removed.

3.2 PREPARATION

- A. Examine and verify substrate suitability for product installation.

- B. Protect existing roofing system indicated to remain.
 - 1. Cover roof membrane with temporary protection materials without impeding drainage.
 - 2. Limit traffic and material storage to protected areas.
 - 3. Maintain temporary protection until replacement roofing is completed.
- C. Protect existing construction and completed work from damage.
- D. Protect landscaping from damage.
- E. Maintain access to existing walkways and adjacent occupied facilities.
- F. Coordinate use of rooftop fresh air intakes with Contracting Officer's Representative to minimize effect on indoor air quality.
- G. Ensure temporary protection materials are available for immediate use in case of unexpected rain.
- H. Ensure roof drainage remains functional.
 - 1. Keep drainage systems clear of debris.
 - 2. Prevent water from entering building and existing roofing system.
- I. Coordinate rooftop utilities remaining active during roofing work with Contracting Officer's Representative.

3.3 RE-ROOFING PREPARATION - GENERAL

- A. Notify Contracting Officer's Representative of planned operations, daily.
 - 1. Identify location and extent of roofing removal.
 - 2. Request authorization to proceed.

3.4 OVERBURDEN REMOVAL

- A. Remove insulation and drainage board from protected roofing membrane.
 - 1. Store insulation and drainage board for reuse.

3.5 COMPLETE ROOFING SYSTEM REMOVAL

- A. Remove existing roofing system completely, exposing structural roof deck.
 - 1. Remove cover board, roof insulation, vapor retarder, and substrate board .
 - 2. Remove or cut-off roofing system fasteners.

3.6 ROOFING MEMBRANE AND SELECTIVE ROOFING SYSTEM COMPONENT REMOVAL

- A. Remove existing roofing membrane, only, in locations and to extent indicated on drawings.
- B. Visually inspect existing roofing material / shingles, cover board, roof insulation, vapor retarder, and substrate board for moisture immediately after roof membrane removal.
 - 1. Coordinate with Contracting Officer's Representative to observe inspections.
 - 2. Identify wet roofing system components required to be removed.
 - 3. Mark roofing system removal locations and extents.
- C. Remove wet roofing system components.
 - 1. Remove or cut-off roofing system fasteners when removals expose structural roof deck.
- D. Patch selective roofing system removals immediately after inspection and repair.
- E. Install patching materials to match existing roofing system.
- F. Patch roofing membrane to maintain building watertight, unless new roofing membrane is installed same day as removal and repair.

3.7 DECK PREPARATION

- A. Inspect structural roof deck after roofing system removal.
- B. Concrete Roof Decks:
 - 1. Visually confirm concrete roof deck is dry.
 - 2. Perform moisture test according to ASTM D4263 each day for each separate roof area.
 - a. Proceed with roofing work only when moisture is not observed.
- C. Steel Roof Decks:
 - 1. Visually inspect structural roof deck installation and fasteners.
 - a. Notify Contracting Officer's Representative of unsuitable conditions and inadequate fastenings potentially affecting roof system performance.
 - 2. Secure roof deck with additional fastenings as indicated on drawings, or as determined by Contracting Officer's Representative.
 - 3. Replace roof deck as indicated on drawings, or as determined by Contracting Officer's Representative.

- a. Replacement Roof Deck: See Section 05 31 00, STEEL DECKING.
Section 06 10 00, ROUGH CARPENTRY.

3.8 TEMPORARY ROOFING

- A. Install temporary roofing to maintain building watertight.
- B. Prepare temporary roofing to receive new roofing.

3.9 BASE FLASHING REMOVAL

- A. Expose base flashings to permit removal.
 - 1. Two-Piece Counterflashings: Remove cap flashing and store for reuse.
 - 2. Single Piece Counterflashings: Carefully bend counterflashing.
 - 3. Metal Copings: Remove decorative cap and store for reuse.
- B. Remove existing base flashings.
 - 1. Clean substrates to receive new flashings.
- C. Replace counterflashings damaged during removal.
 - 1. Counterflashings: See Section 07 60 00 SHEET METAL FLASHING AND TRIM.
- D. Remove existing parapet sheathing and inspect parapet framing.
 - 1. Notify Contracting Officer's Representative of damaged framing.
- E. Install exterior fire-retardant-treated plywood sheathing, 15 mm (19/32 inch) thick.

3.10 RECOVER BOARD INSTALLATION

- A. Install recover boards over existing roof insulation with butted joints. Stagger end joints in adjacent rows.
- B. Fasten recover boards to resist wind-uplift.
 - 1. Fastening Requirements: See Section 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING
 - 2. Uplift Resistance: Base on pull out resistance determined by specified field testing.

3.11 FIELD QUALITY CONTROL

- A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.
 - 1. Fastener Pull Out Tests: ANSI/SPRI FX-1.
- B. Existing Roofing System Warrantor Services:
 - 1. Inspect reroofing preparation and roofing installation to verify compliance with existing warranty conditions.

2. Submit reports of field inspections, and supplemental instructions issued during inspections.

3.12 DISPOSAL

- A. Collect waste materials in containers.
- B. Remove waste materials from project site, regularly, to prevent accumulation.
- C. Legally dispose of waste materials.

- - E N D - -

SECTION 07 13 52
MODIFIED BITUMINOUS SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Modified bituminous sheet material used for exterior below grade waterproofing and split slab waterproofing.

1.2 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. Federal Specifications (Fed. Spec.):
1. UU-B-790A Notice 2- Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent, and Fire Resistant).
- C. ASTM International (ASTM):
1. C578-15b - Rigid, Cellular Polystyrene Thermal Insulation.
 2. D41/D41M-11 - Asphalt Primer Used in Roofing, Dampproofing and Waterproofing.
 3. D4586/D4586M-07(2012)e1 - Asphalt Roof Cement, Asbestos-Free.
 4. D6380/D6380M-03(2012)e1 - Asphalt Roll Roofing (Organic Felt).
- D. American Hardboard Association (AHA):
1. A135.4-2012 - Basic Hardboard.

1.3 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.
1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Contractor.
 - c. Installer.
 - d. Other installers responsible for adjacent and intersecting work, including substrate and flashing installers.
 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Installation schedule.
 - b. Installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.
 - e. Installation.

- f. Terminations.
 - g. Transitions and connections to other work.
 - h. Inspecting and testing.
 - i. Other items affecting successful completion.
3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and installation details.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Installation instructions.
 - 3. Warranty.
- D. Samples:
 - 1. Waterproofing and Flashing Sheet: 200 mm (8 inch) square, each type and color.
 - 2. Insulation: 200 mm (8 inch) square.
- E. Test reports: Certify products comply with specifications.
- F. Certificates: Certify products comply with specifications.
- G. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Installer with project experience list.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Regularly installs specified products.
 - 2. Installed specified products with satisfactory service on five similar installations for minimum five years.
 - a. Project Experience List: Provide contact names and addresses for completed projects.

1.6 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight conditioned facility.
- B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

- A. Environment:
 - 1. Product Temperature: Minimum 4 degrees C (40 degrees F) for minimum 48 hours before installation.
 - 2. Weather Limitations: Install waterproofing only during dry current and forecasted weather conditions.

1.9 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, Contractor's one-year labor and material warranty. "Warranty of Construction."
- B. Manufacturer's Warranty: Warrant waterproofing system against material and manufacturing defects and agree to repair any leak caused by a defect in the waterproofing system materials or workmanship of the installer.
 - 1. Warranty Period: 10 years.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Waterproofing System: Modified bituminous sheet material for exterior below grade and split slab waterproofing.

2.2 PRODUCTS - GENERAL

- A. Provide each product from one manufacturer.
- B. Sustainable Construction Requirements:
 - 1. Insulation Recycled Content:
 - a. Rigid Foam: 9 percent total recycled content, minimum.

2.3 BITUMINOUS SHEET

- A. Cold applied waterproofing membrane composed primarily of modified bituminous material prefabricated in sheet form designed for below grade exterior and split slab waterproofing. Sheet reinforced with fibers at manufacturer's option.
- B. Thickness: 1.5 mm (60 mils), plus or minus 0.13 mm (5 mils), and bonded to 0.1 mm (4 mil) thick plastic sheet.

- C. Provide release sheet to prevent bonding of bituminous sheet to itself.

2.4 PROTECTION MATERIAL

- A. Polystyrene Insulation: ASTM C578, Type I or VIII, 13 mm (3 inches) minimum thickness.

2.5 ACCESSORIES

- A. Patching Compound: Factory-prepared, non-shrinking, fast-setting, cementitious adhesive compound containing no ferrous metal or oxide.
- B. Primer: ASTM D41/D41M.
- C. Roof Cement: ASTM D4586/D4586M.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
 - 1. Concrete surfaces cured minimum time recommended by waterproofing manufacturer.
 - 2. Substrate to be dry as recommended by waterproofing manufacturer.
- B. Protect existing construction and completed work from damage.
- C. Correct substrate deficiencies.
 - 1. Fill voids, joints, and cracks with patching compound.
- D. Clean substrates. Remove contaminants capable of preventing full adhesion.
- E. Priming:
 - 1. Prime concrete and masonry surfaces.
 - 2. Application method, amount of primer and condition or primer before installation of bituminous sheet as recommended by primer manufacturer.
 - 3. Reprime when required according to manufacturer's instructions.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 WATERPROOFING INSTALLATION

- A. Bituminous Sheet Installation:

1. Remove release sheet before application.
 2. Lay bituminous sheet from low point to high point so laps shed water.
 3. Treat expansion, construction and control joints and evident working cracks as expansion joints. Apply bituminous sheet in double thickness over joint by first applying a strip of bituminous sheet minimum 200 mm (8 inches) wide, centered over joint.
 4. Lap seams minimum 50 mm (2 inches).
 5. Lay succeeding sheet with laps, and roll or press into place.
 6. Repair misaligned or inadequately lapped seams according to manufacturer's instructions.
 7. Seal seams and terminations according to sheet manufacturer's instructions.
- B. Corner Treatment:
1. At inside and outside corners, apply double cover using an initial strip minimum 280 mm (11 inches) wide, centered along axis of corner.
 2. Cover each strip completely by the regular application of bituminous sheet.
 3. Provide a fillet or cant on inside corners.
 4. Form cants using patching compound.
 5. Do not use wood, fiber, and insulating materials for cants.
- C. Projection Treatment:
1. Apply a double layer of bituminous sheet around pipes and similar projections at least 150 mm (6 inches) wide.
 2. At drains, apply a bead of roof cement over a double layer of bituminous sheet under clamping rings.
- D. Patching:
1. Repair tears, punctures, air blisters, and inadequately lapped seams, according to manufacturer's instructions before protection course is applied.
- E. Permanent Protection:
1. Vertical Surfaces:
 - a. Install polystyrene insulation protection material.
 - b. Extend protection full height from footing to top of backfill.
 - c. If graded backfill is used, use roll roofing or hardboard.
- F. Horizontal Surfaces:

1. Install polystyrene insulation under earth backfill.
2. Where no concrete wearing course occurs or when surfaces will bear heavy traffic and will not immediately be covered with a wearing course, use protection specified for vertical surfaces.

G. Temporary Protection:

1. When waterproofing materials are subjected to damage by sunlight and cannot be immediately protected as specified, protect waterproofing materials by waterproof building paper or suitable coating approved by manufacturer of waterproofing system used.

3.4 FIELD QUALITY CONTROL

A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.

B. Testing:

1. Before any protection or wearing course is applied, test all horizontal applications of waterproofing with a minimum of 25 mm (1 inch) head of water above highest point and leave for 24 hours.
2. Mark leaks and repair when waterproofing is dry.
3. Certify, to Contracting Officer's Representative, that water tests have been made and that areas tested were found watertight.

C. Inspection:

1. Do not cover waterproofed surfaces by other materials or backfill until work is approved by Contracting Officer's Representative.

3.5 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Clean exposed waterproofing surfaces. Remove contaminants and stains.

3.6 PROTECTION

- A. Protect waterproofing from construction operations.
- B. Remove protective materials immediately before acceptance.
- C. Repair damage.

- - - E N D - - -

**SECTION 07 21 13
THERMAL INSULATION**

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermal insulation.
 - a. Board or block insulation at foundation perimeter.
 - b. Batt or blanket insulation at exterior framed and furred walls.
 - c. Board or block insulation at masonry cavity walls.
2. Acoustical insulation.
 - a. Batt and blanket insulation at interior framed partitions and ceilings .

1.2 RELATED REQUIREMENTS

- A. Adhesives VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Insulation for Cavity Face of Masonry: Section 04 20 00, UNIT MASONRY.
- C. Safing Insulation: Section 07 84 00, FIRESTOPPING.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 1. C516-08(2013)e1 - Vermiculite Loose Fill Thermal Insulation.
 2. C549-06(2012) - Perlite Loose Fill Insulation.
 3. C552-15 - Cellular Glass Thermal Insulation.
 4. C553-13 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 5. C578-15 - Rigid, Cellular Polystyrene Thermal Insulation.
 6. C591-15 - Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
 7. C612-14 - Mineral Fiber Block and Board Thermal Insulation.
 8. C665-12 - Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 9. C728-15 - Perlite Thermal Insulation Board.

10. C954-15 - Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Base to Steel Studs From 0.033 (0.84 mm) inch to 0.112 inch (2.84 mm) in thickness.
11. C1002-14 - Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
12. D312/D312M-15 - Asphalt Used in Roofing.
13. E84-15a - Surface Burning Characteristics of Building Materials.
14. F1667-15 - Driven Fasteners: Nails, Spikes, and Staples.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 1. Show insulation type, thickness, and R-value for each location.
- C. Manufacturer's Literature and Data:
 1. Description of each product.
 2. Adhesive indicating manufacturer recommendation for each application.
- D. Sustainable Construction Submittals:
 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
 2. Low Pollutant-Emitting Materials:
 - a. Show volatile organic compound types and quantities.

1.5 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.6 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight facility.
- B. Protect products from damage during handling and construction operations.
- C. Protect foam plastic insulation from UV exposure.

1.7 WARRANTY

- A. Construction Warranty: Contractor's one year labor and material warranty, FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 INSULATION - GENERAL

- A. Insulation Thickness:
 - 1. Provide thickness required by R-value shown on drawings.
 - 2. Provide thickness indicated when R-value is not shown on drawings.
- B. Insulation Types:
 - 1. Provide one insulation type for each application.
- C. Sustainable Construction Requirements:
 - 1. Insulation Recycled Content:
 - a. Polyisocyanurate/polyurethane rigid foam: 9 percent recovered material.
 - b. Polyisocyanurate/polyurethane foam-in-place: 5 percent recovered material.
 - c. Glass fiber reinforced: 6 percent recovered material.
 - d. Phenolic rigid foam: 5 percent recovered material.
 - e. Rock wool material: 75 percent recovered material.
 - 2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Non-Flooring Adhesives and Sealants.

2.2 THERMAL INSULATION

- A. Perimeter Insulation In Contact with Soil:
 - 1. Polystyrene Board: ASTM C578, Type IV, V, VI, VII, or IX.
- B. Exterior Framing or Furring Insulation:
 - 1. Mineral Fiber: ASTM C665, Type II, Class C, Category I where concealed by thermal barrier.
 - 2. Mineral Fiber: ASTM C665, Type III, Class A at other locations.
- C. Masonry Cavity Wall Insulation:
 - 1. Polyurethane or Polyisocyanurate Board: ASTM C591, Type I, with vapor retarder facing; maximum permeance 29 ng/Pa/s/sq. m (0.5 perms).

2.3 ACOUSTICAL INSULATION

- A. Semi Rigid, Batts and Blankets:
 - 1. Widths and lengths to fit tight against framing.
 - 2. Mineral Fiber Batt or Blankets: ASTM C665 unfaced .
 - 3. Maximum Surface Burning Characteristics: ASTM E84.
 - a. Flame Spread Rating: 25.
 - b. Smoke Developed Rating: 450.

2.4 ACCESSORIES

- A. Fasteners:
 - 1. Staples or Nails: ASTM F1667, zinc-coated, size and type to suit application.
 - 2. Screws: ASTM C954 or ASTM C1002, size and length to suit application with washer minimum 50 mm (2 inches) diameter.
 - 3. Impaling Pins: Steel pins with head minimum 50 mm (2 inches) diameter.
 - a. Length: As required to extend beyond insulation and retain cap washer when washer is placed on pin.
 - b. Adhesive: Type recommended by manufacturer to suit application.
- B. Insulation Adhesive:
 - 1. Nonflammable type recommended by insulation manufacturer to suit application.
- C. Tape:
 - 1. Pressure sensitive adhesive on one face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

- B. Install insulation with vapor barrier facing the heated side, unless indicated otherwise.
- C. Install board and block insulation with joints close and flush, in regular courses, and with end joints staggered.
- D. Install batt and blanket insulation with joints tight. Fill framing voids completely. Seal penetrations, terminations, facing joints, facing cuts, tears, and unlapped joints with tape.
- E. Fit insulation tight against adjoining construction and penetrations, unless indicated otherwise.

3.3 THERMAL INSULATION

- A. Perimeter Insulation In Contact with Soil:
 - 1. Vertical insulation:
 - a. Fill joints of insulation with same material used for bonding.
 - b. Bond polystyrene board to surfaces with adhesive.
 - c. Bond cellular glass insulation to surfaces with hot asphalt or adhesive cement.
 - 2. Horizontal insulation under concrete floor slab:
 - a. Lay insulation boards and blocks horizontally on level, compacted and drained fill.
 - b. Extend insulation from foundation walls towards center of building minimum 600 mm (24 inches).
- B. Exterior Framing or Furring Insulation:
 - 1. General:
 - a. Open voids are not acceptable.
 - b. Pack insulation around door frames and windows, in building expansion joints, door soffits, and other voids.
 - c. Pack behind outlets, around pipes, ducts, and services encased in walls.
 - d. Hold insulation in place with pressure sensitive tape.
 - e. Lap facing flanges together over framing for continuous surface. Seal penetrations through insulation and facings.
 - 2. Metal Studs:
 - a. Fasten insulation between metal studs, framing, and furring with pressure sensitive tape continuous along flanged edges.
 - 3. Roof Rafters and Floor Joists:

- a. Friction fit insulation between framing to provide minimum 50 mm (2 inch) air space between insulation and roof sheathing and subfloor.
 - 4. Ceilings and Soffits:
 - a. Wood Framing:
 - 1) Fasten blanket insulation between wood framing and joists with nails or staples through flanged edges of insulation.
 - 2) Space fastenings maximum 150 mm (6 inches) on center.
 - b. Metal Framing:
 - 1) Fasten insulation between metal framing with pressure sensitive tape continuous along flanged edges.
 - 2) At metal framing and ceilings suspension systems, install insulation above suspended ceilings and metal framing at right angles to main runners and framing.
 - 3) Tape insulation tightly together without gaps. Cover metal framing members with insulation.
 - C. Inside Face of Exterior Wall Insulation:
 - 1. Location: On interior face of solid masonry and concrete walls, beams, beam soffits, underside of floors, and to face of studs to support interior wall finish where indicated.
 - 2. Bond insulation to solid vertical surfaces with adhesive. Fill joints with adhesive cement.
 - 3. Fasten board insulation to face of studs with screws, nails or staples. Space fastenings maximum 300 mm (12 inches) on center. Stagger fasteners at board joints. Install fasteners at each corner.
 - D. Masonry Cavity Wall Insulation:
 - 1. Install insulation on exterior faces of concrete and masonry inner wythes of cavity walls.
 - 2. Bond polyurethane or polyisocyanurate board, and perlite board to surfaces with adhesive.
 - 3. Fill insulation joints with same material used for bonding.
- 3.4 ACOUSTICAL INSULATION**
- A. General:
 - 1. Install insulation without voids.
 - 2. Pack insulation around door frames and windows, in building expansion joints, door soffits, and other voids.

3. Pack behind outlets, around pipes, ducts, and services encased in walls.
 4. Hold insulation in place with pressure sensitive tape.
 5. Lap facer flanges together over framing for continuous surface. Seal all penetrations through the insulation and facers.
 6. Do not compress insulation below required thickness except where embedded items prevent required thickness.
- B. Semi Rigid, Batts and Blankets:
1. When insulation is not full thickness of cavity, adhere insulation to one side of cavity, maintaining continuity of insulation and covering penetrations or embedments.
 - a. Metal Framing:
 - 1) Fasten insulation between metal framing with pressure sensitive tape continuous along flanged edges.
 - 2) At metal framing or ceilings suspension systems, install blanket insulation above suspended ceilings or metal framing at right angles to the main runners or framing.
 - 3) Tape insulation tightly together so no gaps occur and metal framing members are covered by insulation.

3.5 CLEANING

- A. Remove excess adhesive before adhesive sets.

3.6 PROTECTION

- A. Protect insulation from construction operations.
- B. Repair damage.

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SECTION 07 22 00
ROOF AND DECK INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof and deck insulation, substrate board, vapor retarder, and cover board on new concrete or metal deck substrates ready to receive roofing or waterproofing membrane.
2. Repairs and alteration work to existing roof insulation.

1.2 RELATED REQUIREMENTS

- A. Non-Flooring Adhesives and Sealants VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Wood Cants, Blocking, and Edge Strips: Section 06 10 00, ROUGH CARPENTRY.
- C. Perimeter, rigid, and batt or blanket insulation not part of roofing system: Section 07 21 13, THERMAL INSULATION.

Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE):
 1. Standard 90.1-13 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- C. ASTM International (ASTM):
 1. C208-12 - Cellulosic Fiber Insulating Board.
 2. C552-15 - Cellular Glass Thermal Insulation.
 3. C726-05 - Mineral Fiber Roof Insulation Board.
 4. C728-15 - Perlite Thermal Insulation Board.
 5. C1177/C1177M-13 - Glass Mat Gypsum Substrate for Use as Sheathing.
 6. C1278/C1278M-07a(2015) - Fiber-Reinforced Gypsum Panel.
 7. C1289-15 - Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 8. C1396/C1396M-14a - Gypsum Board.

9. D41/D41M-11 - Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
 10. D312-06 - Asphalt Used in Roofing.
 11. D1970/D1970M-15 - Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 12. D2178/D2178M-15 - Asphalt Glass Felt Used in Roofing and Waterproofing.
 13. D2822/D2822M-11 - Asphalt Roof Cement, Asbestos Containing.
 14. D4586/D4586M-07(2012)e1 - Asphalt Roof Cement, Asbestos-Free.
 15. E84-15a - Surface Burning Characteristics of Building Materials.
 16. F1667-15 - Driven Fasteners: Nails, Spikes, and Staples.
- D. National Roofing Contractors Association (NRCA):
1. Manual-15 - The NRCA Roofing Manual: Membrane Roof Systems.
- E. U.S. Department of Agriculture (USDA):
1. USDA BioPreferred Program Catalog.
- F. UL LLC (UL):
1. Listed - Online Certifications Directory.
- G. U.S. Department of Commerce National Institute of Standards and Technology (NIST):
1. DOC PS 1-09 - Structural Plywood.
 2. DOC PS 2-04 - Performance Standard for Wood-Based Structural-Use Panels.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 1. Show size, configuration, and installation details.
 - a. Nailers, cants, and terminations.
 - b. Layout of insulation showing slopes, tapers, penetrations, and edge conditions.
- C. Manufacturer's Literature and Data:
 1. Description of each product.
- D. Samples:
 1. Roof insulation, each type.
 2. Fasteners, each type.
- E. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
 2. Biobased Content:
 - a. Show type and quantity for each product.
 3. Low Pollutant-Emitting Materials:
 - a. Show volatile organic compound types and quantities.
 - b. Certify each composite wood and agrifiber product contain no added urea formaldehyde.
- F. Qualifications: Substantiate qualifications meet specifications.
1. Installer.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Same installer as Division 07 roofing section installer.

1.6 DELIVERY

- A. Comply with recommendations of NRCA Manual.
- B. Deliver products in manufacturer's original sealed packaging.
- C. Mark packaging, legibly. Indicate manufacturer's name or brand, type, and manufacture date.
- D. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Comply with recommendations of NRCA Manual.
- B. Store products indoors in dry, weathertight facility.
- C. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

- A. Environment:
 1. Install products when existing and forecasted weather permit installation according to manufacturer's instructions.

1.9 WARRANTY

- A. Construction Warranty: Contractor's one-year labor and material warranty, FAR clause 52.246-21, "Warranty of Construction."
- B. Manufacturer's Warranty: Warrant substrate board, vapor retarder, insulation, and cover board against material and manufacturing defects as part of Division 07 roofing system warranty.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Insulation Thermal Performance:
 - 1. Overall Average R-Value: RSI-57 (R-33), minimum.
 - 2. Any Location R-Value: RSI-17 (R-10), minimum.
- B. Fire and Wind Uplift Resistance: Provide roof insulation complying with requirements specified in Division 07 roofing section.
- C. Insulation on Metal Decking: UL labeled indicating compliance with one of the following:
 - 1. UL Listed.
 - 2. Insulation Surface Burning Characteristics: When tested according to ASTM E84.
 - a. Flame Spread Rating: 75 maximum.
 - b. Smoke Developed Rating: 150 maximum.

2.2 PRODUCTS - GENERAL

- A. Provide each product from one manufacturer.
- B. Sustainable Construction Requirements:
 - 1. Insulation Recycled Content:
 - a. Rigid Foam: 9 percent total recycled content, minimum.
 - b. Glass Fiber Reinforced Rigid Foam: 6 percent total recycled content, minimum.
 - 2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Non-flooring adhesives and sealants.
 - b. Composite wood and agrifiber.
 - 3. Bio-Based Materials: Where applicable, provide products designated by USDA and meeting or exceeding USDA recommendations for bio-based content, and products meeting Rapidly Renewable Materials and certified sustainable wood content definitions; refer to www.biopreferred.gov.

2.3 ADHESIVES

- A. Primer: ASTM D41/D41M.
- B. Asphalt: ASTM D312, Type III or IV for vapor retarders and insulation.

- C. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free, cold-applied adhesive formulated to adhere roof insulation to substrate or to another insulation layer.
- D. Bead-Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to adhere roof insulation to substrate or to another insulation layer.
- E. Full-Spread Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to adhere roof insulation to substrate or to another insulation layer.
- F. Roof Cement: Asbestos free, ASTM D2822/D2822M, Type I or Type II; or, ASTM D4586/D4586M, Type I or Type II.

2.4 ROOF AND DECK INSULATION

- A. Roof and Deck Insulation, General: Preformed roof insulation boards approved by roofing manufacturer.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, faced with glass fiber reinforced cellulosic felt facers on both major surfaces of the core foam.
- C. Tapered Roof Insulation System:
 - 1. Fabricate of polyisocyanurate. Use only one insulation material for tapered sections. Use only factory-tapered insulation.
 - 2. Cut to provide high and low points with crickets and slopes as shown.
 - 3. Minimum thickness of tapered sections; 38 mm (1-1/2 inch).
 - 4. Minimum slope 1/48 (1/4 inch per 12 inches).
- D. Composite Nail Base Insulated Roof Sheathing:
 - 1. Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing: Polyisocyanurate thermal insulation ASTM C1289, Type V, insulation thickness as shown, with oriented strand board laminated to top surface.
 - 2. Oriented Strand Board: NIST DOC PS 1, Exposure 1, 16 mm (5/8 inch) thick.
 - 3. Bottom surface faced with felt facers.

2.5 INSULATION ACCESSORIES

- A. Glass (Felt): ASTM D2178/D2178M, Type VI, heavy duty ply sheet.
- B. Cants and Tapered Edge Strips:
 - 1. Wood Cant Strips: Refer to Section 06 10 00, ROUGH CARPENTRY.
 - 2. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.
 - 3. Tapered Edge Strips: 1/12 (1 inch per 12 inches), from 0 mm (0 inches), 300 mm to 450 mm (12 inches to 18 inches) wide.
 - a. Cellulosic Fiberboard: ASTM C208.
 - b. Mineral Fiberboard: ASTM C726.
 - c. Perlite Board: ASTM C728.
- C. Vapor Retarder:
 - 1. Glass-Fiber Felts: ASTM D2178/D2178M, Type IV, asphalt impregnated.
 - 2. Self-Adhering Sheet Vapor Retarder: ASTM D1970/D1970M, minimum 1.0 mm (40 mils) thick membrane of HDPE film fully coated with asphalt adhesive, or 0.76 to 1.0 mm (30 to 40 mils) thick membrane of butyl rubber based adhesive backed by a layer of high density cross-laminated polyethylene; maximum permeance rating of 6 ng/Pa/s/sq. m (0.1 perms).
- D. Substrate Board:
 - 1. Gypsum Board: ASTM C1396/C1396M, 16 mm (5/8 inch) thick, Type X.
 - 2. Glass-Mat, Water-Resistant Gypsum Roof Board: ASTM C1177/C1177M, Type X, 16 mm (5/8 inch) thick, factory primed.
 - 3. Cellulosic-Fiber-Reinforced, Water-Resistant Gypsum Roof Board: ASTM C1278/C1278M, 16 mm (5/8 inch) thick.
- E. Cover Board:
 - 1. Glass-Mat, Water-Resistant Gypsum Roof Board: ASTM C1177/C1177M, 16 mm (5/8 inch) thick, factory primed.
 - 2. Cellulosic-Fiber-Reinforced, Water-Resistant Gypsum Roof Board: ASTM C1278/C1278M, // 6 mm (1/4 inch) // 10 mm (3/8 inch) // 13 mm (1/2 inch) // 16 mm (5/8 inch) // thick.
 - 3. Cellulosic-Fiber Insulation Board: ASTM C208, Type II, Grade 2, 13 mm (1/2 inch) thick.

2.6 ACCESSORIES

- A. Fasteners: Corrosion-resistant carbon steel fasteners and galvalume-coated steel or plastic round plates for fastening substrate board and insulation to roof deck.
- B. Nails: ASTM F1667; type to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Comply with requirements of Division 07 roofing section.

3.2 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.

3.3 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions.
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Comply with requirements of UL for insulated steel roof deck.
- C. Attach substrate board and other products to meet requirements of Division 07 roofing section.

3.4 SUBSTRATE BOARD INSTALLATION

- A. Fasten substrate board to top flanges of steel decking to resist uplift pressures according requirements for specified roofing system.
 - 1. Locate the long dimension edge joints solidly bearing on top of decking ribs.

3.5 VAPOR RETARDER INSTALLATION

- A. Vapor Retarder Installation, General:
 - 1. Install continuous vapor retarder on roof decks where indicated.
 - 2. At vertical surfaces, turn up vapor retarder to top of insulation or base flashing.
 - 3. Seal penetrations through vapor retarder with roof cement to prevent moisture entry from below.
- B. Cast in Place Concrete Decks, Except Insulating Concrete:
 - 1. Prime deck as specified.
 - 2. Apply two plies of asphalt saturated felt mopped down to deck.

- C. Precast Concrete Unit Decks Without Concrete Topping:
1. Prime deck as specified.
 2. Apply two plies of asphalt saturated felt.
 3. Mop to deck, keeping bitumen 100 mm (4 inches) away from joints of precast units. Bridge joints with felt. Mop between plies as specified.

3.6 INSULATION INSTALLATION

- A. Insulation Installation, General:
1. Base Sheet: Where required by roofing system, install one lapped base sheet specified in Division 07 roofing section by mechanically fastening to roofing substrate before installation of insulation.
 2. Cant Strips: Install preformed insulation cant strips, or wood cant strips specified in Section 06 10 00 ROUGH CARPENTRY, at junctures of roofing system with vertical construction.
 3. Use same insulation as existing for roof repair and alterations unless specified otherwise.
- B. Insulation Thickness:
1. Thickness of roof insulation shown on drawings is nominal. Provide thickness required to comply with specified thermal performance.
 2. Insulation on Metal Decks: Provide insulation in minimum thickness recommended by insulation manufacturer to span deck flutes. Support edges of insulation on metal deck ribs.
 3. When actual insulation thickness differs from drawings, coordinate alignment and location of roof drains, flashing, gravel stops, fascias and similar items.
 4. Where tapered insulation is used, maintain insulation thickness at high points and roof edges shown on drawings.
 - a. Low Point Thickness: Minimum 38 mm (1-1/2 inches).
 5. Use minimum two layers of insulation when required thickness is 68 mm (2.7 inch) or greater.
- C. Lay insulating units with close joints, in regular courses and with end joints staggered.
1. Stagger joints between layers minimum 150 mm (6 inches).
- D. Lay units with long dimension perpendicular to the rolled (longitudinal) direction of the roofing felt.

- E. Seal cut edges at penetrations and at edges against blocking with bitumen or roof cement.
- F. Cut to fit tightly against blocking or penetrations.
- G. Cover all insulation installed on the same day; comply with temporary protection requirements of Division 07 roofing section.
- H. Installation Method:
 - 1. Mechanically Fastened Insulation:
 - a. Fasten insulation according to requirements in Division 07 roofing section.
 - b. Fasten insulation to resist uplift pressures specified in Division 07 roofing section.

3.7 COVER BOARD INSTALLATION

- A. Install cover boards over insulation with long joints in continuous straight lines with staggered end joints.
- B. Offset cover board joints from insulation joints 150 mm (6 inches), minimum.
- C. Secure cover boards according to "Adhered Insulation" requirements.

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SECTION 07 27 27
FLUID-APPLIED MEMBRANE AIR BARRIERS, VAPOR RETARDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fluid-applied vapor-retarding air barrier at exterior above grade wall assemblies.
2. Connection to adjacent air barrier components providing a durable, continuous, full building air barrier.

1.2 RELATED REQUIREMENTS

- A. General Quality Assurance and Quality Control Requirements: Section 01 45 29 TESTING LABORATORY SERVICES.
- B. General Sustainable Construction Requirements: Section 01 81 13 SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- C. Not Used.
- D. Masonry Unit Air Barrier Substrates: Section 04 20 00 UNIT MASONRY.
- E. Not Used.
- F. Metal Flashing Requiring Air Barrier Transitions: Section 07 60 00 FLASHING AND SHEET METAL.
- G. Joint Sealants: Section 07 92 00 JOINT SEALANTS.
- H. Exterior Wall Openings Requiring Air Barrier Transitions: Division 08 sections for aluminum-framed entrances and storefronts, aluminum windows, louvers and vents.
- I. Wall Sheathings Air Barrier Substrates: Section 09 29 00 GYPSUM BOARD.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. Air Barrier Association of America (ABAA):
 1. Quality Assurance Program.
- C. ASTM International (ASTM):
 1. C920-14a - Elastomeric Joint Sealants.
 2. C1193-13 - Use of Joint Sealants.
 3. D412-06a(2013) - Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 4. E84-15a - Surface Burning Characteristics of Building Materials.
 5. E96/E96M-15 - Water Vapor Transmission of Materials.

6. E162-15a - Surface Flammability of Materials Using a Radiant Heat Energy Source.
 7. E783-02(2010) - Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
 8. E1186-03(2009) - Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.
 9. E2178-13 - Air Permeance of Building Materials.
 10. E2357-11 - Determining Air Leakage of Air Barrier Assemblies.
- D. U.S. Environmental Protection Agency (EPA):
1. 40 CFR 59, Subpart D National Volatile Organic Compound Emission Standards for Consumer and Commercial Products.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
1. Indicate size, configuration, and fabrication and installation details.
- B. Manufacturer's Literature and Data:
1. Description of each product.
 2. Installation instructions.
- C. Sustainable Construction Submittals:
1. Low Pollutant-Emitting Materials:
 - a. Show volatile organic compound types and quantities.
- D. Test reports:
1. Submit field inspection and test reports.
- E. Certificates: Certify each product complies with specifications.
- F. Qualifications: Substantiate qualifications comply with specifications.
1. Manufacturer with project experience list .
 2. Installer with project experience list .
 - a. Certify installer approval by air barrier manufacturer.

1.5 QUALITY ASSURANCE

- A. Coordinate work with adjacent and related work to provide continuous, unbroken, durable air barrier system.
- B. Manufacturer Qualifications:
1. Regularly and presently manufactures specified products.
 2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.

3. Not Used

C. Installer Qualifications:

1. Regularly and presently installs specified products.
2. Approved by manufacturer.
3. Applicators trained and certified by manufacturer of air barrier system.
4. Full time on-site field supervisor has completed three projects of similar scope within last year.
5. Field Supervisor: Holds Sealant, Waterproofing, and Restoration Institute (SWRI) Wall Coating Validation Program Certificate, or similar qualification acceptable to Contracting Officer's Representative.
6. Field supervisor accredited by ABAA as Level 3 Accredited Installer.

D. Testing Agency Qualifications:

1. Accredited by International Accreditation Service, Inc. or American Association for Laboratory Accreditation.
2. Staff experienced in installation of specified system and qualified to perform observation and inspection specified and determine compliance with project requirements.

1.6 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight, conditioned facility.
- B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

- A. Environment:
 1. Work Area Ambient Temperature Range: 4 to 32 degrees C (40 to 90 degrees F) continuously, beginning 48 hours before installation.
- B. Surface Requirements: visibly dry, and complying with manufacturer's instructions.

1.9 WARRANTY

- A. Construction Warranty: Contractor's one year labor and material warranty, FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Air-Barrier Assembly Air Leakage: Maximum 0.2 L/s/sq. m (0.04 cfm/sq. ft.) of surface area at 75 Pa (1.57 psf) differential pressure when tested according to ASTM E2357.
- B. Provide full system of compatible materials under conditions of service and application required. Compatibility based on testing by material manufacturer.
- C. Perform as continuous vapor retarding air barrier and moisture drainage plane.
- D. Transition to adjacent flashings and discharge water to building exterior.
- E. Accommodate substrate movement and seal expansion and control joints, construction material transitions, opening transitions, penetrations, and perimeter conditions without moisture deterioration and air leakage exceeding performance requirements.

2.2 PRODUCTS - GENERAL

- A. Provide air barrier system components from one manufacturer.
- B. Sustainable Construction Requirements:
 - 1. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Non-Flooring Adhesives and Sealants.
 - 2. VOC Content: Maximum 250 g/L per 40 CFR 59, Subpart D (EPA Method 24).

2.3 AIR BARRIER

- A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier:
 - 1. Elastomeric, modified bituminous or synthetic polymer membrane.
 - 2. Air Permeance: ASTM E2178: 0.2 L/s/sq. m (0.04 cfm/sq. ft.) of surface area at 75 Pa (1.57 psf) differential pressure.

3. Vapor Permeance: ASTM E96/E96M: Maximum 5.8 ng/Pa/s/sq. m (0.1 perms).
4. Elongation: Ultimate, ASTM D412, Die C: 500 percent, minimum.
5. Thickness: Minimum 1.0 mm (40 mils) dry film thickness, applied in single continuous coat.
6. Surface Burning Characteristics: When tested according to ASTM E84S.
 - a. Flame Spread Rating: 25 maximum.
 - b. Smoke Developed Rating: 450 maximum.
7. Thickness of Membrane Air Barrier: Not less than 1.0 mm (40 mils) dry film thickness, applied in single continuous coat.

2.4 ACCESSORIES

- A. Primer: Waterborne primer complying with VOC requirements, recommended air barrier manufacturer to suit application.
- B. Counterflashing Sheet: Modified bituminous, minimum 1.0 mm (40 mils) thick, self-adhering composite sheet consisting of minimum 0.8 mm (33 mils) of rubberized asphalt laminated to polyethylene film.
- C. Substrate Patching Material: Manufacturer's standard trowel-grade filler material.
- D. Sprayed Polyurethane Foam Sealant: Foamed-in-place, 24 to 32 kg/cu. m (1.5 to 2.0 pcf) density, with maximum flame-spread index of 25 when tested according to ASTM E84.
- E. Flexible Opening Transition: Cured low-modulus silicone extrusion with reinforcing ribs, sized to fit opening widths, designed for adhesion to or insertion into aluminum framing extrusions, and compatible with air barrier system materials and accessories.
- F. Joint Sealant: ASTM C920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, approved by membrane air barrier manufacturer for adhesion and compatibility with membrane air barrier and accessories.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Correct substrate deficiencies:

1. Remove projections and excess materials and fill voids with substrate patching material.
 2. Remove contaminants capable of affecting subsequently installed product's performance.
- D. Prepare and treat substrate joints and cracks according to ASTM C1193 and membrane air barrier manufacturer's instructions.

3.2 INSTALLATION - AIR BARRIER

- A. Install products according to manufacturer's instructions and approved submittals drawings.
1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Apply primer.
- C. Install transition strips and accessory materials.
- D. Seal air barrier to adjacent components of building air barrier system.
- E. Install flexible opening transition at each opening perimeter. Extend transition onto each substrate minimum 75 mm (3 inches).
1. Fill gaps at perimeter of openings with foam sealant.
- F. At penetrations, seal transition strips around penetrating objects with termination mastic.
1. Fill gaps at perimeter of penetrations with sprayed polyurethane foam sealant.
- G. At top of through-wall flashings, seal with continuous transition strip of manufacturer's recommended material to suit application.
- H. Apply air barrier in full contact with substrate to produce continuous seal with transitions.
- I. Apply fluid membrane in thickness recommended by manufacturer, and minimum specified thickness.
- J. Leave air barrier exposed until tested and inspected and tested by Contracting Officer's Representative.

3.3 FIELD QUALITY CONTROL

- A. Field Inspections and Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.
1. Perform inspections and tests before concealing air barrier with subsequent work.
- B. Inspections:

1. Compatibility of materials within air barrier system and adjacent materials.
 2. Suitability of substrate and support for air barrier.
 3. Suitability of conditions under which air barrier is applied.
 4. Adequacy of substrate priming.
 5. Application and treatment of joints and edges of transition strips, flexible opening transitions, and accessory materials.
 6. Continuity and gap-free installation of air barrier, transition strips, and accessory materials.
- C. Field Tests:
1. Qualitative air-leakage testing according to ASTM E1186.
 2. Quantitative air-leakage testing according to ASTM E783.
- D. Inspection and Test Frequency: Determined by installed air barrier surface area.
1. Up to 900 sq. m (10,000 sq. ft.): One inspection.
 2. 901 - 3,300 sq. m (10,001 - 35,000 sq. ft.): Two inspections.
 3. 3,300 - 7,000 sq. m (35,001 - 75,000 sq. ft.): Three inspections.
 4. 7,001 - 11,600 sq. m (75,001 - 125,000 sq. ft.): Four inspections.
 5. 11,601 - 19,000 sq. m (125,001 - 200,000 sq. ft.): Five inspections.
 6. Over 19,000 sq. m (200,000 sq. ft.): Six inspections.
- E. Submit inspection and test reports to COR within seven calendar days of completing inspection and test.
- F. Defective Work:
1. Correct deficiencies, make necessary repairs, and retest as required to demonstrate compliance with specified requirements.

3.4 CLEANING

- A. Remove masking materials.
- B. Clean spills and overspray using cleaning agents recommended by manufacturers of affected construction.

3.5 PROTECTION

- A. Protect air barrier from construction operations.
- B. Protect air barrier from exposure to UV light exposure exceeding manufacturer's recommendation.
- C. Replace overexposed materials and retest.

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SECTION 07 31 26
SLATE SHINGLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Slate shingles over underlayment nailed to roof sheathing.
2. This section also relates to the careful removal, salvaging and reuse / reinstallation of slate shingles where the following work is indicated:
 - a. Replacement of existing step / counter flashing at existing slate shingle roof.
 - b. Removal of existing dormer and reconstruction of connector / passageway roof in this area

1.2 RELATED REQUIREMENTS

- A. Demolition: Section 02 41 00, DEMOLITION
- B. Counterflashing and Flashing of Roof Projections: Section 07 60 00, FLASHING AND SHEET METAL.
- C. Roof Hatches (Scuttles) and Roof Vents: Section 07 71 00, ROOF SPECIALTIES.
- D. Slate Color: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 1. C406/C406M-15 - Roofing Slate.
 2. D226/D226M-09 - Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
 3. D1970/D1970M-15a - Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 4. D4586/D4586M-07(2012)e1 - Asphalt Roof Cement, Asbestos-Free.
 5. F1667-15 - Driven Fasteners: Nails, Spikes, and Staples.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.
 1. Required Participants:
 - a. Contracting Officer's Representative.

- b. Contractor.
 - c. Installer.
 - d. Other installers responsible for adjacent and intersecting work, including flashing and sheet metal .
2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
- a. Installation schedule.
 - b. Installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.
 - e. Installation.
 - f. Terminations.
 - g. Transitions and connections to other work.
 - h. Other items affecting successful completion.
3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Installation instructions.
- C. Samples:
 - 1. Shingles: Full sized, each type and color. Submit quantity required to show full color and texture range.
- D. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Installer with project experience list .

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Regularly installs specified products.
 - 2. Installed specified products with satisfactory service on five similar installations.
 - a. Project Experience List: Provide contact names and addresses for completed projects.

1.7 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

- A. Protect products from damage during handling and construction operations.

1.9 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide each product from one manufacturer.

2.2 SLATE SHINGLES

- A. Slate Shingles: ASTM C406/C406M, Grade S1, unfading color, with no ribbons.
 - 1. Nail Holes: 2 per shingle, pre-punched or predrilled.
 - 2. Reuse existing slate shingles removed by demolition, or provide new slate shingles to match existing slate in color, size, exposure and texture.
 - 3. Head Lap: 75 mm (3 inches) minimum.

2.3 ROOFING NAILS

- A. Roofing Nails:
 - 1. Nails for Slate Shingles: ASTM F1667, Type 1, Style 23 copper slating nails, 25 mm (1 inch) longer than thickness of slate.
 - 2. Nails for Felt: ASTM F1667, Type I, Style 20, galvanized steel, smooth shanks.

2.4 ROOFING UNDERLAYMENT

- A. Organic Felt: ASTM D226/D226M, Type II, No. 30.
- B. Self-Adhering Modified Bituminous Underlayment: ASTM D1970/D1970M.

2.5 METAL FLASHING

- A. Provide metal roof flashings, including apron flashings, step flashings, valley flashings, drip edges, and vent pipe flashings specified in Section 07 60 00, FLASHING AND SHEET METAL.
 - 1. Metal: Copper.
 - a. Valleys: 1 mm (20 oz., 0.039 inches).
 - b. Other Locations: 0.55 mm (16 oz., 0.022 inches).

2.6 RIDGE VENTS

- A. Ridge Vents: Manufacturer's standard ridge vent intended for long-term use under slate shingles.
 - 1. Provide ridge vents with internal filters, internal baffles, or external baffles, for weather protection.
 - 2. Free Area: Minimum 25400 square mm net free area per meter length (12 square inches per foot).

2.7 SNOW GUARDS

- A. Snow Guards: Individual copper snow guards, designed not to penetrate slate shingles.

2.8 ACCESSORIES

- A. Asphalt Roof Cement: ASTM D4586/D4586M.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for roofing installation.
 - 1. Verify roof substrates are sound, within manufacturer's tolerances, and free from defects which would interfere with roofing installation.
 - 2. Verify roof accessories, vent pipes and other projections through roof are in place and roof flashing is installed, or ready for installation, before installing shingles.
- B. Protect existing construction and completed work from damage.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions.
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 METAL DRIP EDGE INSTALLATION

- A. At eaves and rakes, install copper drip edges specified in Section 07 60 00, FLASHING AND SHEET METAL.
 - 1. Eaves: Install metal drip edge before underlayment.
 - 2. Rakes: Install metal drip edge after underlayment.
- B. Secure metal drip edges with compatible nails spaced minimum 250 mm (10 inches) on center along inner edges.

3.4 FLASHING INSTALLATION

- A. Install copper flashings at intersections of roofs, adjoining walls, roof slope changes, under ridges, hips, and valleys, and at projections through deck such as chimneys and vent stacks. Install metal flashings to comply with requirements in Section 07 60 00, FLASHING AND SHEET METAL.
- B. Install step flashing at intersections with vertical surfaces.
 - 1. Length: Length of shingle plus 50 mm (2 inches).
 - 2. Vertical Leg Height: 200 mm (8 inches) minimum.
 - 3. Horizontal Leg Width: 150 mm (6 inches) minimum.
- C. Valley Flashing: Shingle type, as shown and as specified in Section 07 60 00, FLASHING AND SHEET METAL.
 - 1. Secure valley flashing according to shingle manufacturer's instructions.
 - 2. Width: 300 mm (12 inches) minimum, both sides of valley.
- D. Hip and Ridge Flashing: Step flashing.
 - 1. Length: Length of shingle plus 50 mm (2 inches).
 - 2. Width: 13 mm (1/2 inch) less than shingle on both sides of hip or ridge.
 - 3. Install step flashing as each course of slate shingles is installed. Extend upper edge of flashing 50 mm (2 inches) minimum above each course of shingles. Extend lower edge 13 mm (1/2 inch) above butt of shingle forming next course.

3.5 UNDERLAYMENT INSTALLATION

- A. Install self-adhering sheet underlayment, working from low point to high point. Lap sides 90 mm (3-1/2 inches) minimum, and lap ends 150 mm (6 inches) minimum. Install at the following locations:
 - 1. Eaves and Rakes: From edge of eave and rake to 600 mm (24 inches) minimum beyond inside face of exterior wall.

- a. Lap underlayment over eave metal drip edge.
 2. Valleys, Hips and Roof Slope Transitions: Centered over change in slope, and extended 450 mm (18 inches) minimum on both sides.
 3. Ridges: Centered on ridge, and extended 900 mm (36 inches) minimum on both sides. Do not cover ridge vent opening.
 4. Sidewalls and Projections through Roof: Extended 450 mm (18 inches) from projection, and extended up projection 100 mm (4 inches) minimum.
 5. Roll underlayment to ensure adhesion to roof deck and metal flashings.
- B. Install two layers organic felt underlayment, shingled, on roof deck not covered by self-adhering sheet underlayment, with 100 mm (4 inches) minimum end laps, 50 mm (2 inches) minimum head laps, and 300 mm (12 inches) minimum ridge laps. Nail felt 125 mm (5 inches) on centers along laps.

3.6 ROOF ACCESSORY INSTALLATION

- A. Install roof hatches (scuttles), and roof vents, / specified in Section 07 71 00, ROOF SPECIALTIES before installing shingles.
- B. Lap underlayment and slate shingles over upslope base flanges of roof accessory flashings.
- C. Install underlayment and slate shingles over sideslope base flanges of roof accessory flashings.
- D. Install downslope base flanges of roof accessories over slate shingles.

3.7 SLATE SHINGLE INSTALLATION

- A. Install starter course of roof shingles with 50 mm (2 inch) overhang at eaves. Install first course over starter course.
- B. At rake, overhang roof edge 25 mm (1 inch).
- C. Install shingles with specified head lap.
- D. Fasten shingles using two nails per shingle, concealed by head lap.
- E. Valleys: to match existing .

3.8 RIDGE VENT INSTALLATION

- A. Construct ridge vents. Fasten with roofing nails to penetrate through roof sheathing.
 1. Extent: Continuous along ridges extending to within <distance> of rakes.

3.9 HIP AND RIDGE SHINGLE INSTALLATION

- A. Fasten nailing strips to both sides of hip and ridge.
- B. Install step flashing at hips and ridges.
 - 1. Begin ridge shingle installation at leeward end of ridge. Cover ridge vents with step flashing and shingles. Do not cover ridge vent openings with ridge shingles.
 - 2. Begin hip shingle installation at eave.
- C. Install hip and ridge shingles in pairs, over step flashing. Butt shingles together, nail in place, then install the next course of flashing.
- D. Seal ridge joint with asphalt roof cement.

3.10 NOT USED

3.11 PROTECTION

- A. Protect slate shingles from construction operations.
- B. Repair damage.

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SECTION 07 53 23
ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ethylene Propylene Diene Monomer (EPDM) sheet roofing adhered to insulated concrete or metal roof deck.
2. Fire rated roof system.

1.2 RELATED REQUIREMENTS

- A. Non-Flooring Adhesives and Sealants VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Preparation of Existing Membrane Roofs and Repair Areas: Section 07 01 50.19, PREPARATION FOR REROOFING.
- C. Substrate Board, Vapor Retarder, Roof Insulation, and Cover Board: Section 07 22 00, ROOF AND DECK INSULATION.
- D. Roof Membrane Color: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):
 1. FX-1-01(R2006) - Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
 2. RP-4 2013 - Wind Design Standard for Ballasted Single-ply Roofing Systems.
- C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):
 1. 7-10 - Minimum Design Loads For Buildings and Other Structures.
- D. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):
 1. 90.1-13 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- E. ASTM International (ASTM):
 1. A276/A276M-15 - Stainless Steel Bars and Shapes.
 2. B209-14 - Aluminum and Aluminum-Alloy Sheet and Plate.
 3. B209M-14 - Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

4. C67-14 - Sampling and Testing Brick and Structural Clay Tile.
 5. C140/C140M-15 - Sampling and Testing Concrete Masonry Units and Related Units.
 6. C936/C936M-15 - Solid Concrete Interlocking Paving Units.
 7. C1371-15 - Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
 8. C1549-09(2014) - Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
 9. D751-06(2011) - Coated Fabrics.
 10. D1248-12 - Polyethylene Plastics Extrusion Materials for Wire and Cable.
 11. D1876-08(2015)e1 - Peel Resistance of Adhesives (T-Peel Test).
 12. D2103-15 - Polyethylene Film and Sheeting.
 13. D2240-05(2010) - Rubber Property-Durometer Hardness.
 14. D3884-09(2013)e1 - Abrasion Resistance of Textile Fabrics (Rotary Platform, Double-Head Method).
 15. D4263-83(2012) - Indicating Moisture in Concrete by the Plastic Sheet Method.
 16. D4586/D4586M-07(2012)e1 - Asphalt Roof Cement, Asbestos-Free.
 17. D4637/D4637M-14e1 - EPDM Sheet Used In Single-Ply Roof Membrane.
 18. E96/E96M-15 - Water Vapor Transmission of Materials.
 19. E408-99(2015) - Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
 20. E1918-06(2015) - Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
 21. E1980-11 - Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
 22. G21-15 - Resistance of Synthetic Polymeric Materials to Fungi.
- F. Cool Roof Rating Council (CRRC):
1. 1-15 - Product Rating Program.
- G. Federal Specifications (Fed. Spec.):
1. UU-B-790A - Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent and Fire Resistant).
- H. Florida Department of Business and Professional Regulation (FL):
1. Approved - Product Approval.
- I. National Roofing Contractors Association (NRCA):

1. Manual-15 - The NRCA Roofing Manual: Membrane Roof Systems.
- J. U.S. Department of Agriculture (USDA): USDA BioPreferred Catalog.
- K. UL LLC (UL):
 1. 580-06 - Tests for Uplift Resistance of Roof Assemblies.
 2. 1897-15 - Uplift Tests for Roof Covering Systems.
- L. U.S. Department of Commerce National Institute of Standards and Technology (NIST):
 1. DOC PS 1-09 - Structural Plywood.
 2. DOC PS 2-04 - Performance Standard for Wood-Based Structural-Use Panels.
- M. U.S. Environmental Protection Agency (EPA):
 1. Energy Star - ENERGY STAR Program Requirements for Roof Products Version 3.0.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting at the Project site minimum 30 days before beginning Work of this section.
 1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Contractor.
 - c. Installer.
 - d. Other installers responsible for adjacent and intersecting work, including roof deck, flashings, roof specialties, roof accessories, utility penetrations, rooftop curbs and equipment, lightning protection.
 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Installation schedule.
 - b. Installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.
 - e. Installation.
 - f. Terminations.
 - g. Transitions and connections to other work.
 - h. Inspecting and testing.
 - i. Other items affecting successful completion.
 - j. Pull out test of fasteners.

- k. Material storage, including roof deck load limitations.
- 3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Roofing membrane layout.
 - 2. Roofing membrane seaming and joint details.
 - 3. Roof membrane penetration details.
 - 4. Base flashing and termination details.
 - 5. Paver anchoring locations and details.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Minimum fastener pull out resistance.
 - 3. Installation instructions.
 - 4. Warranty.
 - 5. Product Data for Federally-Mandated Bio-Based Materials: For roof materials, indicating USDA designation and compliance with definitions for bio-based products, Rapidly Renewable Materials, and certified sustainable wood content.
- D. Sustainable Construction Submittals:
 - 1. Solar Reflectance Index (SRI) for roofing membrane.
 - 2. Low Pollutant-Emitting Materials:
 - a. Show volatile organic compound types and quantities.
 - 3. Energy Star label for roofing membrane.
- E. Samples:
 - 1. Roofing Membrane: 150 mm (6 inch) square.
 - 2. Base Flashing: 150 mm (6 inch) square.
 - 3. Fasteners: Each type.
 - 4. Roofing Membrane Seam: 300 mm (12 inches) square.
- F. Certificates: Certify products comply with specifications.
 - 1. Fire and windstorm classification.
 - 2. Energy performance requirements.
- G. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Installer, including supervisors with project experience list .

2. Manufacturer's field representative with project experience list .
- H. Field quality control reports.
- I. Temporary protection plan. Include list of proposed temporary materials.
- J. Operation and Maintenance Data:
 1. Maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 1. Approved by roofing system manufacturer as installer for roofing system with specified warranty.
 2. Regularly installs specified products.
 3. Installed specified products with satisfactory service on five similar installations for minimum five years.
 - a. Project Experience List: Provide contact names and addresses for completed projects.
 4. Employs full-time supervisors experienced installing specified system and able to communicate with Contracting Officer's Representative and installer's personnel.
- B. Manufacturer's Field Representative:
 1. Manufacturer's full-time technical employee or independent roofing inspector.
 2. Individual certified by Roof Consultants Institute as Registered Roof Observer.

1.7 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

- A. Comply with NRCA Manual storage and handling requirements.
- B. Store products indoors in dry, weathertight facility.
- C. Store adhesives according to manufacturer's instructions.
- D. Protect products from damage during handling and construction operations.

- E. Products stored on the roof deck must not cause permanent deck deflection.

1.9 FIELD CONDITIONS

- A. Environment:
 - 1. Product Temperature: Minimum 4 degrees C (40 degrees F) and rising before installation.
 - 2. Weather Limitations: Install roofing only during dry current and forecasted weather conditions.

1.10 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction", except extend the warranty period to ten years.
- B. Manufacturer's Warranty: Warrant roofing system against material and manufacturing defects and agree to repair any leak caused by a defect in the roofing system materials or workmanship of the installer.
 - 1. Warranty Period: 10 years.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Roofing System: Adhered roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards vapor retarders and walkway pads .

2.2 SYSTEM PERFORMANCE

- A. Design roofing system meeting specified performance:
 - 1. Load Resistance: ASCE/SEI 7; Design criteria as indicated on Drawings.
 - 2. Wind Uplift Forces: Resist the following forces per FM Approvals 1-49:
 - a. Wind Zone 1: 1.00 to 1.44 kPa (21 to 30 lbf/sq. ft.): 2.87-kPa (60-lbf/sq. ft.) perimeter uplift force, 4.31-kPa (90-lbf/sq. ft.) corner uplift force, and 1.44-kPa (30-lbf/sq. ft.) outward force.
 - 3. Energy Performance:
 - a. EPA Energy Star Listed for low-slope roof products.
 - b. ASTM E1980; Minimum 78 Solar Reflectance Index (SRI).

- c. Three-Year Aged Performance: Minimum 0.55 solar reflectance tested in according to ASTM C1549 or ASTM E1918, and minimum 0.75 thermal emittance tested in according to ASTM C1371 or ASTM E408.

Where tested aged values are not available:

Calculate compliance adjusting initial solar reflectance according to ASHRAE 90.1.

Provide roofing system with minimum 64 three-year aged Solar Reflectance Index calculated according to ASTM E1980 with 12 W/sq. m/degree K (2.1 BTU/h/sq. ft.) convection coefficient.

2.3 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide roof system components from one manufacturer.
- C. Sustainable Construction Requirements:

- 1. Bio-Based Materials: Where applicable, provide products designated by USDA and meeting or exceeding USDA recommendations for bio-based content, and products meeting Rapidly Renewable Materials and certified sustainable wood content definitions; refer to www.biopreferred.gov.
- 2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Non-flooring adhesives and sealants.

2.4 EPDM ROOFING MEMBRANE

- A. EPDM Sheet: ASTM D4637/D4637M, Type II - internally reinforced, black color .
 - 1. Thickness: 2.54 mm (100 mils) .
 - 2. Color: See Section 09 06 00, SCHEDULE OF FINISHES.
- B. Additional Properties:

PROPERTY	TEST METHOD	REQUIREMENT
Shore A Hardness	ASTM D2240	55 to 75 Durometer

Water Vapor Permeance	ASTM E96/E96M	Minimum 8 ng/Pa/s/sq. m (0.14 perms) Water Method
Fungi Resistance	ASTM G21	After 21 days, no sustained growth or discoloration.

1. Use fire retardant membrane when not protected by ballast or pavers. Verify for UL or approval.

2.5 MEMBRANE ACCESSORY MATERIALS

- A. Sheet roofing manufacturer's specified products.
- B. Flashing Sheet: Manufacturer's standard; same material, and color as roofing membrane.
 1. Self-curing EPDM flashing adaptable to irregular shapes and surfaces.
 2. Minimum Thickness: 1.5 mm (0.060 inch).
- C. Factory Formed Flashings: Inside and outside corners, pipe boots, and other special flashing shapes to minimize field fabrication.
- D. Splice Adhesive or Tape: Manufacturer's standard for roofing membrane and flashing sheet.
- E. Splice Lap Sealant: Liquid EPDM rubber for exposed lap edge.
- F. Bonding Adhesive: Manufacturer's standard, water or solvent based, to suit substrates.
- G. Termination Bars: Manufacturer's standard, stainless steel or aluminum, 25 mm wide by 3 mm thick (1 inch wide by 1/8 inch thick) factory drilled for fasteners.
- H. Battens: Manufacturer's standard, galvanized or galvanized steel, 25 mm wide by 1.3 mm thick (1 inch wide by 0.05 inch thick), factory punched for fasteners.
- I. Pipe Compression Clamp:
 1. Stainless steel drawband.
 2. Worm drive clamp device.
- J. Fasteners: Manufacturer's standard coated steel with metal or plastic plates, to suit application.
- K. Fastener Sealer: One part elastomeric adhesive sealant.

- L. Temporary Closure Sealers (Night Sealant): Polyurethane two part sealer.
- M. Primers, Splice Tapes, Cleaners, and Butyl Rubber Seals: As specified by roof membrane manufacturer.
- N. Asphalt Roof Cement: ASTM D4586/D4586M.

2.6 FASTENERS

- A. Fasteners and washers required for securing pavers together with straps and to walls or other anchorage:
 - 1. Straps for Securing Pavers Together:
 - a. Stainless Steel: ASTM A276/A276M, Type 302 or 304, minimum 0.46 mm (0.018 inch) thick.
 - b. Aluminum Strap: ASTM B209/B209M, minimum 2.39 mm (0.094 inch) thick.
 - c. Round corners on straps.
 - d. Form straps 38 mm (1-1/2 inches) wide, 3 m (10 feet) maximum length with 6 by 10 mm (1/4 by 3/8 inch) punched slotted holes at 100 mm (4 inch) centers centered on width of strap. Punch hole size 2 mm (1/16 inch) larger than fastener shank when shank is thicker than 5 mm (3/16 inch).

2.7 SEPARATION SHEET

- A. Polyethylene Film: ASTM D2103, 0.2 mm (6 mils) thick.
- B. Building Paper: Fed. Spec. UU-B-790.
 - 1. Water Vapor Resistance: Type I, Grade A, Style 4, reinforced.
 - 2. Water Vapor Permeable: Type I, Grade D, Style 4, reinforced.

2.8 FLEXIBLE TUBING

- A. Closed cell neoprene, butyl polyethylene, vinyl, or polyethylene tube or rod.
- B. Diameter approximately 1-1/2 times joint width.

2.9 WALKWAY PADS

- A. Manufacturer's standard, slip resistant, approximately 450 mm by 450 mm (30 by 30 inches) square and 5 mm (3/16 inch) thick with rounded corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine and verify substrate suitability for product installation with roofing installer and roofing inspector present.
 - 1. Verify roof penetrations are complete, secured against movement, and firestopped .
 - 2. Verify roof deck is adequately secured to resist wind uplift.
 - 3. Verify roof deck is clean, dry, and in-plane ready to receive roofing system.
- B. Correct unsatisfactory conditions before beginning roofing work.

3.2 PREPARATION

- A. Complete roof deck construction before beginning roofing work:
 - 1. Curbs, blocking, edge strips, and other components to which roofing and base flashing is attached in place ready to receive insulation and roofing.
 - 2. Coordinate roofing membrane installation with flashing work and roof insulation work so insulation and flashing are installed concurrently to permit continuous roofing operations.
 - 3. Complete installation of flashing, insulation, and roofing in same day except for the area where temporary protection is required when work is stopped for inclement weather or end of work day.
- B. Dry out surfaces including roof deck flutes, that become wet from any cause during progress of the work before roofing work is resumed. Apply materials to dry substrates, only.
- C. Broom clean roof decks. Remove dust, dirt and debris.
- D. Remove projections capable of damaging roofing materials.
- E. Concrete Decks, except Insulating Concrete:
 - 1. Test concrete decks for moisture according to ASTM D4263 before installing roofing materials.
 - 2. Prime concrete decks. Keep primer back 100 mm (four inches) from precast concrete deck joints.
 - 3. Allow primer to dry before application of bitumen.
- F. Insulating Concrete Decks:
 - 1. Allow deck to dry out minimum five days after installation before installing roofing materials.

2. Allow additional drying time when precipitation occurs before installing roofing materials.

G. Existing Membrane Roofs and Repair Areas:

1. Comply with Section 07 01 50.19 PREPARATION FOR REROOFING.

3.3 TEMPORARY PROTECTION

A. Install temporary protection consisting of a temporary seal and water cut-offs at the end of each day's work and when work is halted for an indefinite period or work is stopped when precipitation is imminent.

B. Install temporary cap flashing over top of base flashings where permanent flashings are not in place to protect against water intrusion into roofing system. Securely anchor in place to prevent blow off and damage by construction activities.

C. Temporarily seal exposed insulation surfaces within roofing membrane.

1. Apply temporary seal and water cut off by extending roofing membrane beyond insulation and securely embedding edge of the roofing membrane in 6 mm (1/4 inch) thick by 50 mm (2 inches) wide strip of temporary closure sealant. Weight roofing membrane edge with sandbags, to prevent displacement; space sandbags maximum 2400 mm (8 feet) on center.

2. Direct water away from work. Provide drainage, preventing water accumulation.

3. Check daily to ensure temporary seal remains watertight. Reseal open areas and weight down.

D. Before the work resumes, cut off and discard portions of roof membrane in contact with temporary seal.

1. Cut minimum 150 mm (6 inches) back from sealed edges and surfaces.

E. Remove sandbags and store for reuse.

3.4 INSTALLATION, GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings .

1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Comply with NRCA Manual installation requirements.

C. Comply with UL 580 for uplift resistance.

- D. Do not allow membrane and flashing to contact surfaces contaminated with asphalt, coal tar, oil, grease, or other substances incompatible with EPDM.

3.5 ROOFING INSTALLATION

- A. Install membrane perpendicular to long dimension of insulation boards.
- B. Begin membrane installation at roof low point and work towards high point. Lap membrane shingled in water flow direction.
- C. Position membrane free of buckles and wrinkles.
- D. Roll membrane out; inspect for defects as membrane is unrolled. Remove defective areas:
 - 1. Allow 30 minutes for membrane to relax before proceeding.
 - 2. Lap edges and ends minimum 75 mm (3 inches). Clean lap surfaces.
 - 3. Install seam adhesive or tape, unless furnished with factory applied adhesive strips. Apply pressure to develop full adhesion.
 - 4. Check seams to ensure continuous adhesion and correct defects.
 - 5. Finish seam edges with beveled bead of lap sealant.
 - 6. Finish seams same day as membrane is installed.
 - 7. Anchor membrane perimeter to roof deck and parapet wall as indicated on drawings.
- E. Membrane Perimeter Anchorage:
 - 1. Install batten with fasteners at perimeter of each roof area, curb flashing, expansion joints and similar penetrations on top of roof membrane as indicated on drawings.
 - 2. Mechanical Fastening:
 - a. Space fasteners maximum 300 mm (12 inches) on center, starting 25 mm (1 inch) from ends.
 - b. When battens are cut, round edge and corners before installing.
 - c. Set fasteners in lap sealant and cover fastener head with fastener sealer, including batten.
 - d. Stop batten where batten interferes with drainage. Space ends of batten 150 mm (6 inch) apart.
 - e. Cover batten with 225 mm (9 inch) wide strip of flashing sheet. Seal laps with lap seam adhesive and finish edges with lap sealant.
 - f. At fascia-cants turn roofing membrane down over front edge of blocking, cant, or nailer. Secure roofing membrane to vertical

portion of nailer; with fasteners spaced maximum 150 mm
(6 inches) on centers.

- g. At parapet walls intersecting building walls and curbs, secure roofing membrane to structural deck with fasteners 150 mm (6 inches) on center or as shown in NRCA Manual.

F. Adhered System Installation:

1. Apply bonding adhesive in quantities required by roofing membrane manufacturer.
2. Fold sheet back on itself, clean and coat the bottom side of the membrane and the top of substrate with adhesive. Do not coat the lap joint area.
3. After adhesive has set according to adhesive manufacturer's instructions, roll roofing membrane into adhesive minimizing voids and wrinkles.
4. Repeat for other half of sheet.
5. Cut voids and wrinkles to lay flat. Clean and patch cut area.

3.6 FLASHING INSTALLATION

- A. Install flashings on same day as roofing membrane is installed. When flashing cannot be completely installed in one day, complete installation until flashing is watertight and provide temporary covers or seals.
- B. Flashing Roof Drains:
 1. Install roof drain flashing according to roofing membrane manufacturer's instructions.
 - a. Coordinate to set the metal drain flashing in asphalt roof cement, holding cement back from the edge of the metal flange.
 - b. Do not allow roof cement to contact EPDM roofing membrane.
 - c. Adhere roofing membrane to metal flashing with bonding adhesive.
 2. Turn metal drain flashing and roofing membrane down into drain body. Install clamping ring and strainer.
- C. Installing Base Flashing and Pipe Flashing:
 1. Install flashing sheet to pipes, walls and curbs to minimum 200 mm (8 inches) height above roof surfaces and extend roofing manufacturer's standard lap dimension onto roofing membranes.
 - a. Adhere flashing with bonding adhesive.

- b. Form inside and outside corners of flashing sheet according to NRCA Manual. Form pipe flashing according to NRCA Manual.
 - c. Lap ends roofing manufacturer's standard dimension.
 - d. Adhesively splice flashing sheets together, and adhesively splice flashing sheets to roofing membranes. Finish exposed edges with lap sealant.
2. Anchor top of flashing to walls and curbs with fasteners spaced maximum 150 mm (6 inches) on center. Use surface mounted fastening strip with sealant on ducts. Use pipe clamps on pipes or other round penetrations.
3. Apply sealant to top edge of flashing.
- D. Repairs to Membrane and Flashings:
- 1. Remove sections of roofing membrane or flashing sheet that are creased, wrinkled, or fishmouthed.
 - 2. Cover removed areas, cuts and damaged areas with patch extending 100 mm (4 inches) beyond damaged, cut, or removed area. Adhesively splice patch to roofing membrane or flashing sheet. Finish edge of lap with lap sealant.

3.7 WALKWAY PAD INSTALLATION

- A. Clean membrane where pads are applied.
- B. Adhere pads to membrane with splicing cement.
- C. Layout with minimum 25 mm (1 inch) and maximum 50 mm (2 inch) space between pads.

3.8 FIELD QUALITY CONTROL

- A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.
 - 1. Fastener Pull Out Tests: ANSI/SPRI FX-1; one test for every 230 sq. m (2,500 sq. ft.) of deck. Perform tests for each combination of fastener type and roof deck type before installing roof insulation.
 - a. Test at locations selected by Contracting Officer's Representative.
 - b. Do not proceed with roofing work when pull out resistance is less than manufacturer's required resistance.
 - c. Test Results:

Repeat tests using different fastener type or use additional fasteners achieve pull out resistance required to meet specified wind uplift performance.

Patch cementitious deck to repair areas of fastener tests holes.

2. Examine and probe roofing membrane and flashing seams in presence of Contracting Officer's Representative and Manufacturer's field representative.
 3. Probe seams to detect marginal bonds, voids, skips, and fishmouths.
 4. Cut 100 mm (4 inch) wide by 300 mm (12 inch) long samples through seams where directed by Contracting Officer's Representative.
 5. Cut one sample for every 450 m (1500 feet) of seams.
 6. Cut samples perpendicular to seams.
 7. Failure of samples to pass ASTM D1876 test will be cause for rejection of work.
 8. Repair areas where samples are taken and where marginal bond, voids, and skips occur.
 9. Repair fishmouths and wrinkles by cutting to lay flat. Install patch over cut area extending 100 mm (4 inches) beyond cut.
- B. Manufacturer Services:
1. Inspect initial installation, installation in progress, and completed work.
 2. Issue supplemental installation instructions necessitated by field conditions.
 3. Prepare and submit inspection reports.
 4. Certify completed installation complies with manufacturer's instructions and warranty requirements.

3.9 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Clean exposed roofing surfaces. Remove contaminants and stains to comply with specified solar reflectance performance .

3.10 PROTECTION

- A. Protect roofing system from traffic and construction operations.
 1. Protect roofing system when used for subsequent work platform, materials storage, or staging.
 2. Distribute scaffolding loads to exert maximum 50 percent roofing system materials compressive strength.

- B. Loose lay temporary insulation board overlaid with plywood or OSB.
 - 1. Weight boards to secure against wind uplift.
- C. Remove protection when no longer required when directed by Contacting Officer's Representative .
- D. Repair damage.

- - E N D - -

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**SECTION 07 60 00
FLASHING AND SHEET METAL**

PART 1 - GENERAL

1.1 DESCRIPTION

Formed sheet metal work for wall and roof flashing, copings, roof edge metal, fasciae, drainage specialties, and formed expansion joint covers are specified in this section.

1.2 RELATED WORK

- A. Manufactured flashing, copings, roof edge metal, and fasciae: Section 07 71 00 ROOF SPECIALTIES.
- B. Membrane base flashings and stripping: Section 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING.
- C. Flashing components of factory finished roofing and wall systems: Division 07 roofing and wall system sections.
- D. Joint Sealants: Section 07 92 00, JOINT SEALANTS.
- E. Color of factory coated exterior architectural metal and anodized aluminum items: Section 09 06 00, SCHEDULE FOR FINISHES.
- F. Integral flashing components of manufactured roof specialties and accessories or equipment: Section 07 71 00, ROOF SPECIALTIES, Section 07 72 00, ROOF ACCESSORIES, Division 22, PLUMBING sections and Division 23 HVAC sections.
- G. Paint materials and application: Section 09 91 00, PAINTING.
- I. Flashing of Roof Drains: Section 22 14 00, FACILITY STORM DRAINAGE .

1.3 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
- B. Aluminum Association (AA):
 - AA-C22A41Aluminum Chemically etched medium matte, with clear anodic coating, Class I Architectural, 0.7-mil thick
 - AA-C22A42Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 0.7 mils thick

- AA-C22A44Chemically etched medium matte with
electrolytically deposited metallic compound,
integrally colored coating Class I
Architectural, 0.7-mil thick finish
- C. American National Standards Institute/Single-Ply Roofing
Institute/Factory Mutual (ANSI/SPRI/FM):
4435/ES-1-11Wind Design Standard for Edge Systems Used with
Low Slope Roofing Systems
- D. American Architectural Manufacturers Association (AAMA):
AAMA 620-02Voluntary Specification for High Performance
Organic Coatings on Coil Coated Architectural
Aluminum
AAMA 621-02Voluntary Specification for High Performance
Organic Coatings on Coil Coated Architectural
Hot Dipped Galvanized (HDG) and Zinc-Aluminum
Coated Steel Substrates
- E. ASTM International (ASTM):
A240/A240M-15Standard Specification for Chromium and
Chromium-Nickel Stainless Steel Plate, Sheet
and Strip for Pressure Vessels and for General
Applications.
A653/A653M-15Steel Sheet Zinc-Coated (Galvanized) or Zinc
Alloy Coated (Galvanized) by the Hot- Dip
Process
B32-14Solder Metal
B209-14Aluminum and Aluminum-Alloy Sheet and Plate
B370-12Copper Sheet and Strip for Building
Construction
D173-03 (R2011)Bitumen-Saturated Cotton Fabrics Used in
Roofing and Waterproofing
D412-15Vulcanized Rubber and Thermoplastic Elastomers-
Tension
D1187-97 (R2011)Asphalt Base Emulsions for Use as Protective
Coatings for Metal
D1784-11Rigid Poly (Vinyl Chloride) (PVC) Compounds and
Chlorinated Poly (Vinyl Chloride) (CPVC)
Compounds

- D3656-13Insect Screening and Louver Cloth Woven from
Vinyl-Coated Glass Yarns
- D4586-12Asphalt Roof Cement, Asbestos Free
- F. Sheet Metal and Air Conditioning Contractors National Association
(SMACNA): Architectural Sheet Metal Manual.
- G. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06Metal Finishes Manual
- H. Federal Specification (Fed. Spec):
A-A-1925AShield, Expansion; (Nail Anchors)
UU-B-790ABuilding Paper, Vegetable Fiber
- I. International Code Commission (ICC): International Building Code,
Current Edition

1.4 PERFORMANCE REQUIREMENTS

- A. Wind Uplift Forces: Resist the following forces per FM Approvals 1-49:
1. Not Used
 2. Wind Zone 1: 1.00 to 1.44 kPa (21 to 30 lbf/sq. ft.): 2.87-kPa
(60-lbf/sq. ft.) perimeter uplift force, 4.31-kPa (90-lbf/sq. ft.)
corner uplift force, and 1.44-kPa (30-lbf/sq. ft.) outward force.
 3. Not Used
 4. Not Used
- B. Wind Design Standard: Fabricate and install copings roof-edge
flashings tested per ANSI/SPRI/FM ES-1 to resist above indicated
design pressure or as indicated on Drawings.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT
DATA, AND SAMPLES.
- B. Shop Drawings: For all specified items, including:
1. Flashings
 2. Copings
 3. Gravel Stop-Fascia
 4. Gutter and Conductors
 5. Not Used
 6. Fascia-cant
- C. Manufacturer's Literature and Data: For all specified items, including:

1. Two-piece counterflashing
 2. Thru wall flashing
 3. Not Used
 4. Nonreinforced, elastomeric sheeting
 5. Copper clad stainless steel
 6. Polyethylene coated copper
 7. Bituminous coated copper
 8. Copper covered paper
- D. Certificates: Indicating compliance with specified finishing requirements, from applicator and contractor.

PART 2 - PRODUCTS

2.1 FLASHING AND SHEET METAL MATERIALS

- A. Stainless Steel: ASTM A240, Type 302B, dead soft temper.
- B. Copper ASTM B370, cold-rolled temper.
- C. Bituminous Coated Copper: Minimum copper ASTM B370, weight not less than 1 kg/m² (3 oz/sf). Bituminous coating shall weigh not less than 2 kg/m² (6 oz/sf); or, copper sheets may be bonded between two layers of coarsely woven bitumen-saturated cotton fabric ASTM D173. Exposed fabric surface shall be crimped.
- D. Copper Covered Paper: Fabricated of electro-deposit pure copper sheets ASTM B 370, bonded with special asphalt compound to both sides of creped, reinforced building paper, UU-B-790, Type I, style 5, or to a three ply sheet of asphalt impregnated creped paper. Grooves running along the width of sheet.
- E. Polyethylene Coated Copper: Copper sheet ASTM B370, weighing 1 Kg/m² (3 oz/sf) bonded between two layers of (two mil) thick polyethylene sheet.
- F. Aluminum Sheet: ASTM B209, alloy 3003-H14 //except alloy used for color anodized aluminum shall be as required to produce specified color. Alloy required to produce specified color shall have the same structural properties as alloy 3003-H14//.
- G. Galvanized Sheet: ASTM, A653.
- H. Nonreinforced, Elastomeric Sheeting: Elastomeric substances reduced to thermoplastic state and extruded into continuous homogenous sheet (0.056 inch) thick. Sheeting shall have not less than 7 MPa (1,000 psi) tensile strength and not more than seven percent tension-set at 50 percent elongation when tested in accordance with ASTM D412. Sheeting

shall show no cracking or flaking when bent through 180 degrees over a 1 mm (1/32 inch) diameter mandrel and then bent at same point over same size mandrel in opposite direction through 360 degrees at temperature of -30°C (-20 °F).

2.2 FLASHING ACCESSORIES

- A. Solder: ASTM B32; flux type and alloy composition as required for use with metals to be soldered.
- B. Rosin Paper: Fed-Spec. UU-B-790, Type I, Grade D, Style 1b, Rosin-sized sheathing paper, weighing approximately 3 Kg/10 m² (6 lbs/100 sf).
- C. Bituminous Paint: ASTM D1187, Type I.
- D. Fasteners:
 - 1. Use copper, copper alloy, bronze, brass, or stainless steel for copper and copper clad stainless steel, and stainless steel for stainless steel and aluminum alloy. Use galvanized steel or stainless steel for galvanized steel.
 - 2. Nails:
 - a. Minimum diameter for copper nails: 3 mm (0.109 inch).
 - b. Minimum diameter for aluminum nails 3 mm (0.105 inch).
 - c. Minimum diameter for stainless steel nails: 2 mm (0.095 inch) and annular threaded.
 - d. Length to provide not less than 22 mm (7/8 inch) penetration into anchorage.
 - 3. Rivets: Not less than 3 mm (1/8 inch) diameter.
 - 4. Expansion Shields: Fed Spec A-A-1925A.
- E. Sealant: As specified in Section 07 92 00, JOINT SEALANTS for exterior locations.
- F. Insect Screening: ASTM D3656, 18 by 18 regular mesh.
- G. Roof Cement: ASTM D4586.

2.3 SHEET METAL THICKNESS

- A. Except as otherwise shown or specified use thickness or weight of sheet metal as follows:
- B. Concealed Locations (Built into Construction):
 - 1. Copper: 30g (10 oz) minimum 0.33 mm (0.013 inch thick).
 - 2. Stainless steel: 0.25 mm (0.010 inch) thick.
 - 3. Copper clad stainless steel: 0.25 mm (0.010 inch) thick.

4. Galvanized steel: 0.5 mm (0.021 inch) thick.
- C. Exposed Locations:
1. Copper: 0.4 Kg (16 oz).
 2. Stainless steel: 0.4 mm (0.015 inch).
 3. Copper clad stainless steel: 0.4 mm (0.015 inch).
- D. Thickness of aluminum or galvanized steel is specified with each item.

2.4 FABRICATION, GENERAL

- A. Jointing:
1. In general, copper, stainless steel and copper clad stainless steel joints, except expansion and contraction joints, shall be locked and soldered.
 2. Jointing of copper over 0.5 Kg (20 oz) weight or stainless steel over 0.45 mm (0.018 inch) thick shall be done by lapping, riveting and soldering.
 3. Joints shall conform to following requirements:
 - a. Flat-lock joints shall finish not less than 19 mm (3/4 inch) wide.
 - b. Lap joints subject to stress shall finish not less than 25 mm (one inch) wide and shall be soldered and riveted.
 - c. Unsoldered lap joints shall finish not less than 100 mm (4 inches) wide.
 4. Flat and lap joints shall be made in direction of flow.
 5. Edges of bituminous coated copper, copper covered paper, nonreinforced elastomeric sheeting and polyethylene coated copper shall be jointed by lapping not less than 100 mm (4 inches) in the direction of flow and cementing with asphalt roof cement or sealant as required by the manufacturer's printed instructions.
 6. Soldering:
 - a. Pre tin both mating surfaces with solder for a width not less than 38 mm (1 1/2 inches) of uncoated copper, stainless steel, and copper clad stainless steel.
 - b. Wire brush to produce a bright surface before soldering lead coated copper.
 - c. Treat in accordance with metal producers recommendations other sheet metal required to be soldered.
 - d. Completely remove acid and flux after soldering is completed.

B. Expansion and Contraction Joints:

1. Fabricate in accordance with the Architectural Sheet Metal Manual recommendations for expansion and contraction of sheet metal work in continuous runs.
2. Space joints as shown or as specified.
3. Space expansion and contraction joints for copper, stainless steel, and copper clad stainless steel at intervals not exceeding 7200 mm (24 feet).
4. Space expansion and contraction joints for aluminum at intervals not exceeding 5400 mm (18 feet), except do not exceed 3000 mm (10 feet) for gravel stops and fascia-cant systems.
5. Fabricate slip-type or loose locked joints and fill with sealant unless otherwise specified.
6. Fabricate joint covers of same thickness material as sheet metal served.

C. Cleats:

1. Fabricate cleats to secure flashings and sheet metal work over 300 mm (12 inches) wide and where specified.
2. Provide cleats for maximum spacing of 300 mm (12 inch) centers unless specified otherwise.
3. Form cleats of same metal and weights or thickness as the sheet metal being installed unless specified otherwise.
4. Fabricate cleats from 50 mm (2 inch) wide strip. Form end with not less than 19 mm (3/4 inch) wide loose lock to item for anchorage. Form other end of length to receive nails free of item to be anchored and end edge to be folded over and cover nail heads.

D. Edge Strips or Continuous Cleats:

1. Fabricate continuous edge strips where shown and specified to secure loose edges of the sheet metal work.
2. Except as otherwise specified, fabricate edge strips of minimum 0.6 Kg (24 ounce) copper, or 0.6 mm (0.024 inch) thick stainless steel, or 1.25 mm (0.050 inch) thick aluminum, consistent with adjoining material .
3. Use material compatible with sheet metal to be secured by the edge strip.
4. Fabricate in 3000 mm (10 feet) maximum lengths with not less than 19 mm (3/4 inch) loose lock into metal secured by edge strip.

5. Fabricate Strips for fascia anchorage to extend below the supporting wood construction to form a drip and to allow the flashing to be hooked over the lower edge at least 19 mm (3/4-inch).
6. Fabricate anchor edge maximum width of 75 mm (3 inches) or of sufficient width to provide adequate bearing area to insure a rigid installation using 1 Kg (32 oz) copper, or 0.8 mm (0.031 inch) thick stainless steel, or 1.6 mm (0.0625 inch) thick aluminum.

E. Drips:

1. Form drips at lower edge of sheet metal counter-flashings (cap flashings), fascias, gravel stops, wall copings, by folding edge back 13 mm (1/2 inch) and bending out 45 degrees from vertical to carry water away from the wall.
2. Form drip to provide hook to engage cleat or edge strip for fastening for not less than 19 mm (3/4 inch) loose lock where shown.

F. Edges:

1. Edges of flashings concealed in masonry joints opposite drain side shall be turned up 6 mm (1/4 inch) to form dam, unless otherwise specified or shown otherwise.
2. Finish exposed edges of flashing with a 6 mm (1/4 inch) hem formed by folding edge of flashing back on itself when not hooked to edge strip or cleat. Use 6 mm (1/4 inch) minimum penetration beyond wall face with drip for through-wall flashing exposed edge.
3. All metal roof edges shall meet requirements of IBC, current edition.

G. Metal Options:

1. Where options are permitted for different metals use only one metal throughout.
2. Stainless steel may be used in concealed locations for fasteners of other metals exposed to view.
3. Where copper gravel stops, copings and flashings will carry water onto cast stone, stone, or architectural concrete, or stainless steel.

2.5 FINISHES

- A. Use same finish on adjacent metal or components and exposed metal surfaces unless specified or shown otherwise.
- B. In accordance with NAAMM Metal Finishes Manual AMP 500, unless otherwise specified.
- C. Finish exposed metal surfaces as follows, unless specified otherwise:
 - 1. Copper: Mill finish.
 - 2. Stainless Steel: Finish No. 2B or 2D.
 - 3. Aluminum:
 - a. Clear Finish: AA-C22A41 medium matte, clear anodic coating, Class 1 Architectural, 18 mm (0.7 mils) thick.
 - b. Colored Finish: AA-C22A42 (anodized) or AA-C22A44 (electrolytically deposited metallic compound) medium matte, integrally colored coating, Class 1 Architectural, 18 mm (0.7 mils) thick. Dyes will not be accepted.
 - c. Fluorocarbon Finish: AAMA 620, high performance organic coating.
 - d. Mill finish.
 - 4. Steel and Galvanized Steel:
 - a. Finish painted under Section 09 91 00, PAINTING unless specified as prefinished item.
 - b. Manufacturer's finish:
 - 1) Baked on prime coat over a phosphate coating.
 - 2) Baked-on prime and finish coat over a phosphate coating.
 - 3) Fluorocarbon Finish: AAMA 621, high performance organic coating.

2.6 THROUGH-WALL FLASHINGS

- A. Form through-wall flashing to provide a mechanical bond or key against lateral movement in all directions. Install a sheet having 2 mm (1/16 inch) deep transverse channels spaced four to every 25 mm (one inch), or ribbed diagonal pattern, or having other deformation unless specified otherwise.
 - 1. Fabricate in not less than 2400 mm (8 feet) lengths; 3000 mm (10 feet) maximum lengths.
 - 2. Fabricate so keying nests at overlaps.
- B. For Masonry Work When Concealed Except for Drip:
 - 1. Either copper, stainless steel, or copper clad stainless steel.

2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
 3. Form exposed portions of flashing with drip, approximately 6 mm (1/4 inch) projection beyond wall face.
- C. For Masonry Work When Exposed Edge Forms a Receiver for Counter Flashing:
1. Use same metal and thickness as counter flashing.
 2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
 3. Form exposed portion as snap lock receiver for counter flashing upper edge.
- D. For Flashing at Architectural Precast Concrete Panels or Stone Panels.
1. Use plan flat sheet of stainless steel.
 2. Form exposed portions with drip as specified or receiver.
- E. Window Sill Flashing and Lintel Flashing:
1. Use either copper, stainless steel, copper clad stainless steel plane flat sheet, or nonreinforced elastomeric sheeting, bituminous coated copper, copper covered paper, or polyethylene coated copper.
 2. Fabricate flashing at ends with folded corners to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening.
 3. Turn up back edge as shown.
 4. Form exposed portion with drip as specified or receiver.
- F. Door Sill Flashing:
1. Where concealed, use either 0.5 Kg (20 oz) copper, 0.5 mm (0.018 inch) thick stainless steel, or 0.5 mm (0.018 inch) thick copper clad stainless steel.
 2. Where shown on drawings as combined counter flashing under threshold, sill plate, door sill, or where subject to foot traffic, use either 0.6 Kg (24 ounce) copper, 0.6 mm (0.024 inch) stainless steel, or 0.6 mm (0.024 inch) thick stainless steel.
 3. Fabricate flashing at ends to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening with folded corners.

2.7 BASE FLASHING

- A. Use metal base flashing at vertical surfaces intersecting built-up roofing without cant strips or where shown.
1. Use either copper, or stainless steel, thickness specified unless specified otherwise.

2. When flashing is over 250 mm (10 inches) in vertical height or horizontal width use either 0.5 Kg (20 oz) copper or 0.5 mm (0.018 inch) stainless steel.
3. Use stainless steel at aluminum roof curbs where flashing contacts the aluminum.
4. Use either copper, or stainless steel at pipe flashings.
- B. Fabricate metal base flashing up vertical surfaces not less than 200 mm (8 inch) nor more than 400 mm (16 inch).
- C. Fabricate roof flange not less than 100 mm (4 inches) wide unless shown otherwise. When base flashing length exceeds 2400 mm (8 feet) form flange edge with 13 mm (1/2 inch) hem to receive cleats.
- D. Form base flashing bent from strip except pipe flashing. Fabricate ends for riveted soldered lap seam joints. Fabricate expansion joint ends as specified.
- E. Pipe Flashing: (Other than engine exhaust or flue stack)
 1. Fabricate roof flange not less than 100 mm (4 inches) beyond sleeve on all sides.
 2. Extend sleeve up and around pipe and flange out at bottom not less than 13 mm (1/2 inch) and solder to flange and sleeve seam to make watertight.
 3. At low pipes 200 mm (8 inch) to 450 mm (18 inch) above roof:
 - a. Form top of sleeve to turn down into the pipe at least 25 mm (one inch).
 - b. Allow for loose fit around and into the pipe.
 4. At high pipes and pipes with goosenecks or other obstructions which would prevent turning the flashing down into the pipe:
 - a. Extend sleeve up not less than 300 mm (12 inch) above roofing.
 - b. Allow for loose fit around pipe.

2.8 COUNTERFLASHING (CAP FLASHING OR HOODS)

- A. Either copper or stainless steel, unless specified otherwise.
- B. Fabricate to lap base flashing a minimum of 100 mm (4 inches) with drip:
 1. Form lock seams for outside corners. Allow for lap joints at ends and inside corners.
 2. In general, form flashing in lengths not less than 2400 mm (8 feet) and not more than 3000 mm (10 feet).

3. Two-piece, lock in type flashing may be used in-lieu-of one piece counter-flashing.
 4. Manufactured assemblies may be used.
 5. Where counterflashing is installed at new work use an integral flange at the top designed to be extended into the masonry joint or reglet in concrete.
 6. Where counterflashing is installed at existing work use surface applied type, formed to provide a space for the application of sealant at the top edge.
- C. One-piece Counterflashing:
1. Back edge turned up and fabricate to lock into reglet in concrete.
 2. Upper edge formed to extend full depth of masonry unit in mortar joint with back edge turned up 6 mm (1/4 inch).
- D. Two-Piece Counterflashing:
1. Receiver to extend into masonry wall depth of masonry unit with back edge turned up 6 mm (1/4 inch) and exposed edge designed to receive and lock counterflashing upper edge when inserted.
 2. Counterflashing upper edge designed to snap lock into receiver.
- E. Surface Mounted Counterflashing; one or two piece:
1. Use at existing or new surfaces where flashing can not be inserted in vertical surface.
 2. One piece fabricate upper edge folded double for 65 mm (2 1/2 inches) with top 19 mm (3/4 inch) bent out to form "V" joint sealant pocket with vertical surface. Perforate flat double area against vertical surface with horizontally slotted fastener holes at 400 mm (16 inch) centers between end holes. Option: One piece surface mounted counter-flashing (cap flashing) may be used. Fabricate as detailed on Plate 51 of SMACNA Architectural Sheet Metal Manual.
 3. Two pieces: Fabricate upper edge to lock into surface mounted receiver. Fabricate receiver joint sealant pocket on upper edge and lower edge to receive counterflashing, with slotted fastener holes at 400 mm (16 inch) centers between upper and lower edge.
- F. Pipe Counterflashing:
1. Form flashing for water-tight umbrella with upper portion against pipe to receive a draw band and upper edge to form a "V" joint sealant receiver approximately 19 mm (3/4 inch) deep.
 2. Fabricate 100 mm (4 inch) over lap at end.

3. Fabricate draw band of same metal as counter flashing. Use 0.6 Kg (24 oz) copper or 0.33 mm (0.013 inch) thick stainless steel or copper coated stainless steel.
 4. Use stainless steel bolt on draw band tightening assembly.
 5. Vent pipe counter flashing may be fabricated to omit draw band and turn down 25 mm (one inch) inside vent pipe.
- G. Where vented edge decks intersect vertical surfaces, form in one piece, shape to slope down to a point level with and in front of edge-set notched plank; then, down vertically, overlapping base flashing.

2.11 HANGING GUTTERS

- A. Fabricate gutters of not less than the following:
1. 0.5 (20oz) copper.
 2. 0.6mm (0.025inch)thick stainless steel..
 3. 0.8mm (0.032inch) thick aluminum.
- B. Fabricate hanging gutters in sections not less than 2400 mm (8 feet) long, except at ends of runs where shorter lengths are required.
- C. Building side of gutter shall be not less than 38 mm (1 1/2 inches) higher than exterior side.
- D. Gutter Bead: Stiffen outer edge of gutter by folding edge over approximately 19 mm (3/4 inch) toward roof and down approximately 19 mm (3/4 inch) unless shown otherwise.
- E. Gutter Spacers:
1. Fabricate of same material and thickness as gutter.
 2. Fabricate 25 mm (one inch) wide strap and fasten to gutters not over 900 mm (36 inches) on center.
 3. Turn back edge up 25 mm (one inch) and lap front edge over gutter bead.
 4. Rivet and solder to gutter except rivet and seal to aluminum.
- F. Outlet Tubes:
1. Form outlet tubes to connect gutters to conductors of same metal and thickness as gutters extend into the conductor 75 mm (3 inch). Flange upper end of outlet tube 13 mm (1/2 inch).
 2. Lock and solder longitudinal seam except use sealant in lieu of solder with aluminum.

3. Solder tube to gutter. Seal aluminum tube to gutter and rivet to gutter.
 4. Fabricate basket strainers of same material as gutters.
- G. Gutter Brackets:
1. Fabricate of same metal as gutter. Use the following:
 - a. 6 by 25 mm (1/4 by 1 inch) copper.
 - b. 3 by 40 mm (1/8 by 1 1/2 inch) stainless steel.
 - c. 6 by 25 mm (1/4 by 1 inch) aluminum.
 2. Fabricate to gutter profile.
 3. Drill two 5 mm (3/16 inch) diameter holes in anchor leg for countersunk flat head screws.

2.12 CONDUCTORS (DOWNSPOUTS)

- A. Fabricate conductors of same metal and thickness as gutters in sections approximately 3000 mm (10 feet) long [with 19 mm (3/4 inch) wide flat locked seams].
 1. Fabricate open face channel shape with hemmed longitudinal edges.
- B. Fabricate elbows by mitering, riveting, and soldering except seal aluminum in lieu of solder. Lap upper section to the inside of the lower piece.
- C. Fabricate conductor brackets or hangers of same material as conductor, 2 mm (1/16 inch) thick by 25 mm (one inch) minimum width. Form to support conductors 25 mm (one inch) from wall surface in accordance with Architectural Sheet Metal Manual Plate 34, Design C for rectangular shapes and E for round shapes.
- D. Conductor Heads:
 1. Fabricate of same material as conductor.
 2. Fabricate conductor heads to not less than 250 mm (10 inch) wide by 200 mm (8 inch) deep by 200 mm (8 inches) from front to back.
 3. Form front and side edges channel shape not less than 13 mm (1/2 inch) wide flanges with edge hemmed.
 4. Slope bottom to sleeve to conductor or downspout at not less than 60 degree angle.
 5. Extend wall edge not less than 25 mm (one inch) above front edge.
 6. Solder joints for water tight assembly.
 7. Fabricate outlet tube or sleeve at bottom not less than 50 mm (2 inches) long to insert into conductor.

2.14 REGLETS

- A. Fabricate reglets of one of the following materials:
 - 1. 0.4 Kg (16 ounce) copper.
 - 2. Stainless steel, not less than 0.3 mm (0.012 inch) thick.
 - 3. Plastic coated extruded aluminum, not less than 1.4 mm (0.055 inch) thick prefilled with butyl rubber sealer and complete with plastic wedges inserted at 1000 mm (40 inches) on centers.
 - 4. Plastic, ASTM D1784, Type II, not less than 2 mm (0.075 inch) thick.
- B. Fill open-type reglets with fiberboard or other suitable separator, to prevent crushing of the slot during installation.
- C. Bend edges of reglets for setting into concrete to an angle of not less than 45 degrees, and make wide enough to provide firm anchorage in the concrete.
- D. Fabricate reglets for building into horizontal masonry mortar joints not less than 19 mm (3/4 inch) deep, nor more than 25 mm (one inch) deep.
- E. Fabricate mitered corners, fittings, and special shapes as may be required by details.
- F. Reglets for concrete may be formed to receive flashing and have a 10 mm (3/8 inch), 45 degree snap lock.

2.16 ENGINE EXHAUST PIPE OR FLUE OR STACK FLASHING

- A. Flashing at penetrations through roofing shall consist of a metal collar, sheet metal flashing sleeve and hood.
- B. Fabricate collar with roof flange of 1.2 mm (0.047 inch) minimum thick black iron or galvanized steel sheet.
 - 1. Fabricate inside diameter of collar 100 mm (4 inches) larger than the outside diameter of the item penetration the roofing.
 - 2. Extend collar height from structural roof deck to not less than 350 mm (14 inches) above roof surface.
 - 3. Fabricate collar roof flange not less than 100 mm (4 inches) wide.
 - 4. Option: Collar may be of steel tubing 3 mm (0.125 inch) minimum wall thickness, with not less than four, 50 mm x 100 mm x 3 mm (2 inch by 4 inch by 0.125 inch) thick tabs bottom edge evenly spaced around tube in lieu of continuous roof flange. Full butt weld joints of collar.

- C. Fabricate sleeve base flashing with roof flange of either copper, stainless steel, or copper clad stainless steel.
 - 1. Fabricate sleeve roof flange not less than 100 mm (4 inches) wide.
 - 2. Extend sleeve around collar up to top of collar.
 - 3. Flange bottom of sleeve out not less than 13 mm (1/24 inch) and soldered to 100 mm (4 inch) wide flange to make watertight.
 - 4. Fabricate interior diameter 50 mm (2 inch) greater than collar.
- D. Fabricate hood counter flashing from same material and thickness as sleeve.
 - 1. Fabricate the same as pipe counter flashing except allow not less than 100 mm (4 inch) lap below top of sleeve and to form vent space minimum of 100 mm (4 inch) wide.
 - 2. Hem bottom edge of hood 13 mm (1/2 inch).
 - 3. Provide a 50 mm (2 inch) deep drawband.
- E. Fabricate insect screen closure between sleeve and hood. Secure screen to sleeve with sheet metal screws.

2.17 SCUPPERS

- A. Fabricate scuppers with minimum of 100 mm (4 inch) wide flange.
- B. Provide flange at top on through wall scupper to extend to top of base flashing.
- C. Fabricate exterior wall side to project not less than 13 mm (1/2 inch) beyond face of wall with drip at bottom outlet edge.
- D. Fabricate not less than 100 mm (4 inch) wide flange to lap behind gravel stop fascia.
- E. Fabricate exterior wall flange for through wall scupper not less than 25 mm (one inch) wide on top and sides with edges hemmed.
- F. Fabricate gravel stop bar of 25 mm x 25 mm (one by one inch) angle strip soldered to bottom of scupper.
- G. Fabricate scupper not less than 200 mm (8 inch) wide and not less than 125 mm (5 inch) high for through wall scupper.
- H. Solder joints watertight.

2.18 GOOSENECK ROOF VENTILATORS

- A. Form of 1.3 mm (0.0508 inch) thick sheet aluminum, reinforce as necessary for rigidity, stiffness, and connection to curb, and to be watertight.

1. Form lower-edge to sleeve to curb.
2. Curb:
 - a. Form for 100 mm (4 inch) high sleeve to ventilator.
 - b. Form for concealed anchorage to structural curb and to bear on structural curb.
 - c. Form bottom edge of curb as counterflashing to lap base flashing.
- B. Provide open end with 1.6 mm (16 gage), stainless steel wire guard of 13 mm (1/2 inch) square mesh.
 1. Construct suitable aluminum angle frame to retain wire guard.
 2. Rivet angle frame to end of gooseneck.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 1. Install flashing and sheet metal items as shown in Sheet Metal and Air Conditioning Contractors National Association, Inc., publication, ARCHITECTURAL SHEET METAL MANUAL, except as otherwise shown or specified.
 2. Apply Sealant as specified in Section 07 92 00, JOINT SEALANTS.
 3. Apply sheet metal and other flashing material to surfaces which are smooth, sound, clean, dry and free from defects that might affect the application.
 4. Remove projections which would puncture the materials and fill holes and depressions with material compatible with the substrate. Cover holes or cracks in wood wider than 6 mm (1/4 inch) with sheet metal compatible with the roofing and flashing material used.
 5. Coordinate with masonry work for the application of a skim coat of mortar to surfaces of unit masonry to receive flashing material before the application of flashing.
 6. Apply a layer of 7 Kg (15 pound) saturated felt followed by a layer of rosin paper to wood surfaces to be covered with copper. Lap each ply 50 mm (2 inch) with the slope and nail with large headed copper nails.
 7. Confine direct nailing of sheet metal to strips 300 mm (12 inch) or less wide. Nail flashing along one edge only. Space nail not over 100 mm (4 inches) on center unless specified otherwise.

8. Install bolts, rivets, and screws where indicated, specified, or required in accordance with the SMACNA Sheet Metal Manual. Space rivets at 75 mm (3 inch) on centers in two rows in a staggered position. Use neoprene washers under fastener heads when fastener head is exposed.
9. Coordinate with roofing work for the installation of metal base flashings and other metal items having roof flanges for anchorage and watertight installation.
10. Nail continuous cleats on 75 mm (3 inch) on centers in two rows in a staggered position.
11. Nail individual cleats with two nails and bend end tab over nail heads. Lock other end of cleat into hemmed edge.
12. Install flashings in conjunction with other trades so that flashings are inserted in other materials and joined together to provide a water tight installation.
13. Where required to prevent galvanic action between dissimilar metal isolate the contact areas of dissimilar metal with sheet lead, waterproof building paper, or a coat of bituminous paint.
14. Isolate aluminum in contact with dissimilar metals others than stainless steel, white bronze or other metal compatible with aluminum by:
 - a. Paint dissimilar metal with a prime coat of zinc-chromate or other suitable primer, followed by two coats of aluminum paint.
 - b. Paint dissimilar metal with a coat of bituminous paint.
 - c. Apply an approved caulking material between aluminum and dissimilar metal.
15. Paint aluminum in contact with or built into mortar, concrete, plaster, or other masonry materials with a coat of bituminous paint.
16. Paint aluminum in contact with absorptive materials that may become repeatedly wet with two coats of bituminous paint or two coats of aluminum paint.

3.2 THROUGH-WALL FLASHING

A. General:

1. Install continuous through-wall flashing between top of concrete foundation walls and bottom of masonry building walls; at top of

concrete floors; under masonry, concrete, or stone copings and elsewhere as shown.

2. Where exposed portions are used as a counterflashings, lap base flashings at least 100 mm (4 inches) and use thickness of metal as specified for exposed locations.
3. Exposed edge of flashing may be formed as a receiver for two piece counter flashing as specified.
4. Terminate exterior edge beyond face of wall approximately 6 mm (1/4 inch) with drip edge where not part of counter flashing.
5. Turn back edge up 6 mm (1/4 inch) unless noted otherwise where flashing terminates in mortar joint or hollow masonry unit joint.
6. Terminate interior raised edge in masonry backup unit approximately 38 mm (1 1/2 inch) into unit unless shown otherwise.
7. Under copings terminate both edges beyond face of wall approximately 6 mm (1/4 inch) with drip edge.
8. Lap end joints at least two corrugations, but not less than 100 mm (4 inches). Seal laps with sealant.
9. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound. Sealing compound is specified in Section 07 92 00, JOINT SEALANTS.
10. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.
11. Where ends of flashing terminate turn ends up 25 mm (1 inch) and fold corners to form dam extending to wall face in vertical mortar or veneer joint.
12. Turn flashing up not less than 200 mm (8 inch) between masonry or behind exterior veneer.
13. When flashing terminates in reglet extend flashing full depth into reglet and secure with lead or plastic wedges spaced 150 mm (6 inch) on center.
14. Continue flashing around columns:
 - a. Where flashing cannot be inserted in column reglet hold flashing vertical leg against column.
 - b. Counterflash top edge with 75 mm (3 inch) wide strip of saturated cotton unless shown otherwise. Secure cotton strip with roof

cement to column. Lap base flashing with cotton strip 38 mm (1 1/2 inch).

- B. Flashing at Top of Concrete Foundation Walls Where concrete is exposed. Turn up not less than 200 mm (8 inch) high and into masonry backup mortar joint or reglet in concrete backup as specified.
- C. Flashing at Top of Concrete Floors (except where shelf angles occur): Place flashing in horizontal masonry joint not less than 200 mm (8 inch) below floor slab and extend into backup masonry joint at floor slab 38 mm (1 1/2 inch).
- D. Flashing at Cavity Wall Construction: Where flashing occurs in cavity walls turn vertical portion up against backup under waterproofing, if any, into mortar joint. Turn up over insulation, if any, and horizontally through insulation into mortar joint.
- E. Flashing at Veneer Walls:
 - 1. Install near line of finish floors over shelf angles or where shown.
 - 2. Turn up against sheathing.
 - 3. At stud framing, hem top edge 19 mm (3/4 inch) and secure to each stud with stainless steel fasteners through sheathing.
 - 4. At concrete backing, extend flashing into reglet as specified.
 - 5. Coordinate with installation of waterproofing or asphalt felt for lap over top of flashing.
- F. Lintel Flashing when not part of shelf angle flashing:
 - 1. Install flashing full length of lintel to nearest vertical joint in masonry over veneer.
 - 2. Turn ends up 25 mm (one inch) and fold corners to form dam and extend end to face of wall.
 - 3. Turn back edge up to top of lintel; terminate back edge as specified for back-up wall.
- G. Window Sill Flashing:
 - 1. Install flashing to extend not less than 100 mm (4 inch) beyond ends of sill into vertical joint of masonry or veneer.
 - 2. Turn back edge up to terminate under window frame.
 - 3. Turn ends up 25 mm (one inch) and fold corners to form dam and extend to face of wall.
- H. Door Sill Flashing:

1. Install flashing under bottom of plate sills of doors over curbs opening onto roofs. Extend flashing out to form counter flashing or receiver for counter flashing over base flashing. Set in sealant.
 2. Extend sill flashing 200 mm (8 inch) beyond jamb opening. Turn ends up one inch in vertical masonry joint, extend end to face of wall. Join to counter flashing for water tight joint.
 3. Where doors thresholds cover over waterproof membranes install sill flashing over water proof membrane under thresholds. Extend beyond opening to cover exposed portion of waterproof membrane and not less than 150 mm (6 inch) beyond door jamb opening at ends. Turn up approximately 6 mm (1/4 inch) under threshold.
- I. Flashing at Masonry, Stone, or Precast Concrete Copings:
1. Install flashing with drips on both wall faces unless shown otherwise.
 2. Form penetration openings to fit tight against dowel or other item with edge turned up. Seal penetrations with sealant.

3.3 BASE FLASHING

- A. Install where roof membrane type base flashing is not used and where shown.
1. Install flashing at intersections of roofs with vertical surfaces or at penetrations through roofs, to provide watertight construction.
 3. Set flanges in heavy trowel coat of roof cement and nail through flanges into wood nailers over bituminous roofing.
 4. Secure flange by nailing through roofing into wood blocking with nails spaced 75 mm (3 inch) on centers or, when flange over 100 mm (4 inch) wide terminate in a 13 mm (1/2 inch) folded edge anchored with cleats spaced 200 mm (8 inch) on center. Secure one end of cleat over nail heads. Lock other end into the seam.
- B. For long runs of base flashings install in lengths of not less than 2400 mm (8 feet) nor more than 3000 mm (ten feet). Install a 75 mm (3 inch) wide slip type, loose lock expansion joint filled with sealant in joints of base flashing sections over 2400 mm (8 feet) in length. Lock and solder corner joints at corners.
- C. Extend base flashing up under counter flashing of roof specialties and accessories or equipment not less than 75 mm (3 inch).

3.4 COUNTERFLASHING (CAP FLASHING OR HOODS)

A. General:

1. Install counterflashing over and in conjunction with installation of base flashings, except as otherwise specified or shown.
2. Install counterflashing to lap base flashings not less than 100 mm (4 inch).
3. Install upper edge or top of counterflashing not less than 225 mm (9 inch) above top of the roofing.
4. Lap joints not less than 100 mm (4 inch). Stagger joints with relation to metal base flashing joints.
5. Use surface applied counterflashing on existing surfaces and new work where not possible to integrate into item.
6. When fastening to concrete or masonry, use screws driven in expansion shields set in concrete or masonry. Use screws to wood and sheet metal. Set fasteners in mortar joints of masonry work.

B. One Piece Counterflashing:

1. Where flashing is installed at new masonry, coordinate to insure proper height, embed in mortar, and end lap.
2. Where flashing is installed in reglet in concrete insert upper edge into reglet. Hold flashing in place with lead wedges spaced not more than 200 mm (8 inch) apart. Fill joint with sealant.
3. Where flashing is surface mounted on flat surfaces.
 - a. When top edge is double folded anchor flat portion below sealant "V" joint with fasteners spaced not over 400 mm (16 inch) on center:
 - 1) Locate fasteners in masonry mortar joints.
 - 2) Use screws to sheet metal or wood.
 - b. Fill joint at top with sealant.
4. Where flashing or hood is mounted on pipe.
 - a. Secure with draw band tight against pipe.
 - b. Set hood and secure to pipe with a one by 25 mm x 3 mm (1 x 1/8 inch) bolt on stainless steel draw band type clamp, or a stainless worm gear type clamp.
 - c. Completely fill joint at top with sealant.

C. Two-Piece Counterflashing:

1. Where receiver is installed at new masonry coordinate to insure proper height, embed in mortar, and lap.

2. Surface applied type receiver:
 - a. Secure to face construction in accordance, with manufacturers instructions.
 - b. Completely fill space at the top edge of receiver with sealant.
3. Insert counter flashing in receiver in accordance with fabricator or manufacturer's instructions and to fit tight against base flashing.
- D. Where vented edge occur install so lower edge of counterflashing is against base flashing.
- E. When counter flashing is a component of other flashing install as shown.

3.5 REGLETS

- A. Install reglets in a manner to provide a watertight installation.
- B. Locate reglets not less than 225 mm (9 inch) nor more than 400 mm (16 inch) above roofing, and not less than 125 mm (5 inch) nor more than 325 mm (13 inch) above cant strip.
- C. Butt and align end joints on each section of reglet and securely hold in position until concrete or mortar are hardened:
 1. Coordinate reglets for anchorage into concrete with formwork construction.
 2. Coordinate reglets for masonry to locate horizontally into mortar joints.

3.6 GRAVEL STOPS

- A. General:
 1. Install gravel stops and fascias with allowance for expansion at each joint; minimum of 6 mm (1/4 inch).
 2. Extend roof flange of gravel stop and splice plates not less than four inches out over roofing and nail or screw to wood nailers. Space fasteners on 75 mm (3 inch) centers in staggered pattern.
 3. Install continuous cleat for fascia drip edge. Secure with fasteners as close to lower edge as possible on 75 mm (3 inch) centers.
 4. Where ends of gravel stops and fascias abut a vertical wall, provide a watertight, flashed and sealant filled joint.
 5. Set flange in roof cement when installed over built-up roofing.
 6. Edge securement for low-slope roofs: Low-slope membrane roof systems metal edge securement, except gutters, shall be designed in

accordance with ANSI/SPRI/FM ES-1, except the basic wind speed shall be determined from Figure 1609, of IBC 2003.

B. Sheet metal gravel stops and fascia:

1. Install with end joints of splice plates sheets lapped three inches.
2. Hook the lower edge of fascia into a continuous edge strip.
3. Lock top section to bottom section for two piece fascia.

C. Corrugated sheet gravel stops and fascia:

1. Install 300 mm (12 inch) wide sheet flashing centered under joint. A combination bottom and cover plate, extending above and beneath the joint, may be used.
2. Hook lower edge of fascia into a continuous edge strip.

D. Scuppers:

1. Install scupper with flange behind gravel stops; leave 6 mm (1/4 inch) joint to gravel stop.
2. Set scupper at roof water line and fasten to wood blocking.
3. Use sealant to seal joint with fascia gravel stops at ends.
4. Coordinate to lap over conductor head and to discharge water into conductor head.

3.7 COPINGS

A. General:

1. On walls topped with a wood plank, install a continuous edge strip on the front and rear edge of the plank. Lock the coping to the edge strip with a 19 mm (3/4 inch) loose lock seam.
2. Where shown turn down roof side of coping and extend down over base flashing as specified for counter-flashing. Secure counter-flashing to lock strip in coping at continuous cleat.
3. Install ends adjoining existing construction so as to form space for installation of sealants. Sealant is specified in Section 07 92 00, JOINT SEALANTS.

B. Aluminum Coping:

1. Install with 6 mm (1/4 inch) joint between ends of coping sections.
2. Install joint covers, centered at each joint, and securely lock in place.

C. Stainless steel or Copper Copings:

1. Join ends of sheets by a 19 mm (3/4 inch) locked and soldered seam, except at intervals of 9600 mm (32 feet), provide a 38 mm (1 1/2 inch) loose locked expansion joint filled with sealant or mastic.
2. At straight runs between 7200 mm (24 feet) and 19200 mm (64 feet) locate expansion joint at center.
3. At straight runs that exceed 9600 mm (32 feet) and form the leg of a corner locate the expansion joint not more than 4800 mm (16 feet) from the corner.

3.8 EXPANSION JOINT COVERS, INSULATED

- A. Install insulated expansion joint covers at locations shown on curbs not less than 200 mm (8 inch) high above roof surface.
- B. Install continuous edge strips of same metal as expansion joint flange, nailed at not less than 75 mm (3 inch) centers.
- C. Install insulated expansion joint covers in accordance with manufacturer's directions locking edges to edge strips.

3.9 ENGINE EXHAUST PIPE OR STACK FLASHING

- A. Set collar where shown and secure roof tabs or flange of collar to structural deck with 13 mm (1/2 inch) diameter bolts.
- B. Set flange of sleeve base flashing not less than 100 mm (4 inch) beyond collar on all sides as specified for base flashing.
- C. Install hood to above the top of the sleeve 50 mm (2 inch) and to extend from sleeve same distance as space between collar and sleeve beyond edge not sleeve:
 1. Install insect screen to fit between bottom edge of hood and side of sleeve.
 2. Set collar of hood in high temperature sealant and secure with one by 3 mm (1/8 inch) bolt on stainless steel draw band type, or stainless steel worm gear type clamp. Install sealant at top of head.

3.10 HANGING GUTTERS

- A. Hang gutters with high points equidistant from downspouts. Slope at not less than 1:200 (1/16 inch per foot).
- B. Lap joints, except for expansion joints, at least 25 mm (one inch) in the direction of flow. Rivet and seal or solder lapped joints.

- C. Support gutters in brackets spaced not more than 600 mm (24 inch) on centers, brackets attached to facial or wood nailer by at least two screws or nails.
 - 1. For copper or copper clad stainless steel gutters use brass or bronze brackets.
 - 2. For stainless steel gutters use stainless steel brackets.
 - 3. For aluminum gutters use aluminum brackets or stainless steel brackets.
 - 4. Use brass or stainless steel screws.
- D. Secure brackets to gutters in such a manner as to allow free movement of gutter due to expansion and contraction.
- E. Gutter Expansion Joint:
 - 1. Locate expansion joints midway between outlet tubes.
 - 2. Provide at least a 25 mm (one inch) expansion joint space between end baffles of gutters.
 - 3. Install a cover plate over the space at expansion joint.
 - 4. Fasten cover plates to gutter section on one side of expansion joint only.
 - 5. Secure loose end of cover plate to gutter section on other side of expansion joint by a loose-locked slip joint.
- F. Outlet Tubes: Set bracket strainers loosely into gutter outlet tubes.

3.11 CONDUCTORS (DOWNSPOUTS)

- A. Where scuppers discharge into downspouts install conductor head to receive discharge with back edge up behind drip edge of scupper. Fasten and seal joint. Sleeve conductors to gutter outlet tubes and fasten joint and joints between sections.
- B. Set conductors plumb and clear of wall, and anchor to wall with two anchor straps, located near top and bottom of each section of conductor. Strap at top shall be fixed to downspout, intermediate straps and strap at bottom shall be slotted to allow not less than 13 mm (1/2 inch) movement for each 3000 mm (10 feet) of downspout.
- C. Install elbows, offsets and shoes where shown and required. Slope not less than 45 degrees.

3.13 GOOSENECK ROOF VENTILATORS

- A. Install on structural curb not less than 200 mm (8 inch) high above roof surface.
- B. Securely anchor ventilator curb to structural curb with fasteners spaced not over 300 mm (12 inch) on center.
- C. Anchor gooseneck to curb with screws having nonprene washers at 150 mm (6 inch) on center.

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09-01-18
Renovate Tower of Building 1
VAMC, Sioux Falls, SD
VA Project #438-18-102

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SECTION 07 71 00
ROOF SPECIALTIES

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies copings, gravel stops, fascias.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Color and Texture of Finish: Section 09 06 00, SCHEDULE FOR FINISHES
- C. Sealant Material and Installation: Section 07 92 00, JOINT SEALANTS.
- D. General Insulation: Section 07 21 13, THERMAL INSULATION
- E. Rigid Insulations for Roofing: Section 07 22 00, ROOF AND DECK INSULATION

1.3 QUALITY CONTROL:

- A. Provide roof accessories that products of manufacturers regularly engaged in producing the kinds of products specified.
- B. For each accessory type provide products made by the same manufacturer.
- C. Assemble each accessory to the greatest extent possible before delivery to the site.
- D. Provide each accessory with FM approval listing for class specified.

1.4 PERFORMANCE REQUIREMENTS:

- A. Provide roof accessories that withstand exposure to weather and resist thermal movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, or installation.
- B. Provide roof accessories listed in FM Approvals "RoofNav" and approved for windstorm classification Class 120 mph. Identify materials with FM Approval markings.
- C. Manufacture and install roof accessories to allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects.
 - 1. Provide clips that resist rotation and avoid shear stress as a result of thermal movements.

2. For design purposes, base provisions for thermal movement on assumed ambient temperature (range) from minus 18 degrees C (0 degrees F), ambient to 82 degrees C (180 degrees F).

1.5 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 1. Postconsumer and preconsumer recycled content as specified in PART 2 - PRODUCTS.
- C. Samples: Representative sample panel of color-anodized aluminum not less than 101 x 101 mm (4 x 4 inches), except extrusions are to be of a width not less than section to be used. Submit sample that shows coating with integral color and texture. Include manufacturer's identifying label.
- D. Shop Drawings: Each item specified showing design, details of construction, installation and fastenings.
- E. Manufacturer's Literature and Data: Each item specified.
- F. Certificates: Stating that aluminum has been given specified thickness of anodizing.

1.6 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. ASTM International (ASTM):
 - A240/A240M-14Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - A653/A653M-13Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process
 - A666-10Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
 - B209-14Aluminum and Aluminum Alloy-Sheet and Plate
 - B209M-14Aluminum and Aluminum Alloy-Sheet and Plate (Metric)
 - B221-14Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

- B221M-13Aluminum-Alloy Extruded Bars, Rods, Wire,
Shapes, and Tubes (Metric)
- B32-08 (R2014)Solder Metal
- B370-12Copper Sheet and Strip for Building
Construction
- B882-10Pre-Patinated Copper for Architectural
Applications
- C612-14Mineral Fiber Block and Board Thermal
Insulation
- D1187/D1187M-97 (R2011) Asphalt-Base Emulsions for Use as Protective
Coatings for Metal
- D1970/D1970M-14Self-Adhering Polymer Modified Bituminous Sheet
Materials Used as Steep Roofing Underlayment
for Ice Dam Protection
- D226/D226M-09Asphalt-Saturated Organic Felt Used in Roofing
and Waterproofing
- D4869/D4969M-05 (R2011) .Asphalt-Saturated Organic Felt Underlayment
Used In Steep Slope Roofing
- C. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06Metal Finishes Manual
- D. American Architectural Manufacturers Association (AAMA):
2605-11High Performance Organic Coatings on
Architectural Extrusions and Panels.
611-14Anodized Architectural Aluminum
- E. FM Global (FM):
RoofNavApproved Roofing Assemblies and Products

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Aluminum, Extruded: ASTM B221M (B221).
- B. Aluminum Sheet: ASTM B209M (B209).
- C. Galvanized Sheet Steel: ASTM A653/A653M; G-90 coating.
- D. Stainless-Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304.
- E. Copper Sheet: ASTM B370, cold-rolled copper sheet, H00 or H01 temper.
- F. Recycled Content of Metal Products: Postconsumer recycled content plus
one-half of preconsumer recycled content not less than 30 percent.
- G. Insulation: ASTM C612, Class 1 or 2.

H. Asphalt Coating: ASTM D1187, Type I, quick setting.

2.2 UNDERLAYMENT:

A. Self-Adhering Modified Bitumen Underlayment:

1. Provide self-adhering modified bitumen membrane underlayment material in compliance with ASTM D1970/D1970M, suitable for use as underlayment for metal copings and fascias.
2. Provide membrane resistant to cyclical elevated temperatures for extended period of time in high heat service conditions (stable after testing at 116 degrees C (240 degrees F)).
3. Provide membrane with integral non-tacking top surface of polyethylene film or other surface material to serve as separator between bituminous material and metal products to be applied above.
4. Provide primer.

B. Felt Underlayment: Provide No. 30 asphalt saturated organic, non-perforated felt underlayment in compliance with ASTM D226/D226M, Type II, or ASTM D4869/D4869M.

C. Slip Sheet: Provide 0.24 kg per square meter (5 pounds per 100 sf) rosin sized unsaturated building paper for slip sheet.

2.3 SOLDER:

A. Copper Solder conforming to ASTM B32, lead-free solder or Grade Sn50, 50 percent tin and 50 percent lead.

2.4 COPINGS:

- A. Fabricate of aluminum sheet not less than 3.2-mm (0.125 inch) thick; 16 oz. copper 0.5 mm (0.018 inch) thick; stainless steel.
- B. Turn outer edges down each face of wall as shown on construction documents.
- C. Maximum lengths of 3.05 M (10 feet).
- D. Shop fabricate external and internal corners as one-piece assemblies with not less than 305 mm (12 inch) leg lengths.
- E. Provide 101 mm (4 inch) wide 0.81 mm (0.032 inch) thick watertight joint covers.
- F. Provide anchor gutter bar of 0.81 mm (0.032 inch) thick with anchor holes formed for underside of joint.
- G. Provide concealed guttered splice plate of 0.81 mm (0.032 inch) thick with butyl or other resilient seal strips anchored to splice plate for

underside of joint. Use galvanized steel anchor plate providing compression spring anchoring of coping cover.

H. Finish: Three-coat fluoropolymer as specified.

2.5 EXTRUDED ALUMINUM GRAVEL STOPS AND FASCIAS:

- A. Fabricate of aluminum not less than 2 mm (0.078 inch) thick.
- B. Turn fascia down face of wall and up above roof as shown in construction documents.
- C. Maximum lengths of 3.05 M (10-feet).
- D. Shop fabricate external and internal corners as one (1)-piece assemblies with not less than 305 mm (12 inch) leg lengths.
- E. Provide 101 mm (4 inch) wide 2 mm (0.078 inch) thick watertight joint covers with 152 mm (6 inch) wide 0.8 mm (0.030 inch) thick underside joint flashing.
- F. Finish: Three-coat fluoropolymer as specified.

2.6 EXTRUDED ALUMINUM FASCIA-CANT SYSTEM:

- A. The fascia-cant system consists of three (3) pieces, an extruded aluminum fascia, a galvanized steel cant, and an aluminum compression clamp.
- B. Furnish in stock lengths of not more than 3.05 M (10 feet) long.
- C. Form fascia from not less than 2 mm (0.070 inch) thick aluminum. Provide 101 mm (4 inch) wide 0.81 mm (0.032-inch) thick concealed sheet aluminum joint cover plates in back of fascia.
- D. Form cant strip from galvanized steel not less than 0.75 mm (0.0299 inch) thick, to profile shown and design to hold lower edge of the fascia.
- E. Form compression clamp of not less than 0.81 mm (0.032 inch) thick aluminum designed to hold the top edge of the fascia and the built-up flashing.
- F. Internal and external corners:
 - 1. Factory fabricate and fully weld mitered joints.
 - 2. Furnish corner sections in sizes shown with not less than 305 mm (12 inch) leg lengths.
- G. Factory fabricated fascia sump assemblies.
 - 1. Fabricate sump assemblies with stainless steel cores and extruded aluminum cover to match fascia-cant.

2. Provide stainless steel outlet, tube sized to suit downspout and solder to core to make watertight.
3. Furnish sump assembly in 508 mm (20 inch) minimum lengths.

H. Factory fabricated scupper assemblies:

1. Fabricate scupper assembly with extended plates to match fascia-cant in 508 mm (20 inch) minimum lengths.
2. Extend outlet opening not less than 50 mm (2 inches) with drip edge.
3. Fabricate with stainless steel core or sleeve to drain water from toe of cant and flash in to built-up roofing with 101 mm (4 inch) wide flange.

I. Finish on aluminum: Three-coat fluoropolymer as specified.

2.8 FINISH:

- A. In accordance with NAAMM AMP 500-505.
- B. Aluminum, Mill Finish: AA-MIX, as fabricated.
- C. Aluminum, Clear Anodic Finish AAMA 611: AA-M12C22A41, Class I, 0.017 mm (0.7 mil) thick (min.).
- D. Aluminum Color Anodic Finish AAMA 611: AA-C22A42 (anodized or AA0C22A44 (electrolytically deposited metallic compound), Class 1, Architectural, 0.017 mm (0.7 mil) thick (min.))
- E. Copper Sheet Finishes: Non-Patinated Finish: Mill finish
- F. Fluoropolymer Finishes: High performance organic coating. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 1. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.
 5. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.013 mm (0.5 mil).
- G. Stainless-Steel Finish: No. 3 (coarse, polished directional satin.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Examine substrates, areas, and conditions, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.
- C. Underlayment Installation:
 - 1. Self-Adhering Sheet Underlayment:
 - a. Apply primer as required by manufacturer.
 - b. Comply with temperature restrictions of underlayment manufacturer for installation.
 - c. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 152 mm (6 inches) staggered 610 mm (24 inches) between courses.
 - d. Overlap side edges not less than 89 mm (3-1/2 inches). Roll laps with roller.
 - e. Cover underlayment within 14 days.
 - f. Apply continuously under copings and roof-edge fascias and gravel stops.
 - g. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.
 - 3. Slip Sheet:
 - a. Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties.
 - b. Apply in shingle fashion to shed water, with lapped joints of not less than 50 mm (2 inches).
- D. Install roof accessories where indicated in construction documents.
- E. Secure with fasteners in accordance with manufacture's printed installation instructions and approved shop drawings unless shown otherwise. Provide fasteners suitable for application, for metal types being secured and designed to meet performance requirements.
- F. Where soldered joints are required, clean surfaces to be soldered, removing oils and foreign matter.
 - 1. Pre-tin edges of sheets to be soldered to a width of 38 mm (1-1/2 inches).

2. Reduce pre-tinning where pre-tinned surface would show in completed work.
 3. Tin edges of uncoated copper sheets using solder for copper.
 4. Do not use torches for soldering.
 5. Heat surfaces to receive solder and flow solder into joint.
 6. Fill joint completely.
 7. Completely remove flux and spatter from exposed surfaces.
- G. Coordinate to install insulation where shown; see Section 07 21 13, THERMAL INSULATION and Section 07 22 00, ROOF AND DECK INSULATION.
- H. Comply with section 07 92 00, JOINT SEALANTS to install sealants where required by manufactures installation instructions.
- I. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.
- J. Gravel Stops and Fascias:
1. Install gravel stops and fascia with butt joints with approximately 6 mm (1/4 inch) space for expansion.
 2. Over each joint provide cover plates of sheet aluminum, complete with concealed sheet aluminum flashing, centered under each joint.
 3. Provide lap cover plates and concealed flashing over the gravel stop and fascia not less than 101 mm (4 inches).
 4. Extend concealed flashing over built-up roofing, embed in roof cement and turn down over face of blocking at roof edge.
- K. Aluminum Coping:
1. Install sections of coping with approximately 6 mm (1/4-inch) space between ends of sections.
 2. Center joint gutter bar and covers at joints and lock in place.
 3. When snap-on system is installed ensure front and back edges are locked in place.
- L. Fascia-Cant System:
1. Install galvanized steel cant; coordinate with roofing work and after completion of roofing work install extruded aluminum fascia, concealed joint cover plate, and aluminum compression clamp, where shown in construction documents.
 2. Install system to allow for expansion and contraction with 6 mm (1/4 inch) space between extruded aluminum members and galvanized steel cant as required by manufacturer of system.

3. Offset joints in extruded aluminum members from galvanized steel cant joints.

3.2 PROTECTION OF ALUMINUM:

- A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with two (2) coats of asphalt coating (complete coverage), or by separating the contact surfaces with a preformed neoprene tape having pressure sensitive adhesive coating on one (1) side.
- B. Paint aluminum in contact with wood, concrete and masonry, or other absorptive materials, that may become repeatedly wet, with two (2) coats of asphalt coating.

3.3 ADJUSTING:

- A. Adjust expansion joints to close tightly and be watertight; insuring maximum allowance for building movement.

3.4 PROTECTION:

- A. Protect roof accessories from damage during installation and after completion of the work from subsequent construction.

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**SECTION 07 72 00
ROOF ACCESSORIES**

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies equipment supports.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Sealant material and installation: Section 07 92 00, JOINT SEALANTS.
- D. General insulation: Section 07 21 13, THERMAL INSULATION. Rigid insulations for roofing: Section 07 22 00, ROOF AND DECK INSULATION

1.3 QUALITY ASSURANCE:

- A. Provide roof accessories that are the products of manufacturers regularly engaged in producing the kinds of products specified.
- B. For each accessory type provide the same product made by the same manufacturer.
- C. Assemble each accessory to the greatest extent possible before delivery to the site.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Postconsumer and preconsumer recycled content as specified in PART 2 - PRODUCTS.
- C. Samples: Submit representative sample panel of color anodized aluminum not less than 101 x 101 mm (4 x 4 inches). For extrusions, submit width not less than section to be installed. Show coating with integral color and texture and include manufacturer's identifying label.
- D. Shop Drawings: Each item specified showing design, details of construction, installation and fastenings.
- E. Manufacturer's Literature and Data: Each item specified.
- F. Certificates: Stating that aluminum has been given specified thickness of anodizing.

1.5 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extend referenced. The publications are referenced in the text by the basic designation only.
- B. Federal Specifications (Fed. Spec.):
 - RR-G-1602DGrating, Metal, Other Than Bar Type (Floor, Except for Naval Vessels)
- C. ASTM International (ASTM):
 - A653/A653M-10Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) By the Hot-Dip Process
 - B209-14Aluminum and Aluminum Alloy-Sheet and Plate
 - B209M-14Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
 - B221-14Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 - B221M-13Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)
 - C726-12Mineral Wool Roof Insulation Board
 - C1289-14aFaced Rigid Cellular Polyisocyanurate Thermal Insulation Board
 - D1187/D1187M-97 (R2011) .Asphalt-Base Emulsions for Use as Protective Coatings for Metal
- D. National Association of Architectural Metal Manufacturers (NAAMM):
 - AMP 500 SeriesMetal Finishes Manual
- E. American Architectural Manufacturers Association (AAMA):
 - 2603-13Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels
 - 2605-13High Performance Organic Coatings on Architectural Extrusions and Panels.
 - 611-14Anodized Architectural Aluminum
 - 621-02High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates
- F. American Society of Civil Engineers (ASCE):

ASCE 7-10Minimum Design Loads for Buildings and Other
Structures

- G. U.S. National Archives and Records Administration (NARA):
29 CFR 1910.23Guarding Floor and Wall Openings and Holes

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Aluminum, Extruded: ASTM B221M (B221).
- B. Aluminum Sheet: ASTM B209M (B209).
- C. Galvanized Sheet Steel: ASTM A653/A653M; G-90 coating.
- D. Metal Grating for Roof Walkway: Fed. Spec. RR-G-1602.
- E. Recycled Content of Metal Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 30 percent.
- F. Asphalt Coating: ASTM D1187/D1187M, Type I, quick setting.

2.2 NOT USED

2.3 EQUIPMENT SUPPORTS:

- A. Supported Load Capacity: See equipment information.
- B. Fabricate equipment supports from 1.3 mm (0.0516 inch) thick galvanized ASTM A653/A653M steel fabricate with welded corners and with seams joined by continuous water and air tight welds.
- C. Equipment supports to be internally reinforced with angles 1.22 m (48 inches) on center.
- D. Form exterior curb with integral base,.
- E. Use galvanized steel liners for curbs having inside dimension over 305 mm (12 inches).
- F. Internally insulate with 38 mm (1-1/2 inch) glass-fiber board insulation (ASTM C726).
- G. Fabricate curb with a minimum height of 203 mm (8 inches) above roof surface.
- H. Attach preservative treated wood nailers to top of curb. Provide 50 mm (2 inch) by 50 mm (2 inch) minimum nominal size on curb with openings and 50 mm (2 inch) thick, width of curb up to 305 mm (12 inches) on equipment support curbs.

- H. Make size of supports suit size of equipment furnished, with height as shown on construction documents, but not less than 203 mm (8 inches) above roof surface.
- I. Top of Equipment Supports: Level with pitch built into curb when deck slopes. Equip supports with water diverter or cricket on side that obstructs water flow.
- J. Not Used

2.4 NOT USED

2.5 NOT USED

2.6 FINISH:

- A. In accordance with NAAMM AMP 500 Series.
- B. Aluminum, Mill Finish: AA-MIX, as fabricated.
- F. Fluoropolymer Finish: High performance organic coating. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
 - 1. Not Used
 - 2. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install roof specialties where indicated on construction documents.
- B. Secure with fasteners in accordance with manufacture's printed installation instructions and approved shop drawings unless shown otherwise.
- C. Coordinate to install insulation where shown; see Section 07 21 13, THERMAL INSULATION and Section 07 22 00, ROOF AND DECK INSULATION.
- D. Comply with section 07 92 00, JOINT SEALANTS to install sealants where required by manufactures installation instructions require sealant.
- E. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.
 - 1. After completion of base flashing bend down cap flashing flange and secure to blocking with screws.
 - 3. Install cover plates with formed aluminum flashing concealed and centered on joint. Flashing to lap cover not less than 101 mm (4 inches).

- F. Equipment Supports: Do not anchor to insulating concrete or metal deck.
Anchor only to building structure as per manufacturers recommendations.

3.2 PROTECTION OF ALUMINUM:

- A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with two (2) coats of asphalt coating (complete coverage), or by separating the contact surfaces with a preformed neoprene tape having pressure sensitive adhesive coating on side.
- B. Paint aluminum in contact with wood, concrete and masonry, or other absorptive materials, that may become repeatedly wet, with two coats of asphalt coating.

3.3 ADJUSTING:

- A. Adjust roof hatch hardware to operate freely and so that cover will operate without binding, close tightly at perimeter, and latch securely.

3.4 PROTECTION:

- A. Protect roof accessories from damage during installation and after completion of the work from subsequent construction.

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**SECTION 07 81 00
APPLIED FIREPROOFING**

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies spray-applied mineral fiber and cementitious coverings to provide fire resistance to interior structural steel members shown.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Installer qualifications.
- D. Testing laboratory accreditations.
- E. Manufacturer's Literature and Data:
 - 1. Manufacturer's complete and detailed application instructions and specifications.
 - 2. Manufacturer's repair and patching instructions.
- F. Certificates:
 - 1. Certificate from testing laboratory attesting fireproofing material and application method meet the specified fire ratings.
 - a. List thickness and density of material required to meet fire ratings.
 - b. Accompanied by complete test report and test record.
 - 2. Manufacturer's certificate indicating sprayed-on fireproofing material supplied under the Contract is same within manufacturing tolerance as fireproofing material tested.
- G. Miscellaneous:
 - 1. Manufacturer's written approval of surfaces to receive sprayed-on fireproofing.
 - 2. Manufacturer's written approval of completed installation.

3. Manufacturer's written approval of the applicators of fireproofing material.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver to job-site in sealed containers marked and labeled to show manufacturer's name and brand and UL certification markings of compliance with the specified requirements.
- B. Remove damaged or opened containers from the site.
- C. Store the materials off the ground, under cover, away from damp surfaces.
- D. Keep dry until ready for use.
- E. Remove materials that have been exposed to water before installation from the site.

1.4 FIELD CONDITIONS:

- A. Temperature: Do not apply fireproofing when substrate or ambient temperature is below 4 degrees C (40 degrees F) unless temporary protection and heat are provided to maintain temperature at or above stated value during application and for 24 hours before and after application.
- B. Humidity: Maintain relative humidity levels within limits recommended by fireproofing manufacturer.
- C. Ventilation: Provide ventilation to properly dry the fireproofing after application. Provide a minimum of four (4) air exchanges per hour by forced air circulation. When permitted by Contracting Officer Representative (COR), ventilate by natural circulation.

1.5 QUALITY ASSURANCE:

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. Submit manufacturer's certification that each installer is trained and qualified to install the specified fireproofing. Submit evidence that each installer has a minimum of three (3) years' experience and a minimum of four (4) installations using the specified fireproofing.
- B. Testing Laboratory Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority. Submit a copy of the Certificate of Accreditation and Scope of Accreditation.

- C. Test for fire endurance in accordance with ASTM E119, for fire rating specified, in a nationally recognized laboratory.
- D. Manufacturer's inspection and approval of surfaces to receive fireproofing.
- E. Manufacturer's approval of fireproofing applications.
- F. Manufacturer's approval of completed installation.
- G. Manufacturer's representative is to observe and advise at the commencement of application, and is required to visit the site as required thereafter for the purpose of ascertaining proper application.
- H. Pre-Application Test Area.
 - 1. Apply a test area consisting of a typical overhead fireproofing installation, including not less than 4.5 m (15 feet) of beam and deck.
 - a. Apply to one (1) column.
 - b. Apply for the hourly ratings required in the construction documents.
 - 2. Install in location selected by the COR, for approval by the representative of the fireproofing material manufacturer and the COR.
 - 3. Perform Bond test for cohesive and adhesive strength in accordance with ASTM E736 for each applied fireproofing design used.
 - 4. Perform density test in accordance with ASTM E736 for each applied fireproofing design used.
 - 5. Do not proceed in other areas until installation of test area has been completed and approved.
 - 6. Keep approved installation area open for observation as criteria for sprayed-on fireproofing.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. ASTM International (ASTM):
 - C841-03(R2013)Installation of Interior Lathing and Furring
 - C847-14Metal Lath
 - E84-14Surface Burning Characteristics of Building
Materials

- E119-12aFire Tests of Building Construction and
Materials
- E605-93 (R2011)Thickness and Density of Sprayed Fire-Resistive
Materials Applied to Structural Members
- E736-00 (R2011)Cohesion/Adhesion of Sprayed Fire-Resistive
Materials Applied to Structural Members
- E759-92 (R2011)The Effect of Deflection on Sprayed Fire-
Resistive Material Applied to Structural
Members
- E760-92 (R2011)Impact on Bonding of Sprayed Fire-Resistive
Material Applied to Structural Members
- E761-92 (R2011)Compressive Strength of Fire-Resistive Material
Applied to Structural Members
- E859-93 (R2011)Air Erosion of Sprayed Fire-Resistive Materials
Applied to Structural Members
- E937-93 (R2011)Corrosion of Steel by Sprayed Fire-Resistive
Material Applied to Structural Members
- E1042-02 (R2014)Acoustically, Absorptive Materials Applied by
Trowel or Spray.
- G21-13Determining Resistance of Synthetic Polymeric
Materials to Fungi
- C. Underwriters Laboratories, Inc. (UL):
Fire Resistance Directory...Latest Edition including Supplements
- D. Warnock Hersey (WH):
Certification Listings .Latest Edition
- E. Factory Mutual System (FM):
Approval GuideLatest Edition including Supplements
- F. Environmental Protection Agency (EPA):
40 CFR 59(2014)National Volatile Organic Compound Emission
Standards for Consumer and Commercial Products

PART 2 - PRODUCTS

2.1 SPRAYED-ON FIREPROOFING:

- A. ASTM E1042, Class (a), Category A.
 - 1. Type I, factory mixed cementitious materials with approved aggregate.

2. Type II, factory mixed mineral fiber with integral inorganic binders minimum 240 kg per cubic meter (15 lb. per cubic feet) density per ASTM E605 test unless specified otherwise. Use in areas that are completely encased.

B. Materials containing asbestos are not permitted.

C. Fireproofing characteristics when applied in the thickness and density required to achieve the fire-rating specified.

	Characteristic	Test	Results
1.	Deflection	ASTM E759	No cracking, spalling, or delamination when backing to which it is applied has a deflection up to 1/120 in 3 m (10 ft.)
2.	Corrosion-Resistance	ASTM E937	No promotion of corrosion of steel.
3.	Bond Impact	ASTM E760	No cracking, spalling, or delamination.
4.	Cohesion/Adhesion (Bond Strength)	ASTM E736	Minimum cohesive/adhesive strength of 9.57 kPa (200 lbf per sq. ft.) for protected areas. 19.15 kPa (400 lbf per sq. ft.) for exposed areas.
5.	Air Erosion	ASTM E859	Maximum gain weight of the collecting filter 0.27 gm per sq. meter (0.025 gm per sq. ft.).

6.	Compressive Strength	ASTM E761	Minimum compressive strength 48 kPa (1000 psf).
7.	Surface Burning Characteristics with adhesive and sealer to be used	ASTM E84	Flame spread 25 or less smoke developed 50 or less
8.	Fungi Resistance	ASTM G21	Resistance to mold growth when inoculated with aspergillus niger (28 days for general application)

2.2 ADHESIVE:

- A. Bonding adhesive for Type II (fibrous) materials as recommended and supplied by the fireproofing material manufacturer.
- B. Adhesive may be an integral part of the material or applied separately to surface receiving fireproofing material.

2.3 SEALER:

- A. Sealer for Type II (fibrous) material as recommended and supplied by the fireproofing material manufacturer.
- B. Surface burning characteristics as specified for fireproofing material.
- C. Fungus resistant.
- D. Sealer may be an integral part of the material or applied separately to the exposed surface. When applied separately use contrasting color pigmented sealer, white preferred.
- E. VOC content: Product to comply with VOC content limits of authorities having jurisdiction and the following VOC limits when calculated according to 40 CFR 59, (EPA Method 24):
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Primers, Sealers, and Undercoaters: 200 g/L.

2.4 WATER:

- A. Clean, fresh, and free from organic and mineral impurities.
- B. pH of 6.9 to 7.1.

2.5 MECHANICAL BOND MATERIAL:

- A. Expanded Metal Lath: ASTM C847, minimum weight of 0.92 kg per square meter (1.7 pounds per square yard) or as required, according to fire-resistance designs indicated and fire proofing manufacturer's written instructions.
- B. Fasteners: ASTM C841.

- C. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
- D. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachments.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Verify surfaces to receive fireproofing are clean and free of dust, soot, oil, grease, water soluble materials or any foreign substance which would prevent adhesion of the fireproofing material.
- B. Verify hangers, inserts and clips are installed before the application of fireproofing material.
- C. Verify ductwork, piping, and other obstructing material and equipment is not installed that will interfere with fireproofing installation.
- D. Verify concrete work on steel decking and concrete encased steel is completed.
- E. When applied in conjunction with roof structures or roof decks, verify that roofing, installation of rooftop HVAC equipment, and other related work are complete.
- F. Verify temperature and enclosure conditions required by fire-proofing material manufacturer.
- G. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond. Submit test report.

3.2 APPLICATION:

- A. Do not start application until written approval has been obtained from manufacturer of fireproofing materials that surfaces have been inspected by the manufacturer or his representative, and are suitable to receive sprayed-on fireproofing.
- B. Coordinate application of fireproofing material with other trades.
- C. Cover other work and exterior openings subject to damage from fallout or overspray of fireproofing materials during application.
- D. Application of Metal Lath:
 - 1. Apply to beam and columns having painted surfaces which fail ASTM E736 Bond Test requirements in pre-application test area.
 - 2. Apply to beam flanges 305 mm (12-inches) or more in width.

3. Apply to column flanges 406 mm (16-inches) or more in width.
 4. Apply to beam or column web 406 mm (16-inches) or more in depth.
 5. Tack weld or mechanically fasten on maximum of 305 mm (12-inch) center.
 6. Lap and tie lath member in accordance with ASTM C841.
- E. Mix and apply in accordance with manufacturer's instructions.
1. Mechanically control material and water ratios.
 2. Apply adhesive and sealer, when not an integral part of the materials, in accordance with the manufacturer's instructions.
 3. Apply to density and thickness indicated in UL Fire Resistance Directory, FM Approval Guide, or WH Certification Listings unless specified otherwise. Test in accordance with ASTM E119.
 4. Minimum ASTM E605 applied dry density per cubic meter (cubic foot) for the underside of the walk on deck (interstitial) hung purlin or beam and steel deck, columns in interstitial spaces and mechanical equipment rooms to be as follows:
 - a. Type I - 350 kg per cubic meter (22 lb. per cubic ft.).
 - b. Not Used
 - c. Not Used
- F. Complete application is to be completed in one area. Inspection and approval by COR is required before removal of application equipment and proceeding with further work.

3.3 FIELD TESTS:

- A. The applied fireproofing to be tested by a COR approved independent testing laboratory and paid for by the Contractor. Submit test reports documenting results of tests on the applied material in the project.
- B. COR will select area to be tested in specific bays on each floor using a geometric grid pattern. Apply test sample every 929 square meters (10,000 square feet) of floor area or two (2) for each floor, whichever produces the greatest number of test areas.
- C. Test for thickness and density in accordance with ASTM E605. Areas showing thickness less than that required as a result of fire endurance test are not acceptable.
- D. Areas showing less than required fireproofing characteristics are not suitable for the following field tests.
 1. Test for cohesion/adhesion: ASTM E736.

2. Test for bond impact strength: ASTM E760.

3.4 PATCHING AND REPAIRING:

- A. Inspect after mechanical, electrical and other trades have completed work in contact with fireproofing material, but before sprayed material is covered by subsequent construction.
- B. Perform corrective measures in accordance with fireproofing material manufacturer's recommendations.
 - 1. Respray areas requiring additional fireproofing material to provide the required thickness, and replace dislodged or removed material.
 - 2. Spray material for patching by machine directly on point to be patched, or into a container and then hand apply.
 - 3. Do not hand mix material.
- C. Repair:
 - 1. Respray test and rejected areas.
 - 2. Patch fireproofing material which is removed or disturbed after approval.
- D. Perform final inspection of sprayed areas after patching and repair.

3.6 SCHEDULE:

- A. Apply fireproofing material in interior structural steel members and on underside of interior steel floor and roof decks, except on following surfaces:
 - 1. Structural steel and underside of steel decks in elevator or dumbwaiter machine rooms.
 - 2. Steel members in elevator hoist ways.
 - 3. Areas used as air handling plenums.
 - 4. Steel to be encased in concrete or designated to receive other type of fireproofing.

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**SECTION 07 84 00
FIRESTOPPING**

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Provide UL or equivalent approved firestopping system for the closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction.
- B. Provide UL or equivalent approved firestopping system for the closure of openings in walls against penetration of gases or smoke in smoke partitions.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- C. Spray applied fireproofing: Section 07 81 00, APPLIED FIREPROOFING
- D. Sealants and application: Section 07 92 00, JOINT SEALANTS.
- E. Fire and smoke damper assemblies in ductwork: Section 23 31 00, HVAC DUCTS AND CASINGS; Section 23 37 00, AIR OUTLETS AND INLETS.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Installer qualifications.
- D. Inspector qualifications.
- E. Manufacturers literature, data, and installation instructions for types of firestopping and smoke stopping used.
- F. List of FM, UL, or WH classification number of systems installed.
- G. Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH proposed for use.
- H. Submit certificates from manufacturer attesting that firestopping materials comply with the specified requirements.

1.4 DELIVERY AND STORAGE:

- A. Deliver materials in their original unopened containers with manufacturer's name and product identification.

- B. Store in a location providing protection from damage and exposure to the elements.

1.5 QUALITY ASSURANCE:

- A. FM, UL, or WH or other approved laboratory tested products will be acceptable.
- B. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991 or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements." Submit qualification data.
- C. Inspector Qualifications: Contractor to engage a qualified inspector to perform inspections and final reports. The inspector to meet the criteria contained in ASTM E699 for agencies involved in quality assurance and to have a minimum of two years' experience in construction field inspections of firestopping systems, products, and assemblies. The inspector to be completely independent of, and divested from, the Contractor, the installer, the manufacturer, and the supplier of material or item being inspected. Submit inspector qualifications.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. ASTM International (ASTM):
 - E84-14Surface Burning Characteristics of Building Materials
 - E699-09Standard Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components
 - E814-13aFire Tests of Through-Penetration Fire Stops
 - E2174-14Standard Practice for On-Site Inspection of Installed Firestops
 - E2393-10aStandard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers
- C. FM Global (FM):
 - Annual Issue Approval Guide Building Materials
 - 4991-13Approval of Firestop Contractors
- D. Underwriters Laboratories, Inc. (UL):

Annual Issue Building Materials Directory

Annual Issue Fire Resistance Directory

723-10(2008)Standard for Test for Surface Burning

Characteristics of Building Materials

1479-04(R2014)Fire Tests of Through-Penetration Firestops

E. Intertek Testing Services - Warnock Hersey (ITS-WH):

Annual Issue Certification Listings

F. Environmental Protection Agency (EPA):

40 CFR 59(2014)National Volatile Organic Compound Emission

Standards for Consumer and Commercial Products

PART 2 - PRODUCTS

2.1 FIRESTOP SYSTEMS:

- A. Provide either factory built (Firestop Devices) or field erected (through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke. Firestop systems to accommodate building movements without impairing their integrity.
- B. Through-penetration firestop systems and firestop devices tested in accordance with ASTM E814 or UL 1479 using the "F" or "T" rating to maintain the same rating and integrity as the fire barrier being sealed. "T" ratings are not required for penetrations smaller than or equal to 101 mm (4 in.) nominal pipe or 0.01 sq. m (16 sq. in.) in overall cross sectional area.
- C. Firestop Sealants Basis of Design Manufacturer: Hilti Corporation, www.hilti.com, or approved equal.
- D. Firestop sealants used for firestopping or smoke sealing to have the following properties:
 - 1. Contain no flammable or toxic solvents.
 - 2. Release no dangerous or flammable out gassing during the drying or curing of products.
 - 3. Water-resistant after drying or curing and unaffected by high humidity, condensation or transient water exposure.
 - 4. When installed in exposed areas, capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

5. VOC Content: Firestopping sealants and sealant primers to comply with the following limits for VOC content when calculated according to 40 CFR 59, (EPA Method 24):
 - a. Sealants: 250 g/L.
 - b. Sealant Primers for Nonporous Substrates: 250 g/L.
 - c. Sealant Primers for Porous Substrates: 775 g/L.
- E. Firestopping system or devices used for penetrations by glass pipe, plastic pipe or conduits, unenclosed cables, or other non-metallic materials to have following properties:
 1. Classified for use with the particular type of penetrating material used.
 2. Penetrations containing loose electrical cables, computer data cables, and communications cables protected using firestopping systems that allow unrestricted cable changes without damage to the seal.
- F. Maximum flame spread of 25 and smoke development of 50 when tested in accordance with ASTM E84 or UL 723. Material to be an approved firestopping material as listed in UL Fire Resistance Directory or by a nationally recognized testing laboratory.
- G. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.
- H. Materials to be nontoxic and noncarcinogen at all stages of application or during fire conditions and to not contain hazardous chemicals. Provide firestop material that is free from Ethylene Glycol, PCB, MEK, and asbestos.
- I. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 2. For floor penetrations with annular spaces exceeding 101 mm (4 in.) or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means acceptable to the firestop manufacturer.
 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

2.2 SMOKE STOPPING IN SMOKE PARTITIONS:

- A. Provide silicone sealant in smoke partitions as specified in Section 07 92 00, JOINT SEALANTS.
- B. Provide mineral fiber filler and bond breaker behind sealant.
- C. Sealants to have a maximum flame spread of 25 and smoke developed of 50 when tested in accordance with ASTM E84.
- D. When used in exposed areas capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Submit product data and installation instructions, as required by article, submittals, after an on-site examination of areas to receive firestopping.
- B. Examine substrates and conditions with installer present for compliance with requirements for opening configuration, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

- A. Remove dirt, grease, oil, laitance and form-release agents from concrete, loose materials, or other substances that prevent adherence and bonding or application of the firestopping or smoke stopping materials.
- B. Remove insulation on insulated pipe for a distance of 150 mm (6 inches) on each side of the fire rated assembly prior to applying the firestopping materials unless the firestopping materials are tested and approved for use on insulated pipes.
- C. Prime substrates where required by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- D. Masking Tape: Apply masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from

firestopping materials. Remove tape as soon as it is possible to do so without disturbing seal of firestopping with substrates.

3.3 INSTALLATION:

- A. Do not begin firestopping work until the specified material data and installation instructions of the proposed firestopping systems have been submitted and approved.
- B. Install firestopping systems with smoke stopping in accordance with FM, UL, WH, or other approved system details and installation instructions.
- C. Install smoke stopping seals in smoke partitions.

3.4 CLEAN-UP:

- A. As work on each floor is completed, remove materials, litter, and debris.
- B. Clean up spills of liquid type materials.
- C. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.
- D. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to provide firestopping complying with specified requirements.

3.5 INSPECTIONS AND ACCEPTANCE OF WORK:

- A. Do not conceal or enclose firestop assemblies until inspection is complete and approved by the Contracting Officer Representative (COR).
- B. Furnish service of approved inspector to inspect firestopping in accordance with ASTM E2393 and ASTM E2174 for firestop inspection, and document inspection results. Submit written reports indicating locations of and types of penetrations and type of firestopping used at each location; type is to be recorded by UL listed printed numbers.

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SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section covers interior and exterior sealant and their application, wherever required for complete installation of building materials or systems.

1.2 RELATED WORK (INCLUDING BUT NOT LIMITED TO THE FOLLOWING):

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Sealing of Site Work Concrete Paving: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.
- C. Masonry Control and Expansion Joint: Section 04 20 00, UNIT MASONRY.
- D. Firestopping Penetrations: Section 07 84 00, FIRESTOPPING.
- E. Glazing: Section 08 80 00, GLAZING.
- G. Sound Rated Gypsum Partitions/Sound Sealants: Section 09 29 00, GYPSUM BOARD.
- H. Mechanical Work: Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING; Section 23 05 11, COMMON WORK RESULTS FOR HVAC .

1.3 QUALITY ASSURANCE:

- A. Installer Qualifications: An experienced installer with a minimum of three (3) years' experience and who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance. Submit qualification.
- B. Source Limitations: Obtain each type of joint sealant through one (1) source from a single manufacturer.
- C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.
 - 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.

3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.
 4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
- D. Lab Tests: Submit samples of materials that will be in contact or affect joint sealants to joint sealant manufacturers for tests as follows:
1. Adhesion Testing: Before installing elastomeric sealants, test their adhesion to protect joint substrates according to the method in ASTM C794 to determine if primer or other specific joint preparation techniques are required.
 2. Compatibility Testing: Before installing elastomeric sealants, determine compatibility when in contact with glazing and gasket materials.
 3. Stain Testing: Perform testing per ASTM C1248 on interior and exterior sealants to determine if sealants or primers will stain adjacent surfaces. No sealant work is to start until results of these tests have been submitted to the Contracting Officer Representative (COR) and the COR has given written approval to proceed with the work.
- E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
1. Locate test joints where indicated in construction documents or, if not indicated, as directed by COR.
 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of non-elastomeric sealant and joint substrate indicated.
 3. Notify COR seven (7) days in advance of dates and times when test joints will be erected.
 4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
- F. Not Used

1.4 CERTIFICATION:

- A. Contractor is to submit to the COR written certification that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will properly perform to provide permanent watertight, airtight or vapor tight seals (as applicable), and that materials supplied meet specified performance requirements.

1.5 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Installer qualifications.
- D. Contractor certification.
- E. Manufacturer's installation instructions for each product used.
- F. Cured samples of exposed sealants for each color.
- G. Manufacturer's Literature and Data:
 - 1. Primers
 - 2. Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- H. Manufacturer warranty.

1.6 PROJECT CONDITIONS:

- A. Environmental Limitations:
 - 1. Do not proceed with installation of joint sealants under following conditions:
 - a. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C (40 degrees F).
 - b. When joint substrates are wet.
- B. Joint-Width Conditions:
 - 1. Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions:

1. Do not proceed with installation of joint sealants until
contaminants capable of interfering with adhesion are removed from
joint substrates.

1.7 DELIVERY, HANDLING, AND STORAGE:

- A. Deliver materials in manufacturers' original unopened containers, with
brand names, date of manufacture, shelf life, and material designation
clearly marked thereon.
- B. Carefully handle and store to prevent inclusion of foreign materials.
- C. Do not subject to sustained temperatures exceeding 32 degrees C (90
degrees F) or less than 5 degrees C (40 degrees F).

1.8 DEFINITIONS:

- A. Definitions of terms in accordance with ASTM C717 and as specified.
- B. Backing Rod: A type of sealant backing.
- C. Bond Breakers: A type of sealant backing.
- D. Filler: A sealant backing used behind a back-up rod.

1.9 WARRANTY:

- A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of
Construction".
- B. Manufacturer Warranty: Manufacturer shall warranty their sealant for a
minimum of five (5) years from the date of installation and final
acceptance by the Government. Submit manufacturer warranty.

1.10 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent
referenced. Publications are referenced in text by basic designation
only.
- B. ASTM International (ASTM):
C509-06Elastomeric Cellular Preformed Gasket and
Sealing Material
C612-14Mineral Fiber Block and Board Thermal
Insulation
C717-14aStandard Terminology of Building Seals and
Sealants
C734-06(R2012)Test Method for Low-Temperature Flexibility of
Latex Sealants after Artificial Weathering
C794-10Test Method for Adhesion-in-Peel of Elastomeric
Joint Sealants
C919-12.Use of Sealants in Acoustical Applications.

- C920-14aElastomeric Joint Sealants.
- C1021-08 (R2014)Laboratories Engaged in Testing of Building Sealants
- C1193-13Standard Guide for Use of Joint Sealants.
- C1248-08 (R2012)Test Method for Staining of Porous Substrate by Joint Sealants
- C1330-02 (R2013)Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants
- C1521-13Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints
- D217-10Test Methods for Cone Penetration of Lubricating Grease
- D1056-14Specification for Flexible Cellular Materials—Sponge or Expanded Rubber
- E84-09Surface Burning Characteristics of Building Materials

C. Sealant, Waterproofing and Restoration Institute (SWRI).
The Professionals' Guide

D. Environmental Protection Agency (EPA):
40 CFR 59 (2014)National Volatile Organic Compound Emission Standards for Consumer and Commercial Products

PART 2 - PRODUCTS

2.1 SEALANTS:

- A. Exterior Sealants:
 - 1. S-1 Vertical surfaces, provide non-staining ASTM C920, Type S or M, Grade NS, Class 25, Use NT.
 - 2. S-2 Horizontal surfaces, provide ASTM C920, Type S or M, Grade P, Class 25, Use T.
 - 3. Provide location(s) of exterior sealant as follows (including but not limited to):
 - a. Joints formed where frames and subsills of windows, doors, louvers, and vents adjoin masonry, concrete, or metal frames. Provide sealant at exterior surfaces of exterior wall penetrations.
 - b. Metal to metal.
 - c. Masonry to masonry, stone, or precast concrete.
 - d. Not Used.

- e. Not Used Cast stone to cast stone.
 - f. Masonry expansion and control joints.
 - g. Wood to masonry.
 - h. Masonry joints where shelf angles occur.
 - i. Voids where items penetrate exterior walls.
 - j. Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.
- B. Floor Joint Sealant:
- 1. ASTM C920, Type S or M, Grade P, Class 25, Use T.
 - 2. S-3 Provide location(s) of floor joint sealant as follows.
 - a. Seats of metal thresholds exterior doors.
 - b. Control and expansion joints in floors, slabs, ceramic tile, and walkways.
- C. Interior Sealants:
- 1. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system are to comply with the following limits for VOC content when calculated according to 40 CFR 59, (EPA Method 24):
 - a. Architectural Sealants: 250 g/L.
 - b. Sealant Primers for Nonporous Substrates: 250 g/L.
 - c. Sealant Primers for Porous Substrates: 775 g/L.
 - 2. S-4 Vertical and Horizontal Surfaces: ASTM C920, Type S or M, Grade NS, Class 25, Use NT.
 - 3. Not Used
 - 4. Provide location(s) of interior sealant as follows:
 - a. Typical narrow joint 6 mm, (1/4 inch) or less at walls and adjacent components.
 - b. Perimeter of doors, windows, access panels which adjoin concrete or masonry surfaces.
 - c. Interior surfaces of exterior wall penetrations.
 - d. Joints at masonry walls and columns, piers, concrete walls or exterior walls.
 - e. Not Used.
 - f. Exposed isolation joints at top of full height walls.
 - g. Not Used.
 - h. Not Used.
 - i. Not Used.

D. Acoustical Sealant:

1. Conforming to ASTM C919; flame spread of 25 or less; and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Acoustical sealant have a consistency of 250 to 310 when tested in accordance with ASTM D217; remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C734; and be non-staining.
2. Provide location(s) of acoustical sealant as follows:
 - a. Exposed acoustical joint at sound rated partitions.
 - b. Concealed acoustic joints at sound rated partitions.
 - c. Joints where item pass-through sound rated partitions.

2.2 COLOR:

- A. Sealants used with exposed masonry are to match color of mortar joints.
- B. Sealants used with unpainted concrete are to match color of adjacent concrete.
- C. Color of sealants for other locations to be light gray or aluminum, unless otherwise indicated in construction documents.

2.3 JOINT SEALANT BACKING:

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 1. Type C: Closed-cell material with a surface skin.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056 or synthetic rubber (ASTM C509), nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 32 degrees C (minus 26 degrees F). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint

where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.4 WEEPS:

- A. Weep/Vent Products: Provide the following unless otherwise indicated or approved.
 - 1. Round Plastic Tubing: Medium-density polyethylene, 10 mm (3/8-inch) OD by thickness of stone or masonry veneer.

2.5 FILLER:

- A. Mineral fiberboard: ASTM C612, Class 1.
- B. Thickness same as joint width.
- C. Depth to fill void completely behind back-up rod.

2.6 PRIMER:

- A. As recommended by manufacturer of caulking or sealant material.
- B. Stain free type.

2.7 CLEANERS-NON POROUS SURFACES:

- A. Chemical cleaners compatible with sealant and acceptable to manufacturer of sealants and sealant backing material. Cleaners to be free of oily residues and other substances capable of staining or harming joint substrates and adjacent non-porous surfaces and formulated to promote adhesion of sealant and substrates.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Inspect substrate surface for bond breaker contamination and unsound materials at adherent faces of sealant.
- B. Coordinate for repair and resolution of unsound substrate materials.
- C. Inspect for uniform joint widths and that dimensions are within tolerance established by sealant manufacturer.

3.2 PREPARATIONS:

- A. Prepare joints in accordance with manufacturer's instructions and SWRI (The Professionals' Guide).
- B. Clean surfaces of joint to receive caulking or sealants leaving joint dry to the touch, free from frost, moisture, grease, oil, wax, lacquer paint, or other foreign matter that would tend to destroy or impair adhesion.
 - 1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to

- produce a clean, sound substrate capable of developing optimum bond with joint sealants.
2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include but are not limited to the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous surfaces include but are not limited to the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- C. Do not cut or damage joint edges.
- D. Apply non-staining masking tape to face of surfaces adjacent to joints before applying primers, caulking, or sealing compounds.
 1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Apply primer to sides of joints wherever required by compound manufacturer's printed instructions or as indicated by pre-construction joint sealant substrate test.
 1. Apply primer prior to installation of back-up rod or bond breaker tape.
 2. Use brush or other approved means that will reach all parts of joints. Avoid application to or spillage onto adjacent substrate surfaces.

3.3 BACKING INSTALLATION:

- A. Install backing material, to form joints enclosed on three sides as required for specified depth of sealant.
- B. Where deep joints occur, install filler to fill space behind the backing rod and position the rod at proper depth.

- C. Cut fillers installed by others to proper depth for installation of backing rod and sealants.
- D. Install backing rod, without puncturing the material, to a uniform depth, within plus or minus 3 mm (1/8 inch) for sealant depths specified.
- E. Where space for backing rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.

3.4 SEALANT DEPTHS AND GEOMETRY:

- A. At widths up to 6 mm (1/4 inch), sealant depth equal to width.
- B. At widths over 6 mm (1/4 inch), sealant depth 1/2 of width up to 13 mm (1/2 inch) maximum depth at center of joint with sealant thickness at center of joint approximately 1/2 of depth at adhesion surface.

3.5 INSTALLATION:

- A. General:
 - 1. Apply sealants and caulking only when ambient temperature is between 5 degrees C and 38 degrees C (40 degrees and 100 degrees F).
 - 2. Do not install polysulfide base sealants where sealant may be exposed to fumes from bituminous materials, or where water vapor in continuous contact with cementitious materials may be present.
 - 3. Do not install sealant type listed by manufacture as not suitable for use in locations specified.
 - 4. Apply caulking and sealing compound in accordance with manufacturer's printed instructions.
 - 5. Avoid dropping or smearing compound on adjacent surfaces.
 - 6. Fill joints solidly with compound and finish compound smooth.
 - 7. Tool exposed joints to form smooth and uniform beds, with slightly concave surface conforming to joint configuration per Figure 5A in ASTM C1193 unless shown or specified otherwise in construction documents. Remove masking tape immediately after tooling of sealant and before sealant face starts to "skin" over. Remove any excess sealant from adjacent surfaces of joint, leaving the working in a clean finished condition.
 - 8. Finish paving or floor joints flush unless joint is otherwise detailed.
 - 9. Apply compounds with nozzle size to fit joint width.

10. Test sealants for compatibility with each other and substrate. Use only compatible sealant. Submit test reports.
 11. Replace sealant which is damaged during construction process.
- B. Weeps: Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, at all flashing, and as indicated on construction documents.
1. Use round plastic tubing to form weep holes.
 2. Space weep holes formed from plastic tubing not more than 406 mm (16 inches) o.c.
 3. Trim tubing material used in weep holes flush with exterior wall face after sealant has set.
- C. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise. Take all necessary steps to prevent three-sided adhesion of sealants.
- D. Interior Sealants: Where gypsum board partitions are of sound rated, fire rated, or smoke barrier construction, follow requirements of ASTM C919 only to seal all cut-outs and intersections with the adjoining construction unless specified otherwise.
1. Apply a 6 mm (1/4 inch) minimum bead of sealant each side of runners (tracks), including those used at partition intersections with dissimilar wall construction.
 2. Coordinate with application of gypsum board to install sealant immediately prior to application of gypsum board.
 3. Partition intersections: Seal edges of face layer of gypsum board abutting intersecting partitions, before taping and finishing or application of veneer plaster-joint reinforcing.
 4. Openings: Apply a 6 mm (1/4 inch) bead of sealant around all cutouts to seal openings of electrical boxes, ducts, pipes and similar penetrations. To seal electrical boxes, seal sides and backs.
 5. Control Joints: Before control joints are installed, apply sealant in back of control joint to reduce flanking path for sound through control joint.

3.6 FIELD QUALITY CONTROL:

- A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

1. Extent of Testing: Test completed elastomeric sealant joints as follows:
 - a. Perform 10 tests for first 305 m (1000 feet) of joint length for each type of elastomeric sealant and joint substrate.
 - b. Perform one test for each 305 m (1000 feet) of joint length thereafter or one test per each floor per elevation.
- B. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.
- C. Inspect tested joints and report on following:
 1. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
 2. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 3. Whether sealants filled joint cavities and are free from voids.
 4. Whether sealant dimensions and configurations comply with specified requirements.
- D. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
- E. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.
- F. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements, will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.7 CLEANING:

- A. Fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by manufacturer

of the adjacent material or if not otherwise indicated by the caulking
or sealant manufacturer.

B. Leave adjacent surfaces in a clean and unstained condition.

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VAMC, Sioux Falls, SD
VA Project #438-18-102

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SECTION 07 95 13
EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Prefabricated floor, wall, and ceiling building expansion joint assemblies.
 - a. Elastomeric joint covers at wall and ceiling joints.
 - b. Preformed elastomeric sealant joint at interior floor and wall control joints.
 - c. Exterior wall joints.

1.2 RELATED REQUIREMENTS

- A. Steel Plate Expansion Joint Covers: Section 05 50 00, METAL FABRICATIONS.
- B. Sheet Metal Expansion Joint Seals: Section 07 60 00, FLASHING AND SHEET METAL.
- C. Color of Elastomer Inserts, Filler Strips, Exterior Wall Seals and Metal Finishes: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this Section.
- B. American Society of Civil Engineers (ASCE):
 1. ASCE/SEI 7-10 - Minimum Design Loads For Buildings and Other Structures.
- C. ASTM International (ASTM):
 1. A36/A36M-14 - Structural Steel.
 2. A240/A240M-15b - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.
 3. A283/A283M-13 - Low and Intermediate Tensile Strength Carbon Steel Plates.
 4. A786/A786M-05(2009) - Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
 5. B36/B36M-13 - Brass, Plate, Sheet, Strip, and Rolled Bar.
 6. B121/B121M-11 - Leaded Brass Plate, Sheet, Strip and Rolled Bar.
 7. B209-14 - Aluminum and Aluminum-Alloy Sheet and Plate.
 8. B209M-14 - Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

9. B221-14 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 10. B221M 13 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
 11. B455-10 - Copper-Zinc-Lead Alloy (Leaded-Brass) Extruded Shapes.
 12. C864-05(2011) - Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
 13. D1187/D1187M-97(2011)e1 - Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
 14. E1399/E1399M-97(2013)e1 - Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.
 15. E1966-15 - Standard Test Method for Fire-Resistive Joint Systems.
- D. National Association of Architectural Metal Manufacturers (NAAMM):
1. AMP 500-06 - Metal Finishes Manual.
- E. UL LLC (UL):
1. 2079-15 - Standard for Tests for Fire Resistance of Building Joint Systems.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this Section.
1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Contractor.
 - c. Installer.
 - d. Other installers responsible for adjacent and intersecting work.
 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Installation schedule.
 - b. Installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.
 - e. Installation.
 - f. Terminations.
 - g. Transitions and connections to other work.
 - h. Other items affecting successful completion.

3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 1. Include large-scale details indicating profiles of each type of expansion joint cover, splice joints between joint sections, transitions to other assemblies, terminations, anchorages, fasteners, and relationship to adjoining work and finishes.
 2. Show size, configuration, and fabrication and installation details.
 3. Include composite drawings showing work specified in other Sections coordinated with expansion joints.
- C. Manufacturer's Literature and Data:
 1. Description of each product specified.
 2. Show movement capability of each cover assembly and suitability of material used in exterior seals for ultraviolet exposure.
 3. Description of materials and finishes.
 4. Installation instructions.
- D. Samples: Submit 300 mm (12 inch) long samples.
 1. Each type and color of metal finish for each required thickness and alloy.
 2. Each type and color of flexible seal.
- E. Sustainable Construction Submittals:
 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
 2. Low Pollutant-Emitting Materials:
 - a. Identify volatile organic compound types and quantities.
- F. Qualifications: Substantiate qualifications comply with specifications.
 1. Installer with project experience list .
- G. Certificates: Indicate products comply with specifications.
 1. Fire rated expansion joint cover assemblies.
- H. Operation and Maintenance Data:
 1. Care instructions for each exposed finish product.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:

1. Regularly installs specified products.
2. Installed specified products with satisfactory service on five similar installations for minimum five years.
 - a. Project Experience List: Provide contact names and addresses for completed projects.

1.7 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight facility.
- B. Protect products from damage during handling and construction operations.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify field conditions affecting expansion joint cover assembly fabrication and installation. Show field measurements on Submittal Drawings.
 1. Coordinate field measurement and fabrication schedule to avoid delay.

1.10 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction." Contractor's one-year labor and material warranty.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Provide joint cover assemblies that permit unrestrained movement of joint without disengagement of cover, and, where applicable, maintain moisture, watertight and fire-rated protection.
- B. Provide templates to related trades for location of support and anchorage items.

2.2 SYSTEM PERFORMANCE

- A. Design expansion joint cover assemblies complying with specified performance.

- B. Joint Movement: ASTM E1399.
 - 1. Nominal Joint Width: Varies, see drawings.
 - 2. Minimum Movement Capability: 50 percent.
 - 3. Movement Type: Thermal and wind.
- C. Floor Joints: Live loads, including rolling loads.
 - 1. Load Resistance: ASCE/SEI 7; Design criteria as indicated on Drawings.
 - 2. Maximum Deflection: 1/360 of span, maximum.
- D. Fire Rated Joints: ASTM E1399, ASTM E1966, or UL 2079, including hose stream test at full-rated period.
 - 1. Fire rating: Match adjacent floor, wall, and ceiling construction.
 - 2. System: Capable of anticipated movement while maintaining fire rating.
 - 3. Coverless Applications: Maintain fire rating without joint cover system.

2.3 MATERIALS

- A. Stainless Steel: ASTM A240/A240M, Type 302 or 304.
- B. Structural Steel Shapes: ASTM A36/A36M.
- C. Steel Plate: ASTM A283/A283M, Grade C.
- D. Rolled Steel Floor Plate: ASTM A786/A786M.
- E. Aluminum:
 - 1. Extruded: ASTM B221M (ASTM B221), alloy 6063-T5, 6063-T6, or 6061-T6.
 - 2. Plate and Sheet: ASTM B209M (ASTM B209), alloy 6061-T6.
- F. Bronze: Manufacturer's standard alloy.
 - 1. Extruded: ASTM B455.
 - 2. Plate: ASTM B121.
- G. Brass: ASTM B36/B36M.
- H. Elastomeric Sealant: As specified in Section 07 92 00, JOINT SEALANTS.
- I. Elastomeric Seals:
 - 1. Flexible extruded polyvinyl chloride, meeting a Shore A hardness of 75 with UV stabilizer. Manufacturer's standard colors.
- J. Thermoplastic Rubber:
 - 1. ASTM C864.
 - 2. Dense Neoprene or other material standard with expansion joint manufacturers having the same physical properties.

- K. Compression Seals: Pre-compressed secondary sealant using preformed expanding foam sealant; open-cell polyurethane foam impregnated with polymer-modified acrylic adhesive.
- L. Water Barrier Sheets: Neoprene or EPDM flexible sheet materials minimum 45 mils thick.
 - 1. Provide with drain tubes for horizontal applications.
- M. Vinyl Invertor Sealant Waterstops: Manufacturer's standard shapes and grade.
- N. Moisture Barrier: Fabric reinforced clear vinyl sheet material sized to accommodate opening.
- O. Flexible Membrane: 1.5 mm (60 mil) EPDM sheet, with manufacturer's standard support foam.
- P. Fire Barrier: Labeled by an approved independent testing laboratory for fire resistance ratings indicated for maximum joint width.
 - a. Thermal Insulation: Manufacturer's standard with factory cut miters and transitions.
 - b. Fire Barrier Lengths:
 - 1) Joint widths up to and including 150 mm (6 inches): Maximum 15 m (50 feet) to minimize field splicing.
 - 2) Other Joint widths: 3 m (10 foot) with overlapping ends for field splicing.
- Q. Ceramic Blanket: Manufacturer's standard joint filler to achieve fire rating indicated.
- R. Butyl Caulk Tape: Self adhering double sided butyl rubber sealant tape with easy-release silicone coated paper.

2.4 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide each product from one manufacturer.
 - 1. Provide ceiling and wall expansion joint cover assemblies design matching floor to wall and floor to floor expansion joint cover design.
 - 2. Provide expansion joint cover assembly designs, profiles, materials and configuration indicated, as required to accommodate joint size variations in adjacent surfaces, and anticipated movement.
- C. Sustainable Construction Requirements:
 - 1. Steel Recycled Content: 30 percent total recycled content, minimum.

2. Stainless Steel Recycled Content: 70 percent total recycled content, minimum.
3. Aluminum Recycled Content: 80 percent total recycled content, minimum.
4. Low Pollutant-Emitting Materials: Maximum VOC content by weight.
 - a. Non-Flooring Adhesives and Sealants.

2.5 FABRICATION

- A. Fabricate Expansion Joint Cover Assemblies:
 1. As complete assembly ready for installation.
 2. In longest practicable lengths to minimize number of end joints.
 3. With factory mitered corners where joint changes directions or abuts other materials.
 - a. With closure materials and transition pieces, tee-joints, corners, curbs, cross-connections and other assemblies.
 4. Joints within enclosed spaces such as chase walls, include 1 mm (0.04 inch) thick galvanized steel cover where conventional expansion joint cover is not used.
 5. Where floor slab is fire rated provide ceramic blanket at joints.
 6. Seal Strip: Factory-formed and bonded to metal frames and anchor members.
 7. Compression Seals: Fabricate from expanding foam as secondary seal and elastomeric sealant to sizes and profiles shown.
- B. Floor-to-Floor Metal Plate Joints:
 1. Frames: Metal, continuous on both sides of joint designed to support cover plate.
 - a. Flush Design: Seating surface and raised floor rim to accommodate adjacent flooring.
 - b. Anchorage: Concealed bolt and steel anchors for embedment in concrete.
 2. Cover Plate: Metal, matching frames where exposed.
 - a. Supported Load: 19.2 MPa (400 psf), minimum.
 - b. Rattle-free due to traffic.
 3. Fillers: Resilient material between raised rim of frame and edge of cover plate, where shown.
 - a. No gaps or bulges over full design range joint movement.
 4. Fire Barrier: As required for fire resistance rating.

5. Water Stop: Manufacturer's standard, continuous, full length of joint.
 6. Seismic: As required by Code.
 7. Finishes: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Floor-to-Wall Metal Plate Joints:
1. Frames: Metal, continuous on floor side of joint only.
 - a. Provide wall side frame where required by manufacturer's design.
 2. Cover Plates: Angle cover plates with countersunk flat-head exposed fasteners for securing cover plate to wall unless shown otherwise.
 - a. Fastener Spacing: As recommended by manufacturer.
 3. Joint Design: Match adjacent floor to floor design.
 4. Fire Barrier: As required for fire resistance rating.
 5. Water Stop: Manufacturer's standard, continuous, full length of joint.
 6. Seismic: As required by Code.
 7. Finishes: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Interior Wall Joint Cover Assemblies:
1. Frame: Metal, surface mounted, concealed fastening to wall on one sides of joint.
 2. Cover Plate: Metal, smooth surface, lap both sides of joint and permitting free movement on one side.
 - a. Fabricate with concealed attachment of cover to frame when cover is in close contact with adjacent wall surface finish.
 - b. Use angle cover plates at intersecting walls.
 3. Joint Design: Match adjacent floor to floor design.
 4. Fire Barrier: As required for fire resistance rating.
 5. Seismic: As required by Code.
 6. Finishes: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- E. Exterior Wall Joint Assemblies:
1. Design seal for variable movement and prevention of water and air infiltration.
 2. Frame: Metal, concealed, for fastening to wall on one side of joint.
 3. Cover Plate: Metal, surface mounted, lap both sides of joint, permitting free movement on one side.
 - a. Fabricate with concealed attachment of cover to frame for cover with cover in close contact with adjacent finish surfaces.

- b. Use angle cover plate at intersecting walls.
 - 4. Water Seal: Vinyl seal strip as secondary seal behind primary seal.
 - 5. Seismic: As required by Code.
 - 6. Finish: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- F. Extruded Thermoplastic Rubber Joint Assemblies:
- 1. Frames: Aluminum, both sides of joint.
 - 2. Primary Seal: Flexible rubber on exposed face after frame installation with factory welded watertight miters and transitions.
 - a. Anchor spaced at ends and not over 600 mm (24 inches).
 - 1) Variable movement extruded rubber primary seal designed to remain in aluminum frame, throughout movement of joint.
 - b. Flush mounted seal minimum 3 mm (0.12 inch) thick with dual movement grooves designed for plus or minus 50 percent, movement of joint width.
 - c. Not Used
 - d. Recessed front face seal minimum 3 mm (0.12 inch) thick with no movement grooves, designed for plus or minus 50 percent movement of joint width.
 - e. Provide pantographic wind load supports, maximum 2400 mm (8 feet) on center to support seal systems of 300 mm (12 inches) wide and greater.
 - 3. Secondary Seal: Continuous vinyl sheet seal.
 - 4. Finishes: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- G. Ceiling and Soffit Assemblies:
- 1. Frames: Metal, continuous on both sides of joint, flush mounted with no exposed fasteners.
 - 2. Flexible Insert: Variable movement semi-rigid vinyl locked into frame.
 - a. Face Style: Flush or accordion, as shown, to span joint width without sagging.
 - 3. Seismic: As required by Code.
 - 4. Finishes: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- H. Preformed Sealant Joint: Factory installed elastomeric sealant between extruded aluminum angle frame both sides.
- 1. Frames: Extruded aluminum angle on both sides of joint.
 - 2. Filler: Elastomeric sealant.

3. Anticipated movement: 25 percent maximum.
4. Finishes: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.

2.6 FINISHES

- A. Carbon Steel: NAAMM AMP 500, Galvanized G90.
- B. Stainless Steel: NAAMM AMP 500, No. 2B bright finish.
- C. Aluminum Anodized Finish: NAAMM AMP 500.
 1. Clear Anodized Finish: AA-C22A41; Class I Architectural, 0.018 mm (0.7 mil) thick.
 2. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.018 mm (0.7 mil) thick.
- D. Aluminum Paint Finish:
 1. Fluorocarbon Finish: AAMA 2605; 70 percent fluoropolymer resin, 2-coat system.
 2. Fluorocarbon Finish: AAMA 605; 70 percent fluoropolymer resin, 2-coat system.
- E. Bronze Finish: NAAMM-AMP 500, M32 mechanical finish, directional textured, natural medium satin.

2.7 ACCESSORIES

- A. General: Manufacturer's standard anchors, fasteners, set screws, spaces, protective coating, and filler materials, adhesive and other accessories required for installation.
- B. Barrier Coating: ASTM D1187/D1187M.
- C. Adhesives: Low pollutant-emitting, water based type recommended by adhered product manufacturer for each application.
- D. Fasteners: Type and size recommended by expansion joint cover assembly manufacturer.
 1. Exterior Applications: Stainless steel.
 2. Fasteners for Aluminum: Stainless steel.
 3. Other Applications: Galvanized steel or stainless steel.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
 1. Provide items embedded in concrete and masonry in time for building into work without delaying work.
- B. Protect existing construction and completed work from damage.

- C. Apply barrier coating to aluminum, brass, bronze, or steel surfaces in contact with dissimilar metals and cementitious materials to minimum 0.7 mm (30 mils) dry film thickness.

3.2 INSTALLATION

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Install anchorage devices and fasteners for securing expansion joint assemblies to in-place construction where anchors are not embedded in concrete and masonry.
 - 1. Secure with metal fasteners, type and size to suit application.
- C. Perform cutting, drilling and fitting required for installation of expansion joint cover assemblies.
- D. Install joint cover assemblies aligned and positioned in correct relationship to expansion joint opening and adjoining finished surfaces measured from established lines and levels.
 - 1. Allow for thermal expansion and contraction of metal to avoid buckling.
 - 2. Accommodate joint opening size at time of installation.
- E. Set floor covers at elevations flush with adjacent finished flooring, unless shown otherwise.
- F. Grout floor frames set in prepared recesses.
- G. Locate wall, ceiling and soffit covers in continuous contact with adjacent surfaces. Secure with required accessories.
- H. Locate anchors at interval recommended by manufacturer, but minimum 75 mm (3 inches) from each end, and, maximum 600 mm (24 inches) on centers.
- I. Maintain continuity of expansion joint cover assemblies with end joints held to a minimum and metal members aligned mechanically using splice joints.
- J. Cut and fit ends to accommodate thermal expansion and contraction of metal to avoid buckling of frames and cover plates.
- K. Flush Metal Cover Plates:

1. Secure flexible filler between frames to allow compression and expansion.
2. Adhere flexible filler materials to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

L. Not Used

M. Fire Barriers:

1. Install in compliance with tested assembly.
2. Install at joints in floors and in fire rated walls.
3. Use fire barrier sealant furnished with expansion joint assembly.

N. Apply sealant where required to prevent water and air infiltration.

O. Vertical Exterior Extruded Thermoplastic Rubber.

1. Install side frames mounted on sealant or butyl caulk tape with appropriate anchors 600 mm (24 inches) on center complete with secondary seal.
2. Install primary seals retained in extruded aluminum side frames.

P. Extruded Thermoplastic Rubber or Seals:

1. For straight sections, install preformed seals in continuous lengths.
2. Vulcanize or heat-seal field spliced joints to provide watertight joints as recommended by manufacturer.

Q. Preformed Elastomeric Sealant Joint:

1. Locate joint directly over joints in wall and floor substrates.
2. Fasten full length to substrate using construction adhesive.
3. Install flush or slightly below finish material.

3.3 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Clean exposed metal surfaces. Remove contaminants and stains.

3.4 PROTECTION

- A. Cover floor joints with plywood where wheel traffic occurs before Substantial completion.
- B. Remove protective covering when adjacent work areas are completed. Clean exposed surfaces in compliance with manufacture's printed instructions.

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**SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES**

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hollow metal doors hung in hollow metal frames at interior and exterior locations.
2. Hollow metal door frames for wood doors at interior locations.
3. Glazed openings in hollow metal doors.

1.2 RELATED REQUIREMENTS

- A. Not Used.
- B. Not Used.
- C. Aluminum frames entrance work: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- D. Door Hardware: Section 08 71 00, DOOR HARDWARE.
- E. Glazing: Section 08 80 00, GLAZING.
- F. Card Readers and Biometric Devices: Section 28 13 00, PHYSICAL ACCESS CONTROL SYSTEM.
- G. Not Used.
- H. Not Used.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American National Standard Institute (ANSI):
 1. A250.8-2014 - Standard Steel Doors and Frames.
- C. ASTM International (ASTM):
 1. A240/A240M-15b - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 2. A653/A653M-15 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip.
 3. A1008/A1008M-15 - Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy and High Strength Low Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
 4. B209-14 - Aluminum and Aluminum-Alloy Sheet and Plate.
 5. B209M-14 - Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

6. B221-14 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
7. B221M-13 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
8. D3656/D3656M-13 - Insect Screening and Louver Cloth Woven from Vinyl Coated Glass Yarns.
9. E90-09 - Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- D. Federal Specifications (Fed. Spec.):
 1. L-S-125B - Screening, Insect, Nonmetallic.
- E. Master Painters Institute (MPI):
 1. No. 18 - Primer, Zinc Rich, Organic.
- F. National Association of Architectural Metal Manufacturers (NAAMM):
 1. AMP 500-06 - Metal Finishes Manual.
- G. National Fire Protection Association (NFPA):
 1. 80-16 - Fire Doors and Other Opening Protectives.
- H. UL LLC (UL):
 1. 10C-09 - Positive Pressure Fire Tests of Door Assemblies.
 2. 1784-15 - Air Leakage Tests of Door Assemblies and Other Opening Protectives.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 1. Show size, configuration, and fabrication and installation details.
 2. Elevations of each door design.
 3. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 4. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 5. Locations of reinforcement and preparations for hardware.
 6. Details of anchorages, joints, field splices, and connections.
 7. Details of accessories.
 8. Details of moldings, removable stops, and glazing.
 9. Details of conduit and preparations for power, signal, and control systems.

- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Include schedule showing each door and frame requirements fire label and smoke control label for openings.
 - 3. Installation instructions.
- D. Sustainable Construction Submittals:
 - 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
- E. Test reports: Certify products comply with specifications.
- F. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Manufacturer with project experience list.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Regularly manufactures specified products.
 - 2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.
 - a. Project Experience List: Provide contact names and addresses for completed projects.

1.6 DELIVERY

- A. Fasten temporary steel spreaders across the bottom of each door frame before shipment.
- B. Deliver products in manufacturer's original sealed packaging.
- C. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.
- D. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight conditioned facility.
- B. Protect products from damage during handling and construction operations.

1.8 WARRANTY

- A. Construction Warranty: Contractor's one-year labor and material, FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Design hollow metal doors and frames complying with specified performance:
 - 1. Fire Doors and Frames: UL 10C; NFPA 80 labeled.
 - a. Fire Ratings: See drawings.
 - 2. Stair Doors: Temperature rise rated fire doors.
 - 3. Smoke Control Doors and Frames: UL 1784; NFPA 80 labeled, maximum 0.15424 cu. m/s/sq. m (3.0 cfm/sf) at 24.9 Pa (0.10 inches water gage) pressure differential.
 - 4. Thermal Resistance: 7 R-value, minimum at exterior doors.

2.2 MATERIALS

- A. Stainless Steel: ASTM A240/A240M; Type 304 .
- B. Sheet Steel: ASTM A1008/A1008M, cold-rolled.
- C. Galvanized Sheet Steel: ASTM A653.
- D. Aluminum Sheet: ASTM B209M (ASTM B209).
- E. Aluminum Extrusions: ASTM B221M (ASTM B221).

2.3 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide hollow metal doors and frames from one manufacturer.
- C. Sustainable Construction Requirements:
 - 1. Steel Recycled Content: 30 percent total recycled content, minimum.
 - 2. Stainless Steel Recycled Content: 70 percent total recycled content, minimum.
 - 3. Aluminum Recycled Content: 50 percent total recycled content, minimum.

2.4 HOLLOW METAL DOORS

- A. Hollow Metal Doors: ANSI A250.8; 44 mm (1-3/4 inches) thick. See drawings for sizes and designs.
 - 1. Not Used.
 - 2. Interior Doors: Level 2 and Physical Performance Level B, heavy duty; Model 2, full flush seamless design at interior locations only. Do not use for stairwell doors.

3. Interior Doors: Level 3 and Physical Performance Level A, extra-heavy duty; Model 2, full flush seamless design at stair locations.

4. Exterior Doors: Level 3 and Physical Performance Level A, extra-heavy duty; Model 2, full flush seamless design.

B. Door Faces:

1. Interior Doors: Galvanized sheet steel minimum, Z120 or ZF120 (G40 or A40) coating.

2. Exterior Doors: Galvanized sheet steel minimum, Z180 or ZF180 (G60 or A60) coating.

C. Door Cores:

1. Interior Doors: Kraft paper honeycomb or vertical steel stiffeners.

2. Exterior Doors: Polystyrene or polyurethane .

3. Fire Doors: Manufacturer's standard complying with specified fire rating performance.

2.5 HOLLOW METAL FRAMES

A. Hollow Metal Frames: ANSI A250.8; face welded . See drawings for sizes and designs.

1. Interior Frames:

a. Not Used.

b. Level 2 and Level 3 Hollow Metal Doors: 1.3 mm (0.053 inch) thick.

c. Wood Doors : 1.3 mm (0.053 inch) thick.

2. Interior Borrowed Light Frames: 1.3 mm (0.051 inch) thick.

3. Not Used.

B. Frame Materials:

1. Interior Frames: Galvanized sheet steel minimum, Z120 or ZF120 (G40 or A40) coating.

2. Exterior Frames: Galvanized sheet steel minimum, Z180 or ZF180 (G60 or A60) coating.

2.6 LOUVERS

A. Louver Style: Sight-proof permitting free ventilation.

B. Louver Construction: Sheet metal matching door faces.

1. Interior Door Louvers: 0.8 mm (0.032 inch) thick.

2. Exterior Door Louvers: 1.3 mm (0.053 inch) inch thick.

C. Not Used.

2.7 FABRICATION

- A. Hardware Preparation: ANSI A250.8; for hardware specified in Section 08 71 00, DOOR HARDWARE.
- B. Hollow Metal Door Fabrication:
1. Close top edge of exterior doors flush and seal to prevent water intrusion.
 2. Fill spaces between vertical steel stiffeners with insulation.
- C. Fire and Smoke Control Doors:
1. Close top and vertical edges flush.
 2. Apply steel astragal to active leaf at pair and double egress doors.
 - a. Exception: Where vertical rod exit devices are specified for both leaves swinging in same direction.
 3. Fire and Smoke Control Door Clearances: NFPA 80.
- D. Hollow Metal Frame Fabrication:
1. Fasten mortar guards to back of hardware reinforcements, except on lead-lined frames.
 2. Terminated Stops: ANSI A250.8.
 3. Frame Anchors:
 - a. Floor anchors:
 - 1) Provide extension type floor anchors to compensate for depth of floor fills.
 - 2) Provide 1.3 mm (0.053 inch) thick steel clip angles welded to jamb and drilled to receive floor fasteners.
 - 3) Provide mullion 2.3 mm (0.093 inch) thick steel channel anchors, drilled for two floor fasteners and frame anchor screws.
 - 4) Provide continuous 1 mm (0.042 inch) thick steel rough bucks drilled for floor fasteners and frame anchor screws for sill sections.
 - a) Space floor bolts 50 mm (2 inches) on center.
 - b. Jamb anchors:
 - 1) Place anchors on jambs:
 - a) Near top and bottom of each frame.
 - b) At intermediate points at maximum 600 mm (24 inches) spacing.

- 2) Form jamb anchors from steel minimum 1 mm (0.042 inch) thick.
- 3) Anchors set in masonry: Provide adjustable anchors designed for friction fit against frame and extended into masonry minimum 250 mm (10 inches). Provide one of following types:
 - a) Wire Loop Type: 5 mm (3/16 inch) diameter wire.
 - b) T-Shape type.
 - c) Strap and stirrup type: Corrugated or perforated sheet steel.
- 4) Anchors for stud partitions: Provide tabs for securing anchor to sides of studs. Provide one of the following:
 - a) Welded type.
 - b) Lock-in snap-in type.
- 5) Anchors for frames set in prepared openings:
 - a) Steel pipe spacers 6 mm (1/4 inch) inside diameter, welded to plate reinforcing at jamb stops, or hat shaped formed strap spacers 50 mm (2 inches) wide, welded to jamb near stop.
 - b) Drill jamb stop and strap spacers for 6 mm (1/4 inch) flat head bolts to pass through frame and spacers.
- 6) Modify frame anchors to fit special frame and wall construction.
- 7) Provide special anchors where shown on drawings and where required to suit application.

E. Louver Fabrication:

1. Fabricate louvers as complete units.
2. Weld stationary blades to frames.
3. Factory install louvers in door cutouts, welded to door.

2.8 FINISHES

- A. Galvanized Steel : ANSI A250.8; shop primed.
- B. Stainless Steel: NAAMM AMP 500; No. 4 polished finish.
 1. Blend welds to match adjacent finish.
- C. Finish exposed surfaces after fabrication.
- D. Aluminum Anodized Finish: NAAMM AMP 500.

1. Clear Anodized Finish: AA-C22A41; Class I Architectural, 0.018 mm (0.7 mil) thick.
2. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.018 mm (0.7 mil) thick.
3. Clear Anodized Finish: AA-C22A31; Class II Architectural, 0.01 mm (0.4 mil) thick.
4. Color Anodized Finish: AA-C22A32 or AA-C22A34; Class II Architectural, 0.01 mm (0.4 mil) thick.

2.9 ACCESSORIES

- A. Primers: ANSI A250.8.
- B. Barrier Coating: ASTM D1187/D1187M.
- C. Welding Materials: AWS D1.1/D1.1M, type to suit application.
- D. Clips Connecting Members and Sleeves: Match door faces.
- E. Fasteners: Galvanized steel.
 1. Metal Framing: Steel drill screws.
 2. Masonry and Concrete: Expansion bolts and power actuated drive pins.
- F. Anchors: Galvanized steel.
- G. Galvanizing Repair Paint: MPI No. 18.
- H. Insulation: Unfaced mineral wool.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Apply barrier coating to metal surfaces in contact with cementitious materials to minimum 0.7 mm (30 mils) dry film thickness.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings .
 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
 2. Install fire doors and frames according to NFPA 80.
 3. Install smoke control doors and frames according to NFPA 105.

3.3 FRAME INSTALLATION

- A. Apply barrier coating to concealed surfaces of frames built into masonry.
- B. Plumb, align, and brace frames until permanent anchors are set.
 - 1. Use triangular bracing near each corner on both sides of frames with temporary wood spreaders at midpoint.
 - 2. Use wood spreaders at bottom of frame when shipping spreader is removed.
 - 3. Where construction permits concealment, leave shipping spreaders in place after installation, otherwise remove spreaders when frames are set and anchored.
 - 4. Remove wood spreaders and braces when walls are built and jamb anchors are secured.
- C. Floor Anchors:
 - 1. Anchor frame jambs to floor with two expansion bolts.
 - a. Other Frames: Use 6 mm (1/4 inch) diameter bolts.
 - 2. Power actuated drive pins are acceptable to secure frame anchors to concrete floors.
- D. Jamb Anchors:
 - 1. Masonry Walls:
 - a. Embed anchors in mortar.
 - b. Fill space between frame and masonry with grout or mortar as walls are built.
 - 2. Metal Framed Walls: Secure anchors to sides of studs with two fasteners through anchor tabs.
 - 3. Prepared Masonry and Concrete Openings:
 - a. Direct Securement: 6 mm (1/4 inch) diameter expansion bolts through spacers.
 - b. Subframe or Rough Buck Securement:
 - 1) 6 mm (1/4 inch) diameter expansion bolts on 600 mm (24 inch) centers.
 - 2) Power activated drive pins on 600 mm (24 inches) centers.
- E. Touch up damaged factory finishes.
 - 1. Repair galvanized surfaces with galvanized repair paint.
 - 2. Repair painted surfaces with touch up primer.

3.4 DOOR INSTALLATION

- A. Install doors plumb and level.
- B. Adjust doors for smooth operation.
- C. Touch up damaged factory finishes.
 - 1. Repair galvanized surfaces with galvanized repair paint.
 - 2. Repair painted surfaces with touch up primer.

3.5 CLEANING

- A. Clean exposed door and frame surfaces. Remove contaminants and stains.

3.6 PROTECTION

- A. Protect doors and frames from traffic and construction operations.
- B. Remove protective materials immediately before acceptance.
- C. Repair damage.

- - - E N D - - -

SECTION 08 14 00
INTERIOR WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Interior flush high impact resistant non-rated and fire-rated Acrovyn® Door Systems doors with flush faces as shown on the drawings or specified herein.

1.2 RELATED REQUIREMENTS

- A. Paints and Coatings and Composite Wood and Agrifiber VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Door Hardware including hardware location (height): Section 08 71 00, DOOR HARDWARE.
- C. Installation of Doors and Hardware: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, Section 08 71 00, DOOR HARDWARE.
- D. Door Finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- E. Door Protection: Section 10 26 00, WALL AND DOOR PROTECTION

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American National Standards Institute/Window and Door Manufacturers Association (ANSI/WDMA):
1. I.S. 1A-13 - Architectural Wood Flush Doors.
 2. I.S. 6A-13 - Interior Architectural Stile and Rails Doors.
 3. ANSI/BHMA A156.115-W-2006 American National Standard for Hardware Preparation in Wood Doors with Wood or Steel Frames
- C. ASTM International (ASTM):
1. E90-09 - Laboratory Measurements of Airborne Sound Transmission Loss of Building Partitions and Elements.
 2. ASTM G-21 and ASTM G-22 (Bacteria and Fungal resistance): Provide doors that do not support fungal and bacterial growth when tested in accordance with applicable provisions of ASTM G-21 and ASTM G-22.
 3. ASTM D-543 (Chemical and Stain Resistance): Provide doors that show chemical and stain resistance when tested in accordance with ASTM D-543.

4. ASTM E152 - Methods of Fire Tests and Door Assemblies
- D. National Fire Protection Association (NFPA):
 1. 80-16 - Fire Doors and Other Opening Protectives.
 2. 252-12 - Fire Tests of Door Assemblies.
 3. NFPA 101 Life Safety Code
- E. UL LLC (UL):
 1. 10C-09 - Positive Pressure Fire Tests of Door Assemblies.
- F. Window and Door Manufacturers Association (WDMA):
 1. WDMA TM-6 Test method for determining the durability of adhesives used in doors under accelerated aging conditions
 2. TM 7-14 - Cycle-Slam Test.
 3. TM 8-14 - Hinge Loading Test.
 4. TM 10-14 - Screw Holding Capacity.
- G. MBDC "C2C", McDonough Braungart Design Chemistry - Cradle to Cradle.
- H. FSC - Forestry Stewardship Council

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Product Data: For each type of door, submit manufacturer's data sheets including details of core and edge construction.
- C. Submittal Drawings:
 1. Show size, configuration, and fabrication and installation details.
 2. Submit complete schedule indicating location, size, hardware sets, swing of each door; elevation of each type of door and construction details not covered in product data and other pertinent information. Indicate dimensions and locations of mortises and holes for hardware, fire ratings, and location of cutouts for glass
 3. Include details of glazing, louvers.
 4. Indicate project specific requirements not included in Manufacturer's Literature and Data submittal.
- D. Manufacturer's Literature and Data:
 1. Description of each product.
 2. Fire rated doors showing conformance with NFPA 80.
 3. Manufacturer's limited lifetime warranty

E. Samples:

1. Corner section of flush veneered door 300 mm (12 inches) square, showing details of construction, labeled to show grade and type number and conformance to specified standard.
2. Samples for verification of edge wrapping and edge replaceability. Banded edges will not be approved.
3. Veneer sample 200 mm by 275 mm (8 inch by 11 inch) showing specified wood species sanded to receive a transparent finish. Factory finish veneer sample where the prefinished option is accepted.

F. Sustainable Construction Submittals:

1. Low Pollutant-Emitting Materials:
 - a. Show volatile organic compound types and quantities.

G. Test Reports: Indicate each product complies with specifications.

1. Screw Holding Capacity Test.
2. Cycle-Slam Test.
3. Hinge-Loading Test.

H. Operation and Maintenance Data:

1. Care instructions for each exposed finish product.

Certification: Submit certification that doors and frames comply with UL10c, Positive Pressure Fire Door Test Method.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Regularly and presently manufactures specified products.
2. Manufactures specified products with satisfactory service on five similar installations for minimum five years.

B. Source Limitations: Obtain high impact resistant Acrovyn Door Systems flush doors through one source from a single manufacturer.

C. Quality Standard: Comply with WDMA Industry Standard (I.S. 1A-04 "Architectural Wood Flush Doors").

1. Doors shall meet performance attributes for the following performance duty level: Extra Heavy Duty (Standard Duty for FC5-NR)
2. Tolerances for warp, telegraphing, squareness and prefitting dimensions as per the latest edition of WDMA I.S.1A-04.

D. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities

having jurisdiction, for fire-ratings indicated, based on testing according to UBC Standard 7-2, UL-10C Positive Pressure and NFPA 252.

- E. Doors or trial doors of the type specified herein should be installed in an existing facility for over 6 months to verify quality and durability performance of product.

1.6 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
 - 1. Minimum 0.15 mm (6 mil) polyethylene bags or cardboard packaging to remain unbroken during delivery and storage.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, and manufacture date.
 - 1. Identify door opening corresponding to Door Schedule.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight conditioned facility.
 - 1. Store doors according to ANSI/WDMA I.S. 1A.
- B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

- A. Environment:
 - 1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.
 - 2. Work Area Ambient Temperature Range: 21 to 27 degrees C (70 to 80 degrees F) continuously, beginning 48 hours before installation.
 - 3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.
 - a. Comply with door manufacturer's instructions for relative humidity.

1.9 WARRANTY

- A. Construction Warranty: Contractor's one-year labor and material warranty, FAR clause 52.246-21, "Warranty of Construction.", except that warranty shall be as follows:

- B. Manufacturer's Warranty: Warrant interior factory finished flush wood doors against material and manufacturing defects.
 - 1. Warranty Period: Lifetime of original installation.
- C. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that are deemed defective in materials or workmanship. Conditions are subject to the terms set forth in the manufacturer's warranty.
 - 1. Solid-Core Interior Doors: provide manufacturer's limited lifetime written warranty guarantee against warp, delamination and defects in materials and workmanship.
 - 2. "Edge of a Lifetime" Warranty: If an Acrovyn edge cover is ever damaged, Construction Specialties shall supply a replacement Acrovyn cover at no cost to the Owner. This special warranty begins 1 month after the installation date. Labor not included. Stainless Steel edges not included.

PART 2 - PRODUCTS

2.1 PRODUCTS - GENERAL

- A. Basis of Design: Subject to compliance with all requirements, provide one of the following:
 - 1. To establish a standard of quality, design and function required, drawings and specifications are based on Construction Specialties, Inc. Acrovyn® Door Systems (800) 972-7214 - or approved equal.
 - 2. Also see Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide each product from one manufacturer.
- C. Sustainable Construction Requirements:
 - 1. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Paints and coatings.
 - b. Composite wood and agrifiber.

2.2 FLUSH WOOD DOORS

- A. Door Construction
 - 1. Non-Fire Rated Doors and 20-minute interior FLUSH doors conforming to WDMA I.S.1A-04 and the following:

- a. Thickness: 1 3/4" +/-1/16", (44.45mm +/- 1.58mm)
 - b. Core: Solid. Interior stiles and rails bonded. Tops and bottoms factory sealed with an approved sealer to prevent moisture intrusion.
 - 1) Structural Composite Lumber, 39 lb/ft³ (17.69kg/m³) density - no added urea formaldehyde content
 - c. Crossbanding: FSC certified
 - d. Replaceable door stiles: 3/4" (19.05mm) replaceable stiles shall be field replaceable if ever damaged by impact.
 - e. Replaceable door edges: Fully wrapped and rounded Acrovyn door edges shall be field replaceable if ever damaged by impact, exclusive of external fasteners to improve appearance.
 - 1) Subject to the terms and conditions of our Limited Warranty for the lifetime of the doors, the manufacturer shall supply replacement Acrovyn edge covers AT NO COST to the Owner.
 - f. WDMA I.S.1A-04 Performance Duty Level: Extra Heavy Duty
 - g. Durability Performance: Cycle Slam WDMA TM-7, 1990 Extra Heavy Duty- 1,000,000 cycles to insure durability of entire door construction
2. 45 and 60-minute interior FLUSH fire rated doors conforming to WDMA I.A. 1-A and the following:
- a. Thickness: 1 3/4" +/-1/16", (44.45mm +/- 1.58mm)
 - b. Cores: Solid. Interior stiles and rails bonded. Non-combustible mineral composite, 25-32 lb/ft³ density, no added urea formaldehyde content. Tops and bottoms factory sealed with an approved sealer to prevent moisture intrusion.
 - c. Crossbanding: FSC certified
 - d. Replaceable door stiles: 3/4" (19.05mm) replaceable stiles shall be field replaceable if ever damaged by impact.
 - e. Replaceable door edges: Fully wrapped and rounded Acrovyn door edges shall be field replaceable if ever damaged by impact, exclusive of external fasteners to improve appearance.
 - 1) Subject to the terms and conditions of our Limited Warranty for the lifetime of the doors, the manufacturer shall supply replacement Acrovyn edge covers AT NO COST to the Owner

- f. WDMA I.S.1A-04 Performance Duty Level: Extra Heavy Duty
 - g. Durability Performance: Cycle Slam WDMA TM-7, 1990 - 1,000,000 cycles to insure durability of entire door construction
3. 90-minute interior FLUSH fire rated doors conforming to WDMA I.S.1A-04 and the following:
- a. Thickness: 1 3/4" +/-1/16", (44.45mm +/- 1.58mm)
 - b. Core: Solid. Interior stiles and rails bonded, non-combustible mineral composite construction 25-32 lb/ft³ density, no added urea formaldehyde content. Tops and bottoms factory sealed with an approved sealer to prevent moisture intrusion.
 - c. Crossbanding: mineral composite
 - d. Replaceable door edges: Fully wrapped and rounded Acrovyn door edges shall be field replaceable if ever damaged by impact, exclusive of external fasteners to improve appearance.
 - e. WDMA I.S.1A-04 Performance Duty Level: Extra Heavy Duty
 - f. Durability Performance: Cycle Slam WDMA TM-7, 1990 - 1,000,000 cycles to insure durability of entire door construction.
4. Special LIGHTWEIGHT non-fire rated FLUSH doors conforming to WDMA I.S.1A-04 and the following:
- a. Thickness: 1 3/4" +/-1/16", (44.45mm +/- 1.58mm)
 - b. Core: Solid, WDMA "Standard Duty" performance under TM-10 (door face screw holding power), WDMA "Extra Heavy Duty" performance under TM-6, TM-7 & TM-8. Interior stiles and rails bonded. Tops and bottoms factory sealed with an approved sealer to prevent moisture intrusion.
 - 1) Expanded Polystyrene 2.30lb/ft³ (11.23kg/m³) density, CARB Phase I & II emission standards
 - c. Crossbanding: High density FSC certified fiberboard
 - d. Replaceable door stiles: 3/4" (19.05mm) stiles shall be field replaceable if ever damaged by impact.
 - e. Replaceable door edges: Fully wrapped and rounded Acrovyn® door edges shall be field replaceable if ever damaged by impact, exclusive of external fasteners to improve appearance.

- 1) Subject to the terms and conditions of our Limited Warranty for the lifetime of the doors, the manufacturer shall supply replacement Acrovyn edge covers AT NO COST to the Owner.

B. Faces:

1. Finish
 - a. "Chameleon" wood grain or solid color impact resistant, PVC-free Acrovyn. Finish to be: Acrovyn Fossil Teak #1352
2. Face material base color must be integral throughout to eliminate discoloration caused by scratching.
3. Face Veneer Wear Index - Abrasion Resistance Testing - ASTM D4060-90: 28,000 cycles to prove out resistant to scuffing and scratching.
4. Face Veneer Impact Resistance - ASTM D-4226: 86 in/lb. (99.08kg/cm³) to confirm impact resistance of face finish.

C. Door stiles to meet or exceed the following performance testing to ensure hardware fastener holding strength:

1. WDMA TM-8 "Hinge Loading Resistance" Extra Heavy Duty
2. WDMA TM-10 "Screw Holding Capacity" Extra Heavy Duty

D. Door Edges:

1. Finish [Specify Edge finish]
 - a. Edges of door to be PVC-free impact resistant Acrovyn: Finish to be: Acrovyn Fossil Teak #1352
2. Edges are covered by manufacturer "Edge of a Lifetime" Lifetime Limited Warranty from Construction Specialties Acrovyn Door Systems against damage, and begins 1 month after installation.
3. Edges are to fully wrap the door vertical stiles to eliminate banded edges thus improving durability and impact resistance.
4. Replaceable edges to be ¾" (19.05MM) thick for proper edge and face protection.
5. Door edges shall be exclusive of fasteners to improve appearance.
6. Edges must be flush with face of door thus eliminating raised edges that could be torn off.
7. Edges to include ¼" (6.35mm) radius edges to improve impact deflection. Square or banded edges should not be permitted.
8. Edges are to be extruded (not formed) to ensure correct appearance and proper door fit.

9. Edges to be provided as part of the construction of the door from single source manufacturer.

E. Adhesives

1. Crossbanding to core adhesives shall be Type II, urea formaldehyde free I to improve structural integrity of door.
2. Door faces are to be applied to the crossbanded core using Type I, urea formaldehyde free adhesives to eliminate delamination.

2.3 FABRICATION

- A. Factory machine interior wood doors to receive hardware, bevels, undercuts, cutouts, accessories and fitting for frame.
 1. Factory fit fire rated doors according to NFPA 80.
- B. Rout doors for hardware using templates and location heights specified in Section 08 71 00, DOOR HARDWARE.
- C. Factory fit doors to frame, bevel lock edge of doors 3 mm (1/8 inch) for each 50 mm (2 inches) of door thickness undercut where shown.
 1. Doors shall be prefit and beveled at the factory to fit the openings to reduce handling an onsite labor costs.
- D. Clearances between Doors and Frames and Floors:
 1. Fire Rated Doors: Comply with NFPA 80.
 - a. Doors with Automatic Bottom Seal: Maximum clearance 10 mm (3/8 inch) at threshold.
 - b. Other Door Bottoms: Maximum 3 mm (1/8 inch) clearance at the jambs, heads, and meeting stiles, and a 19 mm (3/4 inch) clearance at bottom, except as otherwise specified.
 2. Door Jambs, Heads, and Meeting Stiles: Maximum 3 mm (1/8 inch).
 3. Prefit tolerances shall be in accordance with the requirements of WDMA I.S.1A-04, latest edition.
- E. Provide cutouts for glazed and louver openings.
- F. Finish surfaces, including both faces, top and bottom and edges of the doors smooth to touch.
- G. Identify each door on top edge.
 1. Mark with stamp, brand or other indelible mark, giving manufacturer's name, door's trade name, construction of door, date of manufacture and quality.

2. Mark door or provide separate certification including name of inspection organization.
3. Identify door manufacturing standard, including glue type.
4. Identify veneer and quality certification.
5. Identification of preservative treatment for stile and rail doors.

2.4 ACCESSORIES

A. Louvers

1. Metal Door Louvers: Specified in Section 10200 (08 91 26).

B. Glazing Stops

1. Non-Rated

a. Acrovyn Vision Panel Covers

- 1) Acrovyn, molded to fit over an All Metal Stamping Model 110 metal vision frame.
- 2) Adhered to frame with double sided tape- removable to allow frame/glass access.
- 3) Acrovyn Panel cover finish matches Acrovyn door face finish.

C. Fire Rated

1. Veneer wrapped metal finished frames stained or painted to match the door faces (20, 45 and 60-minute only) or
2. Acrovyn Vision Panels (20, 45 and 60-minute only)

D. Glass: Refer to Section 08 80 00 for glass types. [If glass and glazing is to be supplied by the door manufacturer at factory list out glass size, type, pattern and thickness for factory glazed doors.]

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

1. Verify door frames are properly anchored.
2. Verify door frames are plumb, square, in plane, and within tolerances for door installation.

B. Protect existing construction and completed work from damage.

C. Install astragal on active leaf of pair of smoke doors and one leaf of double egress smoke doors.

3.2 INSTALLATION

- A. Install products according to manufacturer's instructions and approved submittal drawings .
 - 1. Install fire rated doors according to NFPA 80.
 - 2. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 ADJUSTING

- A. Operating: Re-hang or replace doors that do not swing or operate freely.
- B. Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

3.4 PROTECTION

- A. After installation, place shipping container over door and tape in place.
 - 1. Do not apply tape to door faces and edges.
- B. Provide protective covering over exposed hardware in addition to covering door.
- C. Maintain covering in good condition until removal is directed by Contracting Officer's Representative.

- - E N D - -

02-01-16
Renovate Tower of Building 1
VAMC, Sioux Falls, SD
VA Project #438-18-102

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SECTION 08 31 13
ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access doors and panels installed in walls and ceilings.

1.2 RELATED REQUIREMENTS

- A. Lock Cylinders: Section 08 71 00, DOOR HARDWARE.
- B. Field Painting: Section 09 91 00, PAINTING.
- C. Finish Color: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Not Used.
- E. Not Used
- F. Locations of Access Doors for Ductwork Cleanouts: Section 23 31 00, HVAC DUCTS AND CASINGS.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American Welding Society (AWS):
 1. D1.3/D1.3M-08 - Structural Welding Code - Sheet Steel.
- C. ASTM International (ASTM):
 1. A653/A653M-15 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Sip Process.
 2. A1008/A1008M-15 - Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Baked Hardenable.
 3. A666-15 - Annealed or Cold-Worked Austenitic Stainless Steel sheet, Strip, Plate, and Flat Bar.
 4. E119-15 - Fire Test of Building Construction and Materials.
- D. National Fire Protection Association (NFPA):
 1. 80-16 - Fire Doors and Other Opening Protectives.
 2. 251-12 - Fire Tests of Door Assemblies.
- E. National Association of Architectural Metal Manufacturers (NAAMM):
 1. AMP 500-06 - Metal Finishes Manual.
- F. UL LLC (UL):
 1. Listed - Online Certifications Directory.
 2. 10B-08 - Standard for Fire Tests of Door Assemblies.

3. 263-11 - Fire Tests of Building Construction and Materials.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and fabrication and installation details.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Installation instructions.
- D. Sustainable Construction Submittals:
 - 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

1.5 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.6 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight facility.
- B. Protect products from damage during handling and construction operations.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify field conditions affecting access door fabrication and installation. Show field measurements on Submittal Drawings.
 - 1. Coordinate field measurement and fabrication schedule to avoid delay.

1.8 WARRANTY

- A. Construction Warranty: Contractor's one-year labor and material warranty, FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel Sheet: ASTM A1008/A1008M.

- B. Galvanized Steel: ASTM A 653/A 653M.
- C. Stainless Steel: ASTM A666; Type 302 or Type 304.

2.2 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide each product from one manufacturer.
- C. Sustainable Construction Requirements:
 - 1. Steel Access Doors Recycled Content: 30 percent total recycled content, minimum.
 - 2. Stainless Steel Access Doors Recycled Content: 70 percent total recycled content, minimum.

2.3 ACCESS DOORS, FIRE-RATED

- A. Door Construction:
 - 1. Ceiling Access Door Construction: ASTM E119 or UL 263.
 - 2. Wall Access Doors: NFPA 252 or UL 10B.
- B. Label: Class B opening according to UL 10B or test by another nationally recognized laboratory. 1 hour fire-rated .
- C. Door Panel: Minimum 0.9 mm (0.0359 inch) thick stainless steel sheet, with mineral-fiber insulation core, insulated sandwich type construction.
- D. Frame: Minimum 1.5 mm (0.0598 inch) thick steel sheet, depth and configuration to suit material and construction type where installed.
 - 1. Frame Flange: Provide at units installed in concrete, masonry, or gypsum board.
 - 2. Exposed Joints in Flange: Weld and grind smooth.
 - 3. Not Used.
- E. Provide automatic closing device.
- F. Hinge: Continuous stainless steel hinge with stainless steel pin.
- G. Lock: Self-latching, mortise type with provision for fitting flush a standard screw-in type lock cylinder.
 - 1. Lock cylinder specified in Section 08 71 00, DOOR HARDWARE.
 - 2. Latch release device operable from inside of door.
- H. Anchors for Fire-Rated Access Doors: Comply with requirements of applicable fire test.

2.4 ACCESS DOORS, FLUSH PANEL, NON-RATED

- A. Door Panel:

1. 1.5 mm (0.06 inch) thick stainless steel sheet.
2. Reinforce to maintain flat surface.

B. Frame:

1. 1.5 mm (0.06 inch) thick stainless steel sheet, depth and configuration to suit material and construction type where installed.
2. Frame Flange: Provide at units installed in concrete, masonry, and gypsum board.
3. Exposed Joints in Flange: Weld and grind smooth.
4. Not Used

C. Hinge:

1. Concealed spring hinge, 175 degrees of opening.
2. Removable hinge pin to allow removal of door panel from frame.

D. Lock:

1. Flush, screwdriver-operated cam lock.
2. Tamper proof screws (spanner head locks) for access panels in Behavioral Health Areas.

2.5 ACCESS DOOR, RECESSED PANEL, NON-RATED

A. Door Panel:

1. 1.2 mm (0.05 inch) thick stainless steel sheet to form a 25 mm (1 inch) deep recessed pan to accommodate installation of acoustical units and other materials where shown in walls and ceiling.
2. Reinforce to prevent sagging.

B. Frame:

1. 1.5 mm (0.06 inch) thick steel sheet of depth and configuration to suit installation in suspension system of ceiling or wall framing.
2. Extend sides of frame to protect edge of acoustical units when door panel is in open position.
3. Provide shims, bushings, clips and other devices necessary for installation.

C. Hinge: Continuous stainless steel hinge with stainless steel pin, or concealed hinge.

D. Lock:

1. Flush screwdriver-operated cam lock.
2. Plastic sleeve or stainless steel grommet to protect hole made in acoustical unit for screwdriver access to lock.

3. Tamper proof screws (spanner head locks) for access panels in Behavioral Health Areas.

2.6 FABRICATION - GENERAL

- A. Size: Minimum 600 mm (24 inches) square door unless otherwise shown or required to suit opening in suspension system of ceiling.
- B. Component Fabrication: Straight, square, flat and in same plane where required.
 1. Exposed Edges: Slightly rounded, without burrs, snags and sharp edges.
 2. Exposed Welds: Continuous, ground smooth.
 3. Welding: AWS D1.3/D1.3M.
- C. Locks and Non-Continuous Hinges: Provide in numbers required to maintain alignment of door panel with frame. For fire-rated doors, provide hinges and locks as required by fire test. Anchoring: Make provisions in frame for anchoring to adjacent construction. Provide anchors in size, number and location on four sides to secure access door to substrate. Provide anchors as required by fire test.

2.7 FINISHES

- A. Steel Paint Finish:
 1. Powder-Coat Finish: Manufacturer's standard two-coat finish system consisting of the following:
 - a. One coat primer.
 - b. One coat thermosetting topcoat.
 - c. Dry-film Thickness: 0.05 mm (2 mils) minimum.
 - d. Color: Refer to Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Stainless Steel Exposed Surfaces: NAAMM AMP 500; No. 4 polished finish.

2.8 ACCESSORIES

- A. Fasteners: Type and size recommended by access door manufacturer, to suit application.
 1. Stainless Steel Access Doors: Stainless steel fasteners.
 2. Not Used.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.

1. Verify access door locations and sizes provide required maintenance access to installed building services components.
- B. Protect existing construction and completed work from damage.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions // and approved submittal drawings.
 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Install access doors and panels permitting access to service valves, traps, dampers, cleanouts, and other mechanical, electrical and conveyor control items concealed in walls and partitions, and concealed above gypsum board and plaster ceilings.
- C. Install fire rated access door according to NFPA 80.
- D. Install fire-rated doors in fire-rated partitions and ceilings.
- E. Install flush access panels in partitions and in gypsum board and plaster ceilings.
- F. Install recessed panel access doors where appropriate to match adjacent surfaces.

3.3 ACCESS DOOR AND FRAME INSTALLATION

- A. Wall Installations: Install access doors in openings with sides vertical.
- B. Ceiling Installations: Install access doors parallel to ceiling suspension grid or room partitions.
- C. Frames without Flanges: Install frame flush with surrounding finish surfaces.
- D. Frames with Flanges: Overlap opening, with face uniformly spaced from finish surface.
- E. Recessed Panel Access Doors: Install with face of surrounding materials flush with door panel installed finish.
- F. Secure frames to adjacent construction with fasteners.
- G. Install type, size and quantity of anchoring device suitable for material surrounding opening to maintain alignment, and resist displacement, during normal use of access door.
- H. Field Painting Primed Access Doors: Comply with the requirements of Section 09 91 00, PAINTING.

3.4 ADJUSTMENT

- A. Adjust hardware so door panel opens freely.
- B. Adjust door when closed so door panel is centered in frame.

- - E N D - -

SECTION 08 34 83
FLOOR DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes floor doors.
- B. Related Requirements:
 - 1. Section 077200 "Roof Accessories" for roof hatches.
 - 2. Section 083113 "Access Doors and Frames" for wall- and ceiling-mounted access doors and frames.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details materials, individual components and profiles, and finishes.
- B. Product Schedule: For floor doors.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 ALUMINUM FLOOR DOORS

- A. Recessed Cover Aluminum Floor Door:
 - 1. Basis of Design: Bilco, Type T – Single Leaf, 24” x 24” or approved equal.
 - 2. Frame: Mill finish aluminum, angle profile.
 - 3. Door: Single leaf; 1/4-inch-thick (6.4-mm-thick) aluminum plate with 1/8-inch-deep (3.2-mm-deep) recess for application of finish materials.
 - 4. Loading Capacity: 150-lbf/sq. ft. (7.2-kN/sq. m) pedestrian live load.
 - 5. Hardware:

- a. Material and Finish: Type 316 stainless steel, including latch and lifting mechanism assemblies, hold-open arms, and brackets, hinges, pins, and fasteners.
- b. Hinges: Heavy-duty butt hinges with stainless-steel pins.
- c. Operating Mechanism: Adjustable counterbalancing springs, heavy-duty hold-open arm that automatically locks door open at 90 degrees, release handle with vinyl grip that allows for one-handed closure, and recessed lift handle.
- d. Latch: Stainless-steel slam latch.
- e. Lock: Keyed deadbolt lock.

2.3 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- C. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- E. Rolled-Stainless-Steel Floor Plate: ASTM A 793, manufacturer's standard finish.
- F. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666. Remove tool and die marks and stretch lines, or blend into finish.
- G. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- H. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- I. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- J. Frame Anchors: Same material as door face.
- K. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.4 FABRICATION

- A. General: Provide floor doors manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure floor doors to types of supports indicated.

- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 - 1. For cylinder locks, furnish two keys per lock and key all locks alike.
 - 2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.
- E. Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that comes in contact with concrete.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
- E. Prime Painted Steel: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
- F. Stainless-Steel Finish: Bright, cold-rolled, unpolished No. 2B finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor doors.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 08 34 83

SECTION 08 41 13
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Aluminum-framed entrances and storefronts.

1.2 RELATED REQUIREMENTS

- A. Door Finish and Color: Section 09 06 00, SCHEDULE FOR FINISHES, and as specified herein.
- B. Glass and Glazing: Section 08 80 00, GLAZING.
- C. Hardware: Section 08 71 00, DOOR HARDWARE.
- D. Automatic Door Actuators: Section 08 71 13, AUTOMATIC DOOR OPERATORS.
- E. Aluminum Finish and Color: Section 09 06 00, SCHEDULE FOR FINISHES, and as specified herein.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American Architectural Manufacturers Associations (AAMA):
1. 2603-15 - Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 2. 2604-13 - Performance Requirements and Test Procedures for High Performance Organic Coatings on Architectural Extrusions and Panels.
 3. 2605-13 - Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- C. American Welding Society (AWS):
1. D1.2/D1.2M-14 - Structural Welding Code - Aluminum.
- D. ASTM International (ASTM):
1. A240/A240M-15b - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 2. B209-14 - Aluminum and Aluminum-Alloy Sheet and Plate.
 3. B209M-14 - Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
 4. B221-14 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 5. B221M 13 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
 6. D1187/D1187M-97(2011)e1 - Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

7. E283-04(2012) - Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
8. E330/E330M-14 -Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
9. E331-00(2009) - Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
10. E1886-13a - Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missiles and Exposed to Cyclic Pressure Differentials.
11. E1996-14a - Performance of Exterior Windows, Curtain Walls, Doors, and impact Protective Systems Impacted by Windborne Debris in Hurricanes.
12. F468-15 - Nonferrous Bolts, Hex Cap Screws, and Studs for General Use.
13. F593-13a - Stainless Steel Bolts, Hex Cap Screws, and Studs.
- E. National Association of Architectural Metal Manufacturers (NAAMM):
 1. AMP 500-06 - Metal Finishes Manual.
- F. National Fenestration Rating Council (NFRC):
 1. 500-14(E1A0) - Determining Fenestration Product Condensation Resistance Values.
- G. United States Veterans Administration (VA):
 1. PSDSDD - Physical Security Design Standards Data Definitions.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.
 1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Contractor.
 - c. Installer.
 - d. Other installers responsible for adjacent and intersecting work.
 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Installation schedule.
 - b. Installation sequence.

- c. Preparatory work.
 - d. Protection before, during, and after installation.
 - e. Installation.
 - f. Terminations.
 - g. Transitions and connections to other work.
 - h. Other items affecting successful completion.
3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings: Minimum 1 to 2 (half size) scale.
 1. Show size, configuration, and fabrication and installation details.
 2. Show anchorage and reinforcement.
 3. Show interface and relationship to adjacent work, including thermal, air, and water barrier continuity.
- C. Manufacturer's Literature and Data:
 1. Description of each product.
 2. Doors, each type.
 3. Entrance and Storefront construction.
 4. Installation instructions.
 5. Warranty.
- D. Samples:
 1. Door Corner Section: Minimum 450 mm x 450 mm (18 x 18 inches) for each specified door type, showing head rail and hinge stile, door closer reinforcement, internal reinforcement and insulation in flush panel door .
 2. Aluminum Anodized Finish: wo sample extrusions minimum 150 mm (6 inches) long for each specified color in sets of three showing maximum color range.
 3. Not Used.
- E. Sustainable Construction Submittals:
 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
- F. Test reports: Certify each product complies with specifications.
- G. Certificates: Certify each product complies with specifications.

1. Certify anodized finish thickness.
- H. Qualifications: Substantiate qualifications comply with specifications.
 1. Manufacturer with project experience list .
 2. Installer with project experience list .
 3. Welders and welding procedures.
- I. Delegated Design Drawings and Calculations: Signed and sealed by responsible design professional.
 1. Show location and magnitude of loads applied to building structural frame.
 2. Identify deviations from details shown on drawings.
- J. Operation and Maintenance Data:
 1. Care instructions for each exposed finish product.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 1. Regularly manufactures specified products.
 2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.
 - a. Project Experience List: Provide contact names and addresses for completed projects.
- B. Installer Qualifications: Product manufacturer. Manufacturer authorized representative.
 1. Regularly installs specified products.
 2. Installed specified products with satisfactory service on five similar installations for minimum five years.
 - a. Project Experience List: Provide contact names and addresses for completed projects.
- C. Welders and Welding Procedures Qualifications: AWS D1.2/D1.2M.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.
- D. Store products indoors in dry, weathertight conditioned facility.
- E. Protect products from damage during handling and construction operations.

1.8 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."
- B. Manufacturer's Warranty: Warrant painted finish against material and manufacturing defects.
 - 1. Warranty Period: 20 years.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Delegated Design: Prepare submittal documents including design calculations and drawings signed and sealed by registered design professional, licensed in state where work is located.
 - 1. Minor deviations to details shown on drawings to accommodate manufacturer's standard products may be accepted by Contracting Officer's Representative when deviations do not affect design concept and specified performance.
- B. Design aluminum framed entrances and storefronts complying with specified performance:
 - 1. Wind and Seismic Load Resistance: ASCE/SEI 7; Design criteria as indicated on Drawings when tested according to ASTM E330/E330M.
 - a. Wind Load: 1.4 kPa (30 psf) positive and negative, minimum.
 - b. Maximum Deflection: 1/175 of span, maximum with minimum 1.65 safety factor.
 - 2. Thermal Movement: Accommodate ambient temperature range of 67 degrees C (120 degrees F).
 - 3. Condensation Resistance: NFRC 500.
 - a. Fixed Framing: 45 CRF, minimum.
 - 4. Water Resistance: ASTM E331; No uncontrolled penetration at 380 Pa (8 psf), minimum, pressure differential.
 - 5. Fixed Framing Air Infiltration Resistance: ASTM E283; 0.30 L/s/sq. m (0.06 cfm/sf), maximum at 300 Pa (6.24 psf), minimum, pressure differential.
 - 6. Entrance Doors Air Infiltration Resistance: ASTM E283; maximum allowable at 75 Pa (1.57 psf), minimum, pressure differential.
 - a. Single Doors: 2.5 L/s/sq. m (0.5 cfm/sf).
 - b. Paired Doors: 6 L/s/sq. m (1.2 cfm/sf).

2.2 MATERIALS

- A. Aluminum:
 - 1. Sheet Metal: ASTM B209M (ASTM B209), minimum 1.6 mm (0.063 inch) thick.
 - 2. Extrusions: ASTM B221M (ASTM B221).
 - a. Framing: Minimum 3 mm (0.125 inch) wall thickness.
 - b. Glazing Beads, Moldings, and Trim: Minimum 1.25 mm (0.050 inch) thick.
 - 3. Alloy 6063 temper T5 for doors, door frames, fixed glass, storefronts.
 - 4. Alloy 6061 temper T6 for guide tracks for sliding doors and other extruded structural members.
 - 5. Color Anodized Aluminum: Provide aluminum alloy required to produce specified color. Color to match existing window color exterior theme as selected by architect from manufacturer standard.
- B. Stainless Steel: ASTM A240/A240M; Type 302 or Type 304.
- C. Thermal Break: Manufacturer standard low conductive material retarding heat flow in the framework, where insulating glass is scheduled.

2.3 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide aluminum framed entrances and storefronts from one manufacturer and from one production run .
- C. Provide aluminum entrances, storefront systems from same manufacturer.
- D. Sustainable Construction Requirements:
 - 1. Aluminum Recycled Content: 50 percent total recycled content, minimum.

2.4 FRAMES

- A. Framing Members: Extruded aluminum, thermally broken .
- B. Stops: Provide integral fixed stops and glass rebates and snap-on removable stops.
- C. Provide concealed screws, bolts and other fasteners.
- D. Secure cover boxes to frames in back of lock strike cutouts.

2.5 STILE AND RAIL DOORS

- A. Stiles and Rails: Extruded aluminum, thermally broken .
 - 1. Thickness: 45 mm (1-3/4 inch).
 - 2. Stiles and Head Rails: 90 mm (3-1/2 inches) wide.

3. Bottom Rails: 250 mm (10 inches) wide.
- B. Single-Acting Doors:
1. Bevel: 3 mm (1/8 inch) at lock, hinge, and meeting stile edges.
 2. Clearances: 2 mm (1/16 inch) at hinge stiles, 3 mm (1/8 inch) at lock stiles and top rails, and 5 mm (3/16 inch) at floors and thresholds.
- C. Glass Rebates: Integral with stiles and rails.
- D. Glazing Beads: Extruded aluminum, 1.3 mm (0.050 inch) thick. Integral with stiles and rails or applied type, snap-fit secured.
- E. Stile and Rail Joints: Welded or interlocking dovetail joints between stiles and rails.
1. Clamp door together through top and bottom rails with 9 mm (3/8 inch) primed steel tie rod extending into stiles, and having self-locking nut and washer at both ends.
 2. Reinforce stiles and rails to prevent door distortion when tie rods are tightened.
 3. Provide compensating spring-type washer under each nut for stress relief.
 4. Construct joints to remain rigid and tight when door is operated.
- F. Weather-stripping: Removable, woven pile type (silicone-treated) weather-stripping attached to aluminum or vinyl holder.
1. Make slots for applying weather-stripping integral with doors and door frame stops.
 2. Apply continuous weather-stripping to heads, jambs, bottom, and meeting stiles of doors and frames so doors swing freely and close positively.

2.6 FLUSH PANEL DOORS

- A. Frames: Aluminum extrusions.
- B. Doors: 45 mm (1-3/4 inches) thick.
1. Door Edges and Internal Reinforcing: Extruded aluminum tubes, single piece full height and width, welded joints.
 2. Core: Manufacturer's standard non-combustible insulation.
 3. Faces: Aluminum sheet metal with internal impact reinforcement, laminated to the door edges and core.

2.7 COLUMN COVERS AND TRIM

- A. Column Covers and Trim: Sheet aluminum fabrications shown from sheet aluminum of longest available lengths.
- B. Provide concealed fasteners.
- C. Provide aluminum stiffeners and supporting members shown on drawings and as required to maintain component integrity and shape.

2.8 FABRICATION

- A. Form metal parts and fit and assemble joints, except joints designed to accommodate movement. Seal joints to resist air infiltration and water penetration.
- B. Welding:
 - 1. Make welds without distorting and discoloring exposed surfaces.
 - 2. Clean and dress welds. Remove welding flux and weld spatter.
- C. Prepare and reinforce doors and frames for hardware and accessories.
 - 1. Coordinate preparation with specified hardware. See Section 08 71 00, DOOR HARDWARE.
 - 2. Fabricate reinforcement from stainless steel plates.
 - a. Hinge and pivot reinforcing: Minimum 4.5 mm (0.179 inch) thick.
 - b. Lock Face, Flush Bolts, Concealed Holders, Concealed and Surface Mounted Closers Reinforcing: Minimum 2.6 mm (0.104 inch) thick.
 - c. Other Surface Mounted Hardware Reinforcing: Minimum 1.5 mm (0.059 inch) thick.
 - 3. Where concealed hardware is specified, provide space, cutouts, and reinforcement for installation and secure fastening.
- D. Factory assemble doors.

2.9 FINISHES

- A. Aluminum Anodized Finish: NAAMM AMP 500.
 - 1. Not Used.
 - 2. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.018 mm (0.7 mil) thick. Color to match existing window color exterior theme as selected by architect from manufacturer standard.
 - 3. Not Used.
 - 4. Not Used.
- B. Not Used.

2.10 ACCESSORIES

- A. Dielectric Tape: Plastic, non-absorptive, with pressure sensitive adhesive; 0.18 to 0.25 mm (7 to 10 mils) thick.
- B. Barrier Coating: ASTM D1187/D1187M.
- C. Welding Materials: AWS D1.2/D1.2M, type to suit application.
- D. Fasteners:
 - 1. Aluminum: ASTM F468, Alloy 2024.
 - 2. Stainless Steel: ASTM F593, Alloy Groups 1, 2 and 3.
- E. Anchors: Aluminum or stainless steel; type to suit application.
- F. Galvanizing Repair Paint: MPI No. 18.
- G. Touch-Up Paint: Match shop finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
 - 1. Coordinate floor closer installation recessed into concrete slabs.
 - 2. Coordinate anchor installation built into masonry and concrete.
- B. Protect existing construction and completed work from damage.
- C. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.
- D. Apply dielectric tape or barrier coating to aluminum surfaces in contact with dissimilar metals and cementitious materials to minimum 0.7 mm (30 mils) dry film thickness.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings .
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Install aluminum framed entrances and storefronts plumb and true, in alignment and to lines shown on drawings.
- C. Anchor frames to adjoining construction at heads, jambs and sills.
- D. Provide concealed aluminum clips to connect adjoining frame sections.
- E. Install door hardware and hang doors. See Section 08 71 00, DOOR HARDWARE.

- F. Install door operators. See Section 08 71 13, AUTOMATIC DOOR OPERATORS.
- G. Adjust doors and hardware uniform clearances and proper operation.
- H. Touch up damaged factory finishes.
 - 1. Repair galvanized surfaces with galvanized repair paint.
 - 2. Repair painted surfaces with touch up primer.
- I. Tolerances:
 - 1. Variation from Plumb, Level, Warp, and Bow: Maximum 3 mm in 3 m (1/8 inch in 10 feet).
 - 2. Variation from Plane: Maximum 3 mm in 3.65 m (1/8 inch in 12 feet); 6 mm (1/4 inch) over total length.
 - 3. Variation from Alignment: Maximum 1.5 mm (1/16 inch) in-line offset and maximum 3 mm (1/8 inch) corner offset.
 - 4. Variation from Square: Maximum 3 mm (1/8 inch) diagonal measurement differential.

3.3 PROTECTION, CLEANING AND REPAIRING

- A. Clean exposed aluminum and glass surfaces. Remove contaminants and stains.
- B. Protect aluminum-framed entrances and storefronts from construction operations.
- C. Remove protective materials immediately before acceptance.
- D. Repair damage.

- - - E N D - - -

SECTION 08 42 29.23

SLIDING AUTOMATIC ENTRANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes interior, sliding, power-operated automatic entrances.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For sliding automatic entrances.
 - 1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
 - 2. Include diagrams for power, signal, and control wiring.
 - 3. Indicate locations of activation and safety devices.
 - 4. Include hardware schedule and indicate hardware types, functions, quantities, and locations.
- C. Samples: For each type of exposed finish required.

1.4 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Product test reports.
- C. Field quality-control reports.
- D. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation and maintenance of units required for this Project and who employs a Certified Inspector.
- B. Certified Inspector Qualifications: Certified by AAADM.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of automatic entrances that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 AUTOMATIC ENTRANCE ASSEMBLIES

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Power-Operated Door Standard: BHMA A156.10.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design automatic entrances.
- B. Structural Performance: Automatic entrances shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

- D. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 1.25 cfm/sq. ft. (6.4 L/s x sq. m) of fixed entrance-system area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa).

2.3 SLIDING AUTOMATIC ENTRANCES

- A. General: Provide manufacturer's standard automatic entrances, including doors, sidelites, framing, headers, carrier assemblies, roller tracks, door operators, controls, and accessories required for a complete installation.

- B. Sliding Telescoping Automatic Entrance :

1. Biparting-Telescoping-Sliding Units:

- a. Basis of Design: Stanley, Dura- Max 5400 Series, 6-panel Telescoping or approved equal.

2. Configuration: Biparting-sliding doors with two sliding leaves sidelites on each side.

- a. Traffic Pattern: Two way.
- b. Emergency Breakaway Capability: Sliding leaves only.
- c. Mounting: Between jambs].

3. Operator Features:

- a. Power opening and closing.
- b. Drive System: Chain or belt.
- c. Adjustable opening and closing speeds.
- d. Adjustable hold-open time between zero and 30 seconds.
- e. Obstruction recycle.
- f. On-off/hold-open switch to control electric power to operator, key operated.

4. Sliding-Door Carrier Assemblies and Overhead Roller Tracks: Carrier assembly that allows vertical adjustment; consisting of nylon- or delrin-covered, ball-bearing-center steel wheels operating on a continuous roller track, or ball-bearing-center steel wheels operating on a nylon- or delrin-covered, continuous roller track. Support doors from carrier assembly by cantilever and pivot assembly.

- a. Rollers: Minimum of two ball-bearing roller wheels and two antirise rollers for each active leaf.

5. Sliding-Door Threshold: Threshold members and bottom-guide-track system with stainless-steel, ball-bearing-center roller wheels.

- a. Configuration: Saddle-type threshold across door opening and surface-mounted guide-track system at sidelites.

6. Controls: Activation and safety devices according to BHMA standards.
 - a. Activation Device: Motion sensor mounted on each side of door header to detect pedestrians in activating zone and to open door.
 - b. Safety Device: Presence sensor mounted on each side of door header and two photoelectric beams mounted in sidelite jambs on one side of the door to detect pedestrians in presence zone and to prevent door from closing.
 - c. Sidelite Safety Device: Presence sensor, mounted above each sidelite on side of door opening through which doors travel, to detect obstructions and to prevent door from opening.
7. Finish: Finish framing, door(s), and header with Class I, color anodic finish.
 - a. Color: As selected by Architect from full range of industry colors and color densities.

2.4 ENTRANCE COMPONENTS

- A. Framing Members: Extruded aluminum, minimum 0.125 inch (3.2 mm) thick and reinforced as required to support imposed loads.
 1. Nominal Size: 1-3/4 by 6 inches (45 by 150 mm).
- B. Stile and Rail Doors: 1-3/4-inch- (45-mm-) thick, glazed doors with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular stile and rail members. Mechanically fasten corners with reinforcing brackets that are welded, or incorporate concealed tie-rods that span full length of top and bottom rails.
 1. Glazing Stops and Gaskets: Snap-on, extruded-aluminum stops and preformed gaskets.
 2. Stile Design: Medium stile, 3-1/2-inch (90-mm) nominal width.
 3. Muntin Bars: Horizontal tubular rail member for each door; match stile design and finish.
- C. Headers: Fabricated from minimum 0.125-inch- (3.2-mm-) thick extruded aluminum and extending full width of automatic entrance units to conceal door operators and controls. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.
 1. Mounting: Concealed, with one side of header flush with framing.
- D. Signage: As required by cited BHMA standard.
 1. Application Process: Door manufacturer's standard process.

2.5 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 1. Extrusions: ASTM B 221 (ASTM B 221M).

2. Sheet: ASTM B 209 (ASTM B 209M).

- B. Steel Reinforcement: Reinforcement with corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Use surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
- C. Stainless-Steel Bars: ASTM A 276/A 276M or ASTM A 666, type 304, type 316.
- D. Stainless-Steel Tubing: ASTM A 554, Grade MT 304, Grade MT 316.
- E. Expanded Aluminum Mesh: Expanded, Expanded and flattened aluminum sheet according to the geometry of ASTM F 1267.
- F. Polycarbonate Sheet: ASTM C 1349, Appendix X1, type II, coated, mar-resistant, UV-stabilized polycarbonate with coating on both surfaces.
- G. Glazing: As specified in Section 088000 "Glazing."
- H. Sealants and Joint Fillers: As specified in Section 079200 "Joint Sealants."
- I. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout; complying with ASTM C 1107/C 1107M; of consistency suitable for application.
- J. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- K. Fasteners and Accessories: Corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.6 DOOR OPERATORS AND CONTROLS

- A. General: Provide operators and controls, which include activation and safety devices, according to BHMA standards, for condition of exposure, and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.
- B. Door Operators: Provide door operators of size recommended by manufacturer for door size, weight, and movement.
 - 1. Door Operator Performance: Door operators shall open and close doors and maintain them in fully closed position when subjected to Project's design wind loads.
 - 2. Electromechanical Operators: Concealed, self-contained, overhead units powered by fractional-horsepower, permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor; with solid-state microprocessor controller; complying with UL 325; and with manual operation with power off.
- C. Motion Sensors: Self-contained, K-band-frequency, microwave-scanner units; fully enclosed by their plastic housings; adjustable to provide detection-field sizes and functions required by BHMA A156.10.

1. Provide capability for switching between bi- and unidirectional detection.
 2. For one-way traffic, sensor on egress side shall not be active when doors are fully closed.
- D. Presence Sensors: Self-contained, active-infrared scanner units; adjustable to provide detection-field sizes and functions required by BHMA A156.10. Sensors shall remain active at all times.
- E. Photoelectric Beams: Pulsed infrared, sender-receiver assembly for recessed mounting. Beams shall not be active when doors are fully closed.
- F. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.7 HARDWARE

- A. General: Provide units in sizes and types recommended by automatic entrance and hardware manufacturers for entrances and uses indicated. Finish exposed parts to match door finish unless otherwise indicated.
- B. Breakaway Device for Power-Operated Doors: Device that allows door to swing out in direction of egress to full 90 degrees from any operating position. Interrupt powered operation of door operator while in breakaway mode.
- C. Automatic Locking: Electrically controlled device mounted in header that automatically locks sliding door in closed position, preventing door panels from sliding manually. Provide fail-secure operation if power fails.
1. Power Interruption: Lock shall be engaged, preventing doors from sliding manually.
 2. Means of Egress: Standard breakaway feature.
- D. Uninterrupted Power Supply: UL 1778, fully integrated unit mounted within header.
- E. Weather Stripping: Replaceable components.
1. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.8 FABRICATION

- A. General: Factory fabricate automatic entrance components to designs, sizes, and thicknesses indicated and to comply with indicated standards.
- B. Framing: Provide automatic entrances as prefabricated assemblies. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site.
1. Provide components with concealed fasteners and anchor and connection devices.
 2. Fabricate components with accurately fitted joints, with ends coped or mitered to produce hairline joints free of burrs and distortion.
 3. Fabricate exterior components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior.

4. Provide anchorage and alignment brackets for concealed support of assembly from building structure.
 5. Allow for thermal expansion of exterior units.
- C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.
- D. Door Operators: Factory fabricated and installed in headers, including adjusting and testing.
- E. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated, according to GANA's "Glazing Manual."
- F. Hardware: Factory install hardware to greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site. Cut, drill, and tap for factory-installed hardware before applying finishes.
1. Provide sliding-type weather stripping, mortised into door, at perimeter of doors.
- G. Controls:
1. General: Factory install activation and safety devices in doors and headers as required by BHMA A156.10 for type of door and direction of travel.

2.9 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install automatic entrances according to manufacturer's written instructions and cited BHMA A156.10 for direction of pedestrian travel, including signage, controls, wiring, and connection to the building's power supply.
1. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
 2. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
 3. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous coating.
- B. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.

2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.
 3. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior.
 4. Level recesses for recessed thresholds using nonshrink grout.
- C. Door Operators: Connect door operators to electrical power distribution system.
- D. Controls: Install and adjust activation and safety devices according to manufacturer's written instructions and cited BHMA standard for direction of pedestrian travel. Connect control wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- E. Glazing: Install glazing as specified in Section 088000 "Glazing."
- F. Sealants: Comply with requirements specified in Section 079200 "Joint Sealants" to provide weathertight installation.
1. Set bottom-guide-track system, framing members and flashings in full sealant bed.
 2. Seal perimeter of framing members with sealant.
- G. Signage: Apply signage on both sides of each door, as required by cited BHMA standard for direction of pedestrian travel.
- H. Wiring within Automatic Entrance Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's written limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 FIELD QUALITY CONTROL

- A. Certified Inspector: Engage a Certified Inspector to test and inspect components, assemblies, and installations, including connections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
1. Test and inspect each automatic entrance, using AAADM inspection forms, to determine compliance of installed systems with applicable BHMA standards.
- C. Automatic entrances will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.3 ADJUSTING

- A. Adjust hardware, moving parts, door operators, and controls to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.
- B. Readjust door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain automatic entrances.

END OF SECTION 08 42 29.23

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SECTION 08 51 13
ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum windows for new construction and renovation work .

1.2 RELATED REQUIREMENTS

- A. Sealing Joints: Section 07 92 00, JOINT SEALANTS.
- B. Glazing: Section 08 80 00, GLAZING.
- C. Color of finish: Section 09 06 00, SCHEDULE FOR FINISHES, and as specified herein.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American Architectural Manufacturers Associations (AAMA):
 1. AAMA/WDMA/CSA 101/I.S.2/A440-11 - Windows, Doors, and Skylights.
 2. AAMA 505-09 - Dry Shrinkage and Composite Performance Thermal Cycle Test Procedures.
 3. AAMA 2605-13 - Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
 4. AAMA TIR A8-08 - Structural Performance of Composite Thermal Barrier Framing System.
- C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):
 1. 7-10 - Minimum Design Loads for Buildings and Other Structures.
- D. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
 1. 90.1-13 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- E. ASTM International (ASTM):
 1. B209-14 - Aluminum and Aluminum-Alloy Sheet and Plate.
 2. B209M-14 - Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
 3. B221-14 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

4. B221M-13 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
5. E283-04(2012) - Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
6. E331-00(2009) - Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.
 1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Contractor.
 - c. Installer.
 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Installation schedule.
 - b. Installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.
 - e. Installation.
 - f. Transitions and connections to other work.
 - g. Other items affecting successful completion.
 3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTAL

- A. Submit according to Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 1. Indicate window types required for project.
 2. Identify window unit components by name and type of metal or material, show construction, locking systems, mechanical operators, trim, installation and anchorages.
 3. Include glazing details and standards for factory glazed units.
- C. Manufacturer's Literature and Data:

1. Description of each product.
 2. Installation instructions.
 3. Warranty.
- D. Sustainable Construction Submittals:
1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
- E. Samples:
1. Window Frame: 150 mm (6 inch) long samples showing finishes, specified.
- F. Test reports: Indicate each product complies with specifications.
1. Windows.
 2. Operating hardware.
- G. Certificates: Indicate each product complies with requirements (window characteristics may be on window schedule or other drawings).

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
1. Regularly manufactures specified products.
 2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.
 - a. Provide contact names and addresses for completed projects when requested by Contracting Officer's Representative.
- B. Quality Certified Labels or Certificates:
1. AAMA Label affixed to each window indicating compliance with specification.
 2. Certificates in lieu of label with copy of test report maximum 4 years old from independent testing laboratory and certificate signed by window manufacturer stating that windows provided comply with specified requirements and AAMA/WDMA/CSA 101/I.S.2/A440 for type of window specified.

1.7 STORAGE AND HANDLING

- A. Protect windows from damage during handling and construction operations before, during and after installation.
- B. Store windows under cover, setting upright.
- C. Do not stack windows flat.
- D. Do not lay building materials or equipment on windows.

1.8 WARRANTY

- A. Construction Warranty: Contractor's one year labor and material warranty, FAR clause 52.246-21, "Warranty of Construction."
- B. Manufacturer's Warranty: Warrant windows against material and manufacturing defects.
 - 1. Warranty Period: 10 years.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Design windows complying with specified performance:
 - 1. Load Resistance: ASCE/SEI 7 .
 - a. Performance Grade: AAMA/WDMA/CSA 101/I.S.2/A440 required to resist maximum positive and negative wind load.
 - 2. Thermal Transmittance: Maximum U-value W/sq. m/degree K (Btu/sq. ft./hr./degree F).
 - a. Insulating Glass Windows: U-0.5.
 - b. Dual Glazed Windows: U-0.7, or as required by ASHRAE 90.1.
 - 3. Condensation Resistance Factor (CRF): NFRC 500 Minimum CRF of C 55.
 - 4. Water Resistance: ASTM E331; No uncontrolled penetration at 390 Pa (8.00 psf), minimum, pressure differential.
 - 5. Air Infiltration Resistance: ASTM E283; 0.3 cfm/sq. ft., maximum at 300 Pa (6.24 psf) , minimum, pressure differential.
- B. Provide the following operation types for locations indicated on the Drawings.
 - 1. Casement Windows:
 - a. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440, minimum AW-40 .

2.2 MATERIALS

- A. Aluminum Extrusions: ASTM B221M (ASTM B221); 6063 alloy, T5 temper.
- B. Aluminum Sheet: ASTM B209M (ASTM B209); 5005 alloy, H15 or H34 temper.

2.3 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide windows from one manufacturer.
- C. Sustainable Construction Requirements:
 - 1. Aluminum Recycled Content: 80 total recycled content, minimum.

2.4 ALUMINUM WINDOWS

- A. Frames and Sashes: Aluminum extrusions, AAMA/WDMA/CSA 101/I.S.2/A440.
- B. Thermal-Break Window Construction:
 - 1. Manufacturer's Standard.
 - 2. Low conductance thermal barrier.
 - 3. Capable of structurally holding sash in position and together.
 - 4. Thermal Break Assemblies: Tested according to AAMA TIR A8 and AAMA 505.
 - 5. Design location of thermal break so that, in closed position, outside air does not come in direct contact with interior frame of window.
- C. Mullions: Match window units.
- D. Provide anchors and other related accessories required for installation.

2.5 GLAZING

- A. Glass and Glazing: As specified in Section 08 80 00, GLAZING.
 - 1. Factory glaze windows.
 - 2. Weep holes through glazed areas are not acceptable.

2.6 INSECT SCREENING

- A. Screen Mesh: 18 by 18, AAMA/WDMA/CSA 101/I.S.2/A440.
 - 1. Screen Cloth: Aluminum .
- B. Frame: Aluminum, match window unit finish type and color, unless otherwise indicated.

2.7 HARDWARE

- A. Locks: Two position locking bolts or cam type tamperproof custodial locks with a single point control located not higher than 1500 mm (60 inches) from floor level. Locate locking devices in vent side rail. Provide concealed or nonremovable fastenings for locks and keepers.
- B. Locking Device Strikes: Locate adjustable strikes in frame jamb. Fabricate strikes from Type 304 stainless steel or white bronze.
- C. Fabricate hinges of noncorrosive metal. Hinges may be either fully concealed when window is closed or semi-concealed with exposed knuckles and hospital tips. Surface mounted hinges are not acceptable.
- D. Guide Blocks: Fabricate guide blocks of injection molded nylon. Install guide block fully concealed in vent/frame sill.

- E. Hardware for Emergency Ventilation of Windows:
 - 1. Provide windows with hold open linkage.
 - 2. Provide hold open hardware for maximum 150 mm (6 inches) of window opening with adjustable friction shoe to provide resistance when closing window.
 - 3. Handles: Removable type.
- F. Hardware for Maintenance Opening of Windows: Opening beyond limit stop position accomplished by maintenance key captured by release device when window is in open position.
 - 1. Design operating device to prevent opening with standard tools, coins or bent wire devices.
- G. Pole Operators:
 - 1. Provide pole operator and pole hanger where operable windows have hardware more than 1500 mm (60 inches) above floor, but not over 3000 mm (10 feet) above floor.
 - 2. Fabricate pole of tubular anodized aluminum with rubber cap at lower end and standard push-pull hook at top end to match hardware design.
 - 3. Provide sufficient length for window operation without reaching more than 1500 mm (60 inches) above floor.
 - 4. Provide one operating pole and one pole hanger in each room or space where pole operation of windows is required.
- H. Weather Stripping: AAMA/WDMA/CSA 101/I.S.2/A440; leaf type weather-stripping is not acceptable.
- I. Provide wrenches, keys, or removable locking operating handles, as specified to operate windows.
 - 1. Provide one emergency ventilating operating handle for every four windows.
 - 2. Provide maintenance or window washer operating handles as required.

2.8 FABRICATION

- A. Fabricate windows to comply specified performance class and grade.
 - 1. Assemble frame and sash so fasteners are concealed when window is closed.
 - 2. Attach locking and hold-open devices to windows with concealed fasteners.
 - 3. Where extrusion wall thickness is less than 3 mm (0.125 inch) thick, provide backup plates or similar reinforcements for fasteners.

4. Use stainless steel fasteners to secure Venetian blind hanger clips, vent guide blocks, friction adjuster, and limit opening device.
- B. Aluminum Trim:
1. Trim includes casings, closures, and panning.
 2. Fabricate to shapes shown, minimum 1.6 mm (0.062 inch) thick.
 3. Extruded or formed sections, straight, true, and smooth on exposed surfaces. Curved sections true to line .
 4. Exposed external corners mitered and internal corners coped; fitted with hairline joints.
 5. Reinforce 1.6 mm (0.062 inch) thick members with minimum 3 mm (1/8 inch) thick aluminum.
 6. Except for strap anchors, provide reinforcing for fastening near ends and spaced maximum 300 mm (12 inches) on center.
 7. Design to allow unrestricted expansion and contraction of members and window frames.
 8. Secure to window frames with machine screws or expansion rivets.
 9. Exposed screws, fasteners or pop rivets are not acceptable on exterior of casing or trim cover system.
- C. Aluminum Subsills and Stools:
1. Fabricate to shapes shown, minimum 2 mm (0.080 inch) thick extrusion.
 2. One piece full length of opening with concealed anchors.
 3. Sills turned up back edge minimum 6 mm (1/4 inch). Front edge provide with drip.
 4. Sill back edge behind face of window frame. Do not extend to interior surface or bridge thermal breaks.
 5. Do not perforate for anchorage, clip screws, or other requirements.

2.9 FINISHES

- A. Finish window units according to NAAMM AMP 500 series.
- B. Anodized Aluminum:
1. Not Used
 2. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.018 mm (0.7 mil) thick. Color to match existing window color exterior theme as selected by architect from manufacturer standard.

- C. Not Used
- D. Hardware: Finish hardware exposed when window is in closed position to match window.

2.10 ACCESSORIES

- A. Fasteners: AAMA/WDMA/CSA 101/I.S.2/A440; non-magnetic stainless steel.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
 - 1. Verify openings are within acceptable tolerances.
- B. Protect existing construction and completed work from damage.
- C. Remove existing windows to permit new installation when replacement window is available, and ready for immediate installation.
 - 1. Remove existing work carefully; avoid damage to existing work indicated to remain.
 - 2. Perform other operations as necessary to prepare openings for proper installation and operation of new windows.
 - 3. Do not leave openings uncovered at end of working day, during precipitation or temperatures below 16 degrees C (60 degrees F).

3.2 INSTALLATION, GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings .
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Where type, size or spacing of fastenings for securing window accessories or equipment to building construction is not shown or specified, provide expansion or toggle bolts or screws, as best suited to construction material.
 - 1. Provide bolts or screws minimum 6 mm (1/4 inch) in diameter.
 - 2. Sized and spaced to resist tensile and shear loads imposed.
 - 3. Do not install exposed fasteners on exterior, except when unavoidable for application of hardware.
 - 4. Provide non-magnetic stainless steel Phillips flat-head machine screws for exposed fasteners, where required, or special tamper-proof fasteners.

5. Locate fasteners to avoid disturbing window thermal break.
- C. Set windows plumb, level, true, and in alignment; without warp or rack of frames or sash.
- D. Anchor windows on four sides with anchor clips or fin trim.
 1. Do not allow anchor clips to bridge thermal breaks.
 2. Use separate clips for both sides of thermal breaks.
 3. Make connections to allow for thermal and other movements.
 4. Do not allow building load to bear on windows.
 5. Use manufacturer's standard clips at corners and maximum 600 mm (24 inches) on center.
 6. Where fin trim anchorage is indicated build into adjacent construction, anchoring at corners and maximum 600 mm (24 inches) on center.
- E. Sills and Stools:
 1. Set in bed of mortar or other compound to fully support, true to line shown.
 2. Do not extend sill to inside window surface or past thermal break.
 3. Leave space for sealants at ends and to window frame unless indicated otherwise.

3.3 MULLIONS CLOSURES, TRIM, AND PANNING

- A. Cut mullion full height of opening and anchor directly to window frame on both sides.
- B. Closures, Trim, and Panning: External corners mitered and internal corners coped, fitted with hairline, tightly closed joints.
 1. Secure to concrete and solid masonry with expansion bolts, expansion rivets, split shank drive bolts, or powder actuated drive pins.
 2. Toggle bolt to hollow masonry units.
 3. Screw to wood and metal.
- C. Fasten except for strap anchors, near ends and corners and maximum 300 mm (12 inches) on center.
- D. Seal units following installation to provide weathertight system.

3.4 ADJUSTING

- A. Adjust ventilating sash and hardware to provide tight fit at contact points, and at weather-stripping for smooth operation and weathertight closure.

3.5 FIELD TESTING

- A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Test Method: AAMA 502.
- C. Test Specimen:
 - 1. Include window assembly and construction. Affix test chamber to interior side of test specimen and the conduct testing using positive static air pressure (Test method A).
 - 2. Test specimens to be selected by the Contracting Officer's Representative after windows have been installed according to the drawings and specification.

3.6 CLEANING

- A. Lubricate hardware and moving parts.
- B. Remove excess glazing and sealant compounds.
- C. Clean exposed aluminum and glass surfaces. Remove contaminants and stains.
- D. Keep windows locked except while adjusting and testing.

- - E N D - -

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Door hardware and related items necessary for complete installation and operation of doors.

1.2 RELATED WORK

- A. Caulking: Section 07 92 00 JOINT SEALANTS.
- B. Application of Hardware: Section 08 14 00, WOOD DOORS, Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS Section 08 71 13, AUTOMATIC DOOR OPERATORS,
- C. Finishes: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Painting: Section 09 91 00, PAINTING.
- E. Card Readers: Section 28 13 00, PHYSICAL ACCESS CONTROL SYSTEMS.
- F. Electrical: Division 26, ELECTRICAL.
- G. Fire Detection: Section 28 31 00, FIRE DETECTION AND ALARM.

1.3 GENERAL

- A. All hardware shall comply with UFAS, (Uniform Federal Accessible Standards) unless specified otherwise.
- B. Provide rated door hardware assemblies where required by most current version of the International Building Code (IBC).
- C. Hardware for Labeled Fire Doors and Exit Doors: Conform to requirements of NFPA 80 for labeled fire doors and to NFPA 101 for exit doors, as well as to other requirements specified. Provide hardware listed by UL, except where heavier materials, large size, or better grades are specified herein under paragraph HARDWARE SETS. In lieu of UL labeling and listing, test reports from a nationally recognized testing agency may be submitted showing that hardware has been tested in accordance with UL test methods and that it conforms to NFPA requirements.
- D. Hardware for application on metal and wood doors and frames shall be made to standard templates. Furnish templates to the fabricator of these items in sufficient time so as not to delay the construction.
- E. The following items shall be of the same manufacturer, except as otherwise specified:
 - 1. Mortise locksets.
 - 2. Hinges for hollow metal and wood doors.

- 3. Surface applied overhead door closers.
- 4. Exit devices.
- 5. Floor closers.

1.4 WARRANTY

- A. Automatic door operators shall be subject to the terms of FAR Clause 52.246-21, except that the Warranty period shall be two years in lieu of one year for all items except as noted below:
 - 1. Locks, latchsets, and panic hardware: 5 years.
 - 2. Door closers and continuous hinges: 10 years.

1.5 MAINTENANCE MANUALS

- A. In accordance with Section 01 00 00, GENERAL REQUIREMENTS Article titled "INSTRUCTIONS", furnish maintenance manuals and instructions on all door hardware. Provide installation instructions with the submittal documentation.

1.6 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Submit 6 copies of the schedule per Section 01 33 23. Submit 2 final copies of the final approved schedules to VAMC Locksmith as record copies (VISN Locksmith if the VAMC does not have a locksmith).
- B. Hardware Schedule: Prepare and submit hardware schedule in the following form:

Hardware Item	Quantity	Size	Reference Publication Type No.	Finish	Mfr. Name and Catalog No.	Key Control Symbols	UL Mark (if fire rated and listed)	ANSI/BHMA Finish Designation

- C. Samples and Manufacturers' Literature:
 - 1. Samples: All hardware items (proposed for the project) that have not been previously approved by Builders Hardware Manufacturers Association shall be submitted for approval. Tag and mark all items with manufacturer's name, catalog number and project number.

2. Samples are not required for hardware listed in the specifications by manufacturer's catalog number, if the contractor proposes to use the manufacturer's product specified.

- D. Certificate of Compliance and Test Reports: Submit certificates that hardware conforms to the requirements specified herein. Certificates shall be accompanied by copies of reports as referenced. The testing shall have been conducted either in the manufacturer's plant and certified by an independent testing laboratory or conducted in an independent laboratory, within four years of submittal of reports for approval.

1.7 DELIVERY AND MARKING

- A. Deliver items of hardware to job site in their original containers, complete with necessary appurtenances including screws, keys, and instructions. Tag one of each different item of hardware and deliver to COR for reference purposes. Tag shall identify items by Project Specification number and manufacturer's catalog number. These items shall remain on file in COR's office until all other similar items have been installed in project, at which time the COR will deliver items on file to Contractor for installation in predetermined locations on the project.

1.8 PREINSTALLATION MEETING

- A. Convene a preinstallation meeting not less than 30 days before start of installation of door hardware. Require attendance of parties directly affecting work of this section, including Contractor and Installer, Architect, Project Engineer and VA Locksmith, Hardware Consultant, and Hardware Manufacturer's Representative. Review the following:
1. Inspection of door hardware.
 2. Job and surface readiness.
 3. Coordination with other work.
 4. Protection of hardware surfaces.
 5. Substrate surface protection.
 6. Installation.
 7. Adjusting.
 8. Repair.
 9. Field quality control.
 10. Cleaning.

1.9 INSTRUCTIONS

- A. Hardware Set Symbols on Drawings: Except for protective plates, door stops, mutes, thresholds and the like specified herein, hardware requirements for each door are indicated on drawings by symbols. Symbols for hardware sets consist of letters (e.g., "HW") followed by a number. Each number designates a set of hardware items applicable to a door type.
- B. Keying: All cylinders shall be keyed into existing Great Grand Master Key System. Provide removable core cylinders that are removable only with a special key or tool without disassembly of knob or lockset.. Keying information shall be furnished at a later date by the COR.
 - 1. Keying information will be furnished to the Contractor by the COR.
 - 2. Supply information regarding key control of cylinder locks to manufacturers of equipment having cylinder type locks. Notify Resident Engineer immediately when and to whom keys or keying information is supplied. Return all such keys to the COR.

1.10 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. In text, hardware items are referred to by series, types, etc., listed in such specifications and standards, except as otherwise specified.
- B. American Society for Testing and Materials (ASTM):
 - F883-04Padlocks
 - E2180-07.....Standard Test Method for Determining the
Activity of Incorporated Antimicrobial Agent(s)
In Polymeric or Hydrophobic Materials
- C. American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA):
 - A156.1-06Butts and Hinges
 - A156.2-03Bored and Pre-assembled Locks and Latches
 - A156.3-08Exit Devices, Coordinators, and Auto Flush
Bolts
 - A156.4-08Door Controls (Closers)

- A156.5-14Cylinders and Input Devices for Locks.
- A156.6-05Architectural Door Trim
- A156.8-05Door Controls-Overhead Stops and Holders
- A156.11-14Cabinet Locks
- A156.12-05Interconnected Locks and Latches
- A156.13-05Mortise Locks and Latches Series 1000
- A156.14-07Sliding and Folding Door Hardware
- A156.15-06Release Devices-Closer Holder, Electromagnetic
and Electromechanical
- A156.16-08Auxiliary Hardware
- A156.17-04Self-Closing Hinges and Pivots
- A156.18-06Materials and Finishes
- A156.20-06Strap and Tee Hinges, and Hasps
- A156.21-09Thresholds
- A156.22-05Door Gasketing and Edge Seal Systems
- A156.23-04Electromagnetic Locks
- A156.24-03Delayed Egress Locking Systems
- A156.25-07Electrified Locking Devices
- A156.26-06Continuous Hinges
- A156.28-07Master Keying Systems
- A156.29-07Exit Locks and Alarms
- A156.30-03High Security Cylinders
- A156.31-07Electric Strikes and Frame Mounted Actuators
- A156.36-10Auxiliary Locks
- A250.8-03Standard Steel Doors and Frames
- D. National Fire Protection Association (NFPA):
 - 80-10Fire Doors and Other Opening Protectives
 - 101-09Life Safety Code
- E. Underwriters Laboratories, Inc. (UL):
 - Building Materials Directory (2008)

PART 2 - PRODUCTS

2.1 BUTT HINGES

- A. ANSI A156.1. Provide only three-knuckle hinges, except five-knuckle where the required hinge type is not available in a three-knuckle version (e.g., some types of swing-clear hinges). The following types

of butt hinges shall be used for the types of doors listed, except where otherwise specified:

1. Exterior Doors: Type A2112/A5112 for doors 900 mm (3 feet) wide or less and Type A2111/A5111 for doors over 900 mm (3 feet) wide. Hinges for exterior outswing doors shall have non-removable pins. Hinges for exterior fire-rated doors shall be of stainless steel material.
 2. Interior Doors: Type A8112/A5112 for doors 900 mm (3 feet) wide or less and Type A8111/A5111 for doors over 900 mm (3 feet) wide. Hinges for doors exposed to high humidity areas (shower rooms, toilet rooms, kitchens, janitor rooms, etc. shall be of stainless steel material.
- B. Provide quantity and size of hinges per door leaf as follows:
1. Doors up to 1210 mm (4 feet) high: 2 hinges.
 2. Doors 1210 mm (4 feet) to 2260 mm (7 feet 5 inches) high: 3 hinges minimum.
 3. Doors greater than 2260 mm (7 feet 5 inches) high: 4 hinges.
 4. Doors up to 900 mm (3 feet) wide, standard weight: 114 mm x 114 mm (4-1/2 inches x 4-1/2 inches) hinges.
 5. Doors over 900 mm (3 feet) to 1065 mm (3 feet 6 inches) wide, standard weight: 127 mm x 114 mm (5 inches x 4-1/2 inches).
 6. Doors over 1065 mm (3 feet 6 inches) to 1210 mm (4 feet), heavy weight: 127 mm x 114 mm (5 inches x 4-1/2 inches).
 7. Provide heavy-weight hinges where specified.
 8. At doors weighing 330 kg (150 lbs.) or more, furnish 127 mm (5 inch) high hinges.
- C. See Articles "MISCELLANEOUS HARDWARE" and "HARDWARE SETS" for pivots and hinges other than butts specified above and continuous hinges specified below.
- a) Basis of Design / Acceptable Manufacturer(s):
 - a. McKinney
 - b. Others as approved equal.

2.2 CONTINUOUS HINGES

- A. ANSI/BHMA A156.26, Grade 1-600.
1. Listed under Category N in BHMA's "Certified Product Directory."
- B. General: Minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height

of door and frame and to template screw locations; with components finished after milling and drilling are complete

- C. Continuous, Barrel-Type Hinges: Hinge with knuckles formed around a Teflon-coated 6.35mm (0.25-inch) minimum diameter pin that extends entire length of hinge.
1. Base Metal for Exterior Hinges: Stainless steel.
 2. Base Metal for Interior Hinges: Steel.
 3. Base Metal for Hinges for Fire-Rated Assemblies: Steel.
 4. Provide with non-removable pin (hospital tip option) at lockable outswing doors.
 5. Where required to clear adjacent casing, trim, and wall conditions and allow full door swing, provide wide throw hinges of minimum width required.
 6. Provide with manufacturer's cut-outs for separate mortised power transfers and/or mortised automatic door bottoms where they occur.
 7. Where thru-wire power transfers are integral to the hinge, provide hinge with easily removable portion to allow easy access to wiring connections.
 8. Where models are specified that provide an integral wrap-around edge guard for the hinge edge of the door, provide manufacturer's adjustable threaded stud and machine screw mechanism to allow the door to be adjusted within the wrap-around edge guard.
 - a) Basis of Design / Acceptable Manufacturer(s):
 - a. Markar
 - b. Pemko
 - c. McKinney
 - d. Others as approved equal
- A. 2.3 DOOR CLOSING DEVICES ANSI A156.4, Grade 1. Door closers shall have cast iron or aluminum shells. The arms shall be forged. Finish shall match the hardware on the side of the door to which the closer is mounted. All door closers shall have full rack and pinion mechanism with adjustable control for "sweep", "latch", and "backcheck" speeds. All adjustments shall require the use of tamper-proof tools or valve keys. Closers shall be equipped with adjustable spring power to adjust the closer size from size 2 to size 6.

B. Furnish inverted installations, parallel arms, holder arms, drop plates, etc. as required to suit conditions. With closers mounted as follows unless details or other conditions dictate otherwise:

1. Room side of corridor doors.
2. Inside of exterior doors (use parallel arm or top jamb mounting)
3. Stair side of stairways.

Closer shall be attached with thru-bolts on the following:

1. Mineral core doors.
2. Lead Lined Doors;

C. Hardware schedule shall indicate the closer manufacturer, finish, accessories, and degree of opening for each item.

a) Basis of Design / Acceptable Manufacturer(s):

- a. LCN 4000 Series
- b. Others as approved equal.

2.4 AUTOMATIC DOOR OPERATOR

A. Reference Section 08 71 13 .

2.5 NOT USED

2.6 DOOR STOPS

A. Conform to ANSI A156.16.

B. Provide door stops wherever an opened door or any item of hardware thereon would strike a wall, column, equipment or other parts of building construction. For concrete, masonry or quarry tile construction, use lead expansion shields for mounting door stops.

C. Where cylindrical locks with turn pieces or pushbuttons occur, equip wall bumpers Type L02251 (rubber pads having concave face) to receive turn piece or button.

D. Provide floor stops (Type L02141 or L02161 in office areas; Type L02121 x 3 screws into floor elsewhere. Wall bumpers, where used, must be installed to impact the trim or the door within the leading half of its width. Floor stops, where used, must be installed within 4-inches of the wall face and impact the door within the leading half of its width.

E. Where drywall partitions occur, use floor stops, Type L02141 or L02161 in office areas, Type L02121 elsewhere.

F. Provide stop Type L02011, as applicable for exterior doors. At outswing doors where stop can be installed in concrete, provide stop mated to concrete anchor set in 76mm (3-inch) core-drilled hole and filled with quick-setting cement.

- G. Omit stops where floor mounted door holders are required and where automatic operated doors occur.
- H. Provide appropriate roller bumper for each set of doors (except where closet doors occur) where two doors would interfere with each other in swinging.
- I. Provide appropriate door mounted stop on doors in individual toilets where floor or wall mounted stops cannot be used.
- J. Provide overhead surface applied stop Type C02541, ANSI A156.8 on patient toilet doors in bedrooms where toilet door could come in contact with the bedroom door.
- K. Provide door stops on doors where combination closer magnetic holders are specified, except where wall stops cannot be used or where floor stops cannot be installed within 4-inches of the wall.
- L. Where the specified wall or floor stop cannot be used, provide concealed overhead stops (surface-mounted where concealed cannot be used).
 - a) Basis of Design / Acceptable Manufacturer(s):
 - a. Rockwood
 - b. Ives
 - c. Others as approved equal

2.7 OVERHEAD DOOR STOPS AND HOLDERS

- A. Conform to ANSI Standard A156.8. Overhead holders shall be of sizes recommended by holder manufacturer for each width of door. Set overhead holders for 110 degree opening, unless limited by building construction or equipment. Provide Grade 1 overhead concealed slide type: stop-only at rated doors and security doors, hold-open type with exposed hold-open on/off control at all other doors requiring overhead door stops.
 - a) Basis of Design / Acceptable Manufacturer(s):
 - a. Rixson 9 Series
 - b. Others as approved equal.

2.8 FLOOR DOOR HOLDERS

- A. Conform to ANSI Standard A156.16. Provide extension strikes for Types L01301 and L01311 holders where necessary.

2.9 LOCKS AND LATCHES

- A. Conform to ANSI A156.2. Locks and latches for doors 45 mm (1-3/4 inch) thick or over shall have beveled fronts. Cylinders for all locksets shall be removable core type. Cylinders shall be furnished with construction removable cores and construction master keys. Cylinder shall be removable by special key or tool. Construct all cores so that they will be interchangeable into the core housings of all mortise locks, rim locks, cylindrical locks, and any other type lock included in the Great Grand Master Key System. Disassembly of lever or lockset shall not be required to remove core from lockset. All locksets or latches on double doors with fire label shall have latch bolt with 19 mm (3/4 inch) throw, unless shorter throw allowed by the door manufacturer's fire label. Provide temporary keying device or construction core to allow opening and closing during construction and prior to the installation of final cores.
- B. In addition to above requirements, locks and latches shall comply with following requirements:
1. Mortise Lock and Latch Sets: Conform to ANSI/BHMA A156.13. Mortise locksets shall be series 1000, minimum Grade 2. All locksets and latchsets, except on designated doors in Psychiatric (Mental Health) areas, shall have lever handles fabricated from cast stainless steel. Provide sectional (lever x rose) lever design matching building standard. No substitute lever material shall be accepted. All locks and latchsets shall be furnished with 122.55 mm (4-7/8-inch) curved lip strike and wrought box. At outswing pairs with overlapping astragals, provide flat lip strip with 21mm (7/8-inch) lip-to-center dimension. Lock function F02 shall be furnished with emergency tools/keys for emergency entrance. All lock cases installed on lead lined doors shall be lead lined before applying final hardware finish. Furnish armored fronts for all mortise locks. Where mortise locks are installed in high-humidity locations or where exposed to the exterior on both sides of the opening, provide non-ferrous mortise lock case.
 - a) Basis of Design / Acceptable Manufacturer(s):
 - a. Sargent 8200 Series "LNL"
 - b. Schlage L9000 Series
 - c. Others as approved equal.

3. Cylindrical Lock and Latch Sets: levers shall meet ADA (Americans with Disabilities Act) requirements. Cylindrical locksets shall be series 4000 Grade I. All locks and latchsets shall be furnished with 122.55 mm (4-7/8-inch) curved lip strike and wrought box. At outswing pairs with overlapping astragals, provide flat lip strip with 21mm (7/8-inch) lip-to-center dimension. Provide lever design to match design selected by Architect or to match existing lever design. Where two turn pieces are specified for lock F76, turn piece on inside knob shall lock and unlock inside knob, and turn piece on outside knob shall unlock outside knob when inside knob is in the locked position. (This function is intended to allow emergency entry into these rooms without an emergency key or any special tool.)

a) Acceptable Manufacturer(s):

- a. Sargent 10-Line "LL"
- b. Schlage ND Series
- c. Others as approved equal

3. Auxiliary locks shall be as specified under hardware sets and conform to ANSI A156.36.
4. Locks on designated doors in Psychiatric (Mental Health) areas shall be paddle type with arrow projection covers and be UL Listed. Provide these locks with paddle in the down position on both sides of the door. Locks shall be fabricated of wrought stainless steel.
5. Privacy locks in non-mental-health patient rooms shall have an inside thumbturn for privacy and an outside thumbturn for emergency entrance. Single occupancy patient privacy doors shall typically swing out; where such doors cannot swing out, provide center-pivoted doors with rescue hardware (see HW-2B).

2.10 NOT USED

2.11 ELECTROMAGNETIC LOCKS

- A. ANSI/BHMA A156.23; electrically powered, of strength and configuration indicated; with electromagnet attached to frame and armature plate attached to door. Listed under Category E in BHMA's "Certified Product Directory."

1. Type: Full exterior or full interior, as required by application indicated.
 2. Strength Ranking: Not less than 1000 lbf (4448 N).
 3. Inductive Kickback Peak Voltage: Not more than 27 V.
 4. Residual Magnetism: Not more than 0 lbf (0 N) to separate door from magnet.
- B. Delayed-Egress Locks: BHMA A156.24 Listed under Category G in BHMA's "Certified Product Directory".
1. Means of Egress Doors: Lock releases within 15 seconds after applying a force not more than 15 lbf (67 N) for not more than 3 seconds, as required by NFPA 101.
 2. Security Grade: Activated from secure side of door by initiating device.
 3. Movement Grade: Activated by door movement as initiating device.
 4. The lock housing shall not project more than 4-inches (101mm) from the underside of the frame head stop.

2.12 ELECTRIC STRIKES

- A. ANSI/ BHMA A156.31 Grade 1.
- B. General: Use fail-secure electric strikes at fire-rated doors.

2.13 KEYS

- A. Stamp all keys with change number and key set symbol. Furnish keys in quantities as follows:

Locks/Keys	Quantity
Cylinder locks	2 keys each
Cylinder lock change key blanks	100 each different key way
Master-keyed sets	6 keys each
Grand Master sets	6 keys each
Great Grand Master set	5 keys
Control key	2 keys

- B. Psychiatric keys shall be cut so that first two bittings closest to the key shoulder are shallow to provide greater strength at point of greatest torque.

2.14 KEY CABINET

- A. ANSI Standard A156.11. Provide key cabinet made of cold rolled, 1.2 mm (0.0478 inch) thick furniture steel electro-welded. Doors shall have

"no sag" continuous brass-pin piano type hinge and be equipped with chrome plated locking door handles, hook cam and mechanical pushbutton door lock. Key Cabinet and Key Control System shall accommodate all keys for this project plus 25 percent. Provide minimum number of multiple cabinets where a single cabinet of largest size will not accommodate the required number of keys.

- B. Key tags shall consist of two sets: Permanent self-locking and loan key snaphook type with tag colors as follows: Red fiber marker of the permanent self-locking type approximately 32 mm (1-1/4 inch) in diameter engraved with the legend "FILE KEY MUST NOT BE LOANED." Also furnish for each hook a white cloverleaf key marker with snap-hooks engraved with the legend "LOAN KEY."
- C. The manufacturer of the lock cylinders and locks shall attach a key tag to keys of each lock cylinder and shall mark thereon the respective item number and key change number. Provide each group of keys in a key gathering envelope (supplied by Key Cabinet Manufacturer) in which the lock manufacturer shall include the following information: Item number, key change number and door number. The contractor shall furnish the Key Cabinet Manufacturer the hardware and keying schedules and change keys.
- D. The Key Cabinet Manufacturer shall set up a three-way cross index system, including master keys, listing the keys alphabetically, the hooks numerically and the key changes numerically on different colored index cards. Index cards shall be typewritten and inserted in a durable binder. Attach the keys to the two sets of numbered tags supplied with the cabinet. (The permanent tag and the loan key tag). Instruct the owner in proper use of the system. Install cabinet as directed by the Resident Engineer.

2.15 ARMOR PLATES, KICK PLATES, MOP PLATES AND DOOR EDGING

- A. Conform to ANSI Standard A156.6.
- B. Provide protective plates and door edging as specified below:
 - 1. Kick plates, mop plates and armor plates of metal, Type J100 series.
 - 2. Provide kick plates and mop plates where specified. Kick plates shall be 254 mm (10 inches) or 305 mm (12 inches) high. Mop plates shall be 152 mm (6 inches) high. Both kick and mop plates shall be minimum 1.27 mm (0.050 inches) thick. Provide kick and mop plates beveled on all 4 edges (B4E). On push side of doors where jamb stop

extends to floor, make kick plates 38 mm (1-1/2 inches) less than width of door, except pairs of metal doors which shall have plates 25 mm (1 inch) less than width of each door. Extend all other kick and mop plates to within 6 mm (1/4 inch) of each edge of doors. Kick and mop plates shall butt astragals. For jamb stop requirements, see specification sections pertaining to door frames.

3. Kick plates and/or mop plates are not required on following door sides:
 - a. Armor plate side of doors;
 - b. Exterior side of exterior doors;
 - c. Closet side of closet doors;
 - d. Both sides of aluminum entrance doors.
4. Armor plates for doors are listed under Article "Hardware Sets". Armor plates shall be thickness as noted in the hardware set, 875 mm (35 inches) high and 38 mm (1-1/2 inches) less than width of doors, except on pairs of metal doors. Provide armor plates beveled on all 4 edges (B4E). Plates on pairs of metal doors shall be 25 mm (1 inch) less than width of each door. Where top of intermediate rail of door is less than 875 mm (35 inches) from door bottom, extend armor plates to within 13 mm (1/2 inch) of top of intermediate rail. On doors equipped with panic devices, extend armor plates to within 13 mm (1/2 inch) of panic bolt push bar.
5. Where louver or grille occurs in lower portion of doors, substitute stretcher plate and kick plate in place of armor plate. Size of stretcher plate and kick plate shall be 254 mm (10 inches) high.
6. Provide stainless steel edge guards where so specified at wood doors. Provide mortised type instead of surface type except where door construction and/or ratings will not allow. Provide edge guards of bevel and thickness to match wood door. Provide edge guards with factory cut-outs for door hardware that must be installed through or extend through the edge guard. Provide full-height edge guards except where door rating does not allow; in such cases, provide edge guards to height of bottom of typical lockset armor front. Forward edge guards to wood door manufacturer for factory installation on doors.
 - a) Basis of Design / Acceptable Manufacturer(s):
 - a. Rockwood

- b. Hiawatha
- c. Others as approved equal.

2.16 EXIT DEVICES

- A. Conform to ANSI Standard A156.3. Exit devices shall be Grade 1; type and function are specified in hardware sets. Provide flush with finished floor strikes for vertical rod exit devices in interior of building. Trim shall have cast satin stainless steel lever handles of design similar to locksets, unless otherwise specified. Provide key cylinders for keyed operating trim and, where specified, cylinder dogging.
- B. Surface vertical rod panics shall only be provided less bottom rod; provide fire pins as required by exit device and door fire labels. Do not provide surface vertical rod panics at exterior doors.
- C. Concealed vertical rod panics shall be provided less bottom rod at interior doors, unless lockable or otherwise specified; provide fire pins as required by exit device and door fire labels. Where concealed vertical rod panics are specified at exterior doors, provide with both top and bottom rods.
- D. Where removable mullions are specified at pairs with rim panic devices, provide mullion with key-removable feature.
- E. At non-rated openings with panic hardware, provide panic hardware with key cylinder dogging feature.
- F. Exit devices for fire doors shall comply with Underwriters Laboratories, Inc., requirements for Fire Exit Hardware. Submit proof of compliance.
 - a) Basis of Design / Acceptable Manufacturer(s):
 - a. Sargent: 80 Series
 - b. Von Duprin: 99/98 Series
 - c. Others as approved equal.

2.17 FLUSH BOLTS (LEVER EXTENSION)

- A. Conform to ANSI A156.16. Flush bolts shall be Type L24081 unless otherwise specified. Furnish proper dustproof strikes conforming to ANSI A156.16, for flush bolts required on lower part of doors.
- B. Lever extension manual flush bolts shall only be used at non-fire-rated pairs for rooms only accessed by maintenance personnel.

- C. Face plates for cylindrical strikes shall be rectangular and not less than 25 mm by 63 mm (1 inch by 2-1/2 inches).
- D. Friction-fit cylindrical dustproof strikes with circular face plate may be used only where metal thresholds occur.
- E. Provide extension rods for top bolt where door height exceeds 2184 mm (7 feet 2 inches).
 - a) Basis of Design / Acceptable Manufacturer(s):
 - a. Rockwood
 - b. Hiwawtha
 - c. Others as approved equal.

2.18 FLUSH BOLTS (AUTOMATIC)

- A. Conform to ANSI A156.3. Dimension of flush bolts shall conform to ANSI A115. Bolts shall conform to Underwriters Laboratories, Inc., requirements for fire door hardware. Flush bolts shall automatically latch and unlatch. Furnish dustproof strikes conforming to ANSI A156.16 for bottom flushbolt. Face plates for dustproof strike shall be rectangular and not less than 38 mm by 90 mm (1-1/2 by 3-1/2 inches).
- B. At interior doors, provide auto flush bolts less bottom bolt, unless otherwise specified, except at wood pairs with fire-rating greater than 20 minutes; provide fire pins as required by auto flush bolt and door fire labels.
 - a) Basis of Design / Acceptable Manufacturer(s):
 - a. Rockwood
 - b. Ives
 - c. Others as approved equal.

2.19 DOOR PULLS WITH PLATES

- A. Conform to ANSI A156.6. Pull Type J401, 152 mm CTC (6 inches CTC) length by 19 mm (3/4 inches) diameter minimum with plate Type J302, 90 mm by 381 mm (3-1/2 inches by 15 inches), unless otherwise specified. Provide pull with projection of 57.2 mm (2 1/4 inches) minimum and a clearance of 38.1 mm (1 1/2 inches) minimum. Cut plates of door pull plate for cylinders, or turn pieces where required.
 - a) Basis of Design / Acceptable Manufacturer(s):
 - a. Rockwood
 - b. Hiwawtha

c. Others as approved equal.

2.20 PUSH PLATES

A. Conform to ANSI A156.6. Metal, Type J302, 203 mm (8 inches) wide by 406.4 mm (16 inches) high. Provide metal Type J302 plates 102 mm (4 inches) wide by 406.4 mm (16 inches) high where push plates are specified for doors with stiles less than 203 mm (8 inches) wide. Cut plates for cylinders, and turn pieces where required.

a) Basis of Design / Acceptable Manufacturer(s):

- a. Rockwood
- b. Hiwawtha
- c. Others as approved equal.

2.21 COMBINATION PUSH AND PULL PLATES

A. Conform to ANSI 156.6. Type J303, stainless steel 3 mm (1/8 inch) thick, 80 mm (3-1/3 inches) wide by 800 mm (16 inches) high), top and bottom edges shall be rounded. Secure plates to wood doors with 38 mm (1-1/2 inch) long No. 12 wood screws. Cut plates for turn pieces, and cylinders where required. Pull shall be mounted down.

a) Basis of Design / Acceptable Manufacturer(s):

- a. Rockwood
- b. Hiwawtha
- c. Others as approved equal.

2.22 COORDINATORS

A. Conform to ANSI A156.16. Coordinators, when specified for fire doors, shall comply with Underwriters Laboratories, Inc., requirements for fire door hardware. Coordinator may be omitted on exterior pairs of doors where either door will close independently regardless of the position of the other door. Coordinator may be omitted on interior pairs of non-labeled open where open back strike is used. Open back strike shall not be used on labeled doors. Paint coordinators to match door frames, unless coordinators are plated. Provide bar type coordinators, except where gravity coordinators are required at acoustic pairs. For bar type coordinators, provide filler bars for full width and, as required, brackets for push-side surface mounted closers, overhead stops, and vertical rod panic strikes.

a) Basis of Design / Acceptable Manufacturer(s):

- a. Rockwood

- b. Ives
- c. Others as approved equal.

2.23 THRESHOLDS

- A. Conform to ANSI A156.21, mill finish extruded aluminum, except as otherwise specified. In existing construction, thresholds shall be installed in a bed of sealant with ¼-20 stainless steel machine screws and expansion shields. In new construction, embed aluminum anchors coated with epoxy in concrete to secure thresholds. Furnish thresholds for the full width of the openings.
- B. For thresholds at elevators entrances see other sections of specifications.
- C. At exterior doors and any interior doors exposed to moisture, provide threshold with non-slip abrasive finish.
- D. Provide with miter returns where threshold extends more than 12 mm (0.5 inch) beyond face of frame.
 - a) Basis of Design / Acceptable Manufacturer(s):
 - a. Pemko
 - b. Reese
 - c. Others as approved equal.

2.24 NOT USED

2.25 WEATHERSTRIPS (FOR EXTERIOR DOORS)

- A. Conform to ANSI A156.22. Air leakage shall not to exceed 0.50 CFM per foot of crack length (0.000774m³/s/m).
 - a) Basis of Design / Acceptable Manufacturer(s):
 - a. Pemko
 - b. Reese
 - c. Others as approved equal.

2.26 MISCELLANEOUS HARDWARE

- A. Access Doors (including Sheet Metal, Screen and Woven Wire Mesh Types):
Except for fire-rated doors and doors to Temperature Control Cabinets, equip each single or double metal access door with Lock Type E07213, conforming to ANSI A156.11. Key locks as directed. Ship lock prepaid to the door manufacturer. Hinges shall be provided by door manufacturer.
- B. Cylinders for Various Partitions and Doors: Key cylinders same as entrance doors of area in which partitions and door occur, except as otherwise specified . Provide cylinders to operate locking devices where specified for following partitions and doors:

1. Folding doors and partitions.
 2. Wicket door (in roll-up door assemblies).
 3. Slide-up doors.
 4. Swing-up doors.
 5. Fire-rated access doors-Engineer's key set.
 6. Doors from corridor to electromagnetic shielded room.
 7. Day gate on vault door.
- C. Mutes: Conform to ANSI A156.16. Provide door mutes or door silencers Type L03011 or L03021, depending on frame material, of white or light gray color, on each steel or wood door frame, except at fire-rated frames, lead-lined frames and frames for sound-resistant, lightproof and electromagnetically shielded doors. Furnish 3 mutes for single doors and 2 mutes for each pair of doors, except double-acting doors. Provide 4 mutes or silencers for frames for each Dutch type door. Provide 2 mutes for each edge of sliding door which would contact door frame.

2.27 NOT USED

2.28 NOT USED

2.29 NOT USED

2.30 FINISHES

- A. Exposed surfaces of hardware shall have ANSI A156.18, finishes as specified below. Finishes on all hinges, pivots, closers, thresholds, etc., shall be as specified below under "Miscellaneous Finishes." For field painting (final coat) of ferrous hardware, see Section 09 91 00, PAINTING.
- B. 626 or 630: All surfaces on exterior and interior of buildings, except where other finishes are specified.
- C. Miscellaneous Finishes:
1. Hinges --exterior doors: 626 or 630.
 2. Hinges --interior doors: 652 or 630.
 3. Pivots: Match door trim.
 4. Door Closers: Factory applied paint finish. Dull or Satin Aluminum color.
 5. Thresholds: Mill finish aluminum.
 6. Cover plates for floor hinges and pivots: 630.
 7. Other primed steel hardware: 600.

- D. Hardware Finishes for Existing Buildings: U.S. Standard finishes shall match finishes of hardware in (similar) existing spaces except where otherwise specified.
- E. Special Finish: Exposed surfaces of hardware for dark bronze anodized aluminum doors shall have oxidized oil rubbed bronze finish (dark bronze) finish on door closers shall closely match doors.
- F. Not Used.

2.31 BASE METALS

- A. Apply specified U.S. Standard finishes on different base metals as following:

Finish	Base Metal
652	Steel
626	Brass or bronze
630	Stainless steel

PART 3 - EXECUTION

3.1 HARDWARE HEIGHTS

- A. For existing buildings locate hardware on doors at heights to match existing hardware. The Contractor shall visit the site, verify location of existing hardware and submit locations to VA COR for approval.
- A. For new buildings locate hardware on doors at heights specified below, with all hand-operated hardware centered within 864 mm (34 inches) to 1200 mm (48 inches), unless otherwise noted:
 - B. Hardware Heights from Finished Floor:
 1. Exit devices centerline of strike (where applicable) 1024 mm (40-5/16 inches).
 2. Locksets and latch sets centerline of strike 1024 mm (40-5/16 inches).
 3. Deadlocks centerline of strike 1219 mm (48 inches).
 4. Hospital arm pull 1168 mm (46 inches) to centerline of bottom supporting bracket.
 5. Centerline of door pulls to be 1016 mm (40 inches).
 6. Push plates and push-pull shall be 1270 mm (50 inches) to top of plate.
 7. Push-pull latch to be 1024 mm (40-5/16 inches) to centerline of strike.

8. Locate other hardware at standard commercial heights. Locate push and pull plates to prevent conflict with other hardware.

3.2 INSTALLATION

A. Closer devices, including those with hold-open features, shall be equipped and mounted to provide maximum door opening permitted by building construction or equipment. Closers shall be mounted on side of door inside rooms, inside stairs, and away from corridors except security bedroom, bathroom and anteroom doors which shall have closer installed parallel arm on exterior side of doors. . At exterior doors, closers shall be mounted on interior side. Where closers are mounted on doors they shall be mounted with sex nuts and bolts; foot shall be fastened to frame with machine screws.

B. Hinge Size Requirements:

Door Thickness	Door Width	Hinge Height
45 mm (1-3/4 inch)	900 mm (3 feet) and less	113 mm (4-1/2 inches)
45 mm (1-3/4 inch)	Over 900 mm (3 feet) but not more than 1200 mm (4 feet)	125 mm (5 inches)
35 mm (1-3/8 inch) (hollow core wood doors)	Not over 1200 mm (4 feet)	113 mm (4-1/2 inches)

C. Hinge leaves shall be sufficiently wide to allow doors to swing clear of door frame trim and surrounding conditions.

D. Where new hinges are specified for new doors in existing frames or existing doors in new frames, sizes of new hinges shall match sizes of existing hinges; or, contractor may reuse existing hinges provided hinges are restored to satisfactory operating condition as approved by COR. Existing hinges shall not be reused on door openings having new doors and new frames. Coordinate preparation for hinge cut-outs and screw-hole locations on doors and frames.

E. Hinges Required Per Door:

Doors 1500 mm (5 ft) or less in height	2 butts
Doors over 1500 mm (5 ft) high and not over 2280 mm (7 ft 6 in) high	3 butts
Doors over 2280 mm (7 feet 6 inches) high	4 butts
Dutch type doors	4 butts

Doors with spring hinges 1370 mm (4 feet 6 inches) high or less	2 butts
Doors with spring hinges over 1370 mm (4 feet 6 inches)	3 butts

- F. Fastenings: Suitable size and type and shall harmonize with hardware as to material and finish. Provide machine screws and lead expansion shields to secure hardware to concrete, ceramic or quarry floor tile, or solid masonry. Fiber or rawl plugs and adhesives are not permitted. All fastenings exposed to weather shall be of nonferrous metal.
- G. After locks have been installed; show in presence of COR that keys operate their respective locks in accordance with keying requirements. (All keys, Master Key level and above shall be sent Registered Mail to the Medical Center Director along with the bitting list. Also a copy of the invoice shall be sent to the COR for his records.) Installation of locks which do not meet specified keying requirements shall be considered sufficient justification for rejection and replacement of all locks installed on project.

3.3 FINAL INSPECTION

- A. Installer to provide letter to VA COR that upon completion, installer has visited the Project and has accomplished the following:
 1. Re-adjust hardware.
 2. Evaluate maintenance procedures and recommend changes or additions, and instruct VA personnel.
 3. Identify items that have deteriorated or failed.
 4. Submit written report identifying problems.

3.4 DEMONSTRATION

- A. Demonstrate efficacy of mechanical hardware and electrical, and electronic hardware systems, including adjustment and maintenance procedures, to satisfaction of COR and VA Locksmith.

3.5 HARDWARE SETS

- A. Following sets of hardware correspond to hardware symbols shown on drawings. Only those hardware sets that are shown on drawings will be required. Disregard hardware sets listed in specifications but not shown on drawings.
- B. Hardware Consultant working on a project will be responsible for providing additional information regarding these hardware sets. The numbers shown in the following sets come from BHMA standards.

C. Hardware brand and model number shown in hardware set(s) are intended for a basis of design. Use complete overall specification for approved brands and products.

Hardware Sets

Set: HW-1B

Single: Passage x Door Closer x Magnetic Hold w/ Accessories

3 Hinge	A8112 (McKinney - TA2714)	MK
1 Mortise Passage Set	F01 (Sargent 8215)	SA
1 Door Closer	C02011 / C02021 (Sargent - 351 O / 351 P10)	SA
1 Kick Plate	10" High x As Specified	OT
1 Spacer	As Required - Use w/ C00011 (Rixson - 900-x00)	RF
1 Armature Extension	As Required - Use w/ C00011 (Rixson - 900-Z)	RF
1 Electromagnetic Holder	C00011 (Rixson - 996M)	RF
1 Gasketing	ROY154 (Pemko - S88)	PE

Both inside and outside levers are active allowing free egress and ingress at all times.

Magnetic hold-open will keep door(s) held open.
Loss of power or activation of fire alarm system will release magnetic hold open(s) allowing door(s) to come closed.

Set: HW-1C

Single: Passage x Door Closer x Magnetic Hold

3 Hinge	A8112 (McKinney - TA2714)	MK
1 Mortise Passage Set	F01 (Sargent 8215)	SA
1 Door Closer	C02011 / C02021 (Sargent - 351 O / 351 P10)	SA
1 Kick Plate	10" High x As Specified	OT
1 Electromagnetic Holder	C00011 (Rixson - 994M)	RF
1 Gasketing	ROY154 (Pemko - S88)	PE

Both inside and outside levers are active allowing free egress and ingress at all times.

Magnetic hold-open will keep door(s) held open.
Loss of power or activation of fire alarm system will release magnetic hold open(s) allowing door(s) to come closed.

Set: HW-3

Single: Classroom Lock x Overhead Stop

3 Hinge	A8112 (McKinney - TA2714)	MK
1 Classroom Lock	F05 (Sargent - 72 8237)	SA
1 I.C. Core	As Specified	FA
1 Surf Overhead Stop	C02541 (Rixson - 9-X36)	RF
1 Gasketing	ROY154 (Pemko - S88)	PE

Door normally closed, latched with keyed-side lever locked and unlocked by mechanical key - free egress at all times.

Set: HW-5

Single: Office Lock

3 Hinge	A8112 (McKinney - TA2714)	MK
1 Cylindrical Office Lock	F109 (Sargent 72 10G05)	SA
1 I.C. Core	As Specified	FA
1 Stop	L02101 (Rockwood - 406 Convex)	RO

Door normally open with either handle retracting latch for entrance or egress.
Depressing inside lever handle pushbutton locks outside handle only allowing entrance by mechanical key.
Mechanical key or turning inside lever will release inside pushbutton allowing entrance.
Depressing and twisting inside pushbutton keeps button in where a key is required everytime for entrance; reverse the procedure and the button will project to its normal state.
Free egress at all times.

Set: HW-5B

Single: Office Lock x Overhead Stop

3 Hinge	A8112 (McKinney - TA2714)	MK
1 Cylindrical Office Lock	F109 (Sargent 72 10G05)	SA

1 I.C. Core	As Specified	FA
1 Surf Overhead Stop	C02541 (Rixson - 9-X36)	RF

Door normally open with either handle retracting latch for entrance or egress.
Depressing inside lever handle pushbutton locks outside handle only allowing entrance by mechanical key.
Mechanical key or turning inside lever will release inside pushbutton allowing entrance.
Depressing and twisting inside pushbutton keeps button in where a key is required everytime for entrance; reverse the procedure and the button will project to its normal state.
Free egress at all times.

Set: HW-6

Single: Rim Exit Device (passage) x Door Closer w/ Spring Stop

3 Hinge	A8112 (McKinney - TA2714)	MK
1 Exit Device (passage)	ANSI 14 (12 43 8815 ET_)	SA
1 Door Closer	C02021 x Spring Stop (Sargent - 351 CPS)	SA
1 Kick Plate	10" High x As Specified	OT
1 Gasketing	ROY154 (Pemko - S88)	PE

Inside push-pad and outside lever trim active allowing free egress and ingress at all times.

Set: HW-6A

Single: Rim Exit Device (passage) x Door Closer

3 Hinge	A8112 (McKinney - TA2714)	MK
1 Exit Device (passage)	ANSI 14 (12 43 8815 ET_)	SA
1 Door Closer	C02011 (Sargent - 351 O)	SA
1 Kick Plate	10" High x As Specified	OT
1 Stop	L02101 (Rockwood - 406 Convex)	RO
1 Gasketing	ROY154 (Pemko - S88)	PE

Inside push-pad and outside lever trim active allowing free egress and ingress at all times.

Set: HW-6D

Single: Rim Exit Device (passage) x Door Closer x Roller Stop

3 Hinge	A8112 (McKinney - TA2714)	MK
1 Exit Device (passage)	ANSI 14 (12 43 8815 ET_)	SA
1 Door Closer	C02011 (Sargent - 351 O)	SA
1 Kick Plate	10" High x As Specified	OT
1 Curved Roller Stop	L02211 (Rockwood - 455)	RO
1 Gasketing	ROY154 (Pemko - S88)	PE

Inside push-pad and outside lever trim active allowing free egress and ingress at all times.

Set: HW-9

Card Reader w/ Pin (Monitored) - Single: Storeroom Lock w/ REX x EL Strike x Door Closer

1 Electric Hinge	A8112 x Wire (McKinney - TA2714 x Wire)	MK
3 Hinge	A8112 x NRP (McKinney - TA2714 x NRP)	MK
1 Mortise Storeroom Lock	F07 x REX (Sargent - RX 72 8204)	SA
1 I.C. Core	As Specified	FA
1 Bridge Rectifier	(HES - 2005M3)	HS
1 Electric Strike	As Required x 24VDC x Fail Secure (HES - 1600/1500)	HS
1 Door Closer	C02011 / C02021 (Sargent - 351 O / 351 P10)	SA
1 Kick Plate	10" High x As Specified	OT
1 Stop	L02101 (Rockwood - 406 Convex)	RO
1 Gasketing	ROY154 (Pemko - S88)	PE
1 Access Control Reader	by Division 28	OT
1 Position Switch	Alarm Contact (Securitron - DPS)	SU
1 Wire Diagram	By Hardware Supplier	OT
1 Power Supply	Regulated x Filtered x 24VDC x Amperage as Required (Securitron - AQD2)	SU

Door normally closed, latched, and locked - free egress at all times.
 Door monitored for door ajar or forced open - internal switch within unsecure side of latching hardware allows an individual to freely leave without sending an alarm to the access control system.
 Entrance by mechanical key or presenting a valid card to card-reader.
 Egress allowed at all times.

Loss of power maintains door security from locked side, entrance by mechanical key only - free egress at all times.

Set: HW-9B

Card Reader (Monitored) - Single: Storeroom Lock w/ REX x EL Strike x Door Closer w/ Spring Stop

1 Electric Hinge	A8112 x Wire (McKinney - TA2714 x Wire)	MK
2 Hinge	A8112 x NRP (McKinney - TA2714 x NRP)	MK
1 Mortise Storeroom Lock	F07 x REX (Sargent - RX 72 8204)	SA
1 I.C. Core	As Specified	FA
1 Bridge Rectifier	(HES - 2005M3)	HS
1 Electric Strike	As Required x 24VDC x Fail Secure (HES - 1600/1500)	HS
1 Door Closer	C02021 x Spring Stop (Sargent - 281 CPS)	SA
1 Kick Plate	10" High x As Specified	OT
1 Gasketing	ROY154 (Pemko - S88)	PE
1 Access Control Reader	by Division 28	OT
1 Position Switch	Alarm Contact (Securitron - DPS)	SU
1 Wire Diagram	By Hardware Supplier	OT
1 Power Supply	Regulated x Filtered x 24VDC x Amperage as Required (Securitron - AQD2)	SU

Door normally closed, latched, and locked - free egress at all times.
 Door monitored for door ajar or forced open - internal switch within unsecure side of latching hardware allows an individual to freely leave without sending an alarm to the access control system.
 Entrance by mechanical key or presenting a valid card to card-reader.
 Egress allowed at all times.
 Loss of power maintains door security from locked side, entrance by mechanical key only - free egress at all times.

Set: HW-9D

(ALD/ALF) Exterior - Single: EL Rim Exit Device (ELR, nightlatch) x Automatic Operator

1 Continuous Geared Hinge	ANSI A156.26-2012 x Grade 1-150 (McKinney - MCK-12HD EPT)	MK
1 Exit Device (storeroom)	ANSI 03 x Motor EL Retraction (Sargent - LD 43 56 72 AD8504)	SA
2 I.C. Core	As Specified	FA

1 I.C. Cylinder Housing	As Required	FA
1 Pull	TYPE AS REQUIRED (Rockwood - RM202 Mtg-Type 12XHD)	RO
1 Conc Overhead Stop	C01541 (Rixson - 1-X36)	RF
2 Actuator Switch	by Section 08 7115	OT
1 Door Operator	by Section 08 7115	OT
1 Threshold	J32300 (Pemko - 173A)	PE
1 Rain Guard	Overhead Rain Drip (Pemko - 346_)	PE
1 Set Weatherstrip	(door manufacturer's heavy duty standard)	00
1 Sweep	R3A534 (Pemko - 345_NB)	PE
1 Power Transfer	As Required (Securitron - CEPT-10)	SU
1 Wire Diagram	By Hardware Supplier	OT
1 Keyswitch	(Securitron - MKA2)	SU
1 Power Supply	Regulated x Filtered x 24VDC x Amperage as Required (Securitron - AQD2)	SU

SECURED TIME PERIOD:

Door normally closed, latched, and locked from pull side - free egress at all times.

Key switch turned, LED indicator light is red, to signal exit device latch to project; thus, locking door from pull side - free egress at all times.

Entrance by mechanical key only.

Outside actuator switch is disabled by same key-switch, LED indicator light is red.

During secured period of time, only inside actuator switch activates automatic operator for accessibility needs.

Loss of power maintains security from pull side of opening, automatic door operator loses the electrically open operation - Entrance by mechanical key only - free egress at all times.

UNSECURED TIME PERIOD:

Door normally closed, latched, and unlocked - free egress at all times.

Key switch turned, LED indicator light is green, to signal exit device latch to retract and stay retracted - allowing free ingress and egress.

Outside actuator switch is enabled by same key-switch, LED indicator light is green.

During unsecure period of time, depressing either actuator switch activates automatic operator for accessibility needs.

Loss of power maintains security from pull side of opening, automatic door operator loses the electrically open operation - Entrance by mechanical key only - free egress at all times.

Set: HW-9E

Exterior - Card Reader (Monitored) - Single: Rim Exit Device (storeroom) x EL Strike x Door Closer w/ Spring Stop

3 Hinge (heavy weight)	A5111 x NRP (McKinney - T4A3386 x NRP)	MK
1 Rim Exit Device	ANSI 09 (Sargent - LD 43 72 8806 ET)	SA
1 I.C. Core	As Specified	FA
1 Electric Strike	As Required x 24VDC x Fail Secure (HES - 1600/1500)	HS
1 Door Closer	C02021 x Spring Stop (Sargent - 351 CPS)	SA
1 Kick Plate	10" High x As Specified	OT
1 Rain Guard	Overhead Rain Drip (Pemko - 346_)	PE
1 Gasketing	R3G164 / R3G165 (Pemko - 2891_PK)	PE
1 Sweep	R3A534 (Pemko - 345_NB)	PE
1 Access Control Reader	by Division 28	OT
1 Position Switch	Alarm Contact (Securitron - DPS)	SU
1 Wire Diagram	By Hardware Supplier	OT
1 Motion Detector	(Alarm Controls - SREX-100)	AK
1 Power Supply	Regulated x Filtered x 24VDC x Amperage as Required (Securitron - AQD2)	SU

Application:

- Field verify existing conditions and field modify existing door and frame to accept new hardware specified.
- Use above new hardware, all other hardware to remain.

Door normally closed, latched, and locked - free egress at all times.
 Door monitored for door ajar or forced open - motion sensor above unsecure side (egress side) of door allows an individual to freely leave without sending an alarm to the access control system.
 Entrance by mechanical key or presenting a valid card to card-reader.
 Egress allowed at all times.
 Loss of power maintains door security from locked side, entrance by mechanical key only - free egress at all times.

Set: HW-22

EXISTING - Card Reader - Monitored (DPS) - Single: EL Strike x Motion Sensor x Power Supply

1 Bridge Rectifier	(HES - 2005M3)	HS
1 Electric Strike	As Required x 24VDC x Fail Secure (HES - 1600/1500)	HS
1 Access Control Reader	by Division 28	OT
1 Position Switch	Alarm Contact (Securitron - DPS)	SU

1 Wire Diagram	By Hardware Supplier	OT
1 Motion Detector	(Alarm Controls - SREX-100)	AK
1 Power Supply	Regulated x Filtered x 24VDC x Amperage as Required (Securitron - AQD2)	SU

Application:

- Field verify existing conditions and field modify existing door and frame to accept new hardware specified.
- Use above new hardware, all other hardware to remain.

Door normally closed, latched, and locked - free egress at all times.
Door monitored for door ajar or forced open - motion sensor above unsecure side (egress side) of door allows an individual to freely leave without sending an alarm to the access control system.

Entrance by mechanical key or presenting a valid card to card-reader.
Egress allowed at all times.

Loss of power maintains door security from locked side, entrance by mechanical key only - free egress at all times.

- - - E N D - - -

SECTION 08 71 13
AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Automatic operators for swinging and sliding doors .
2. Controls, control wiring, and interface with building power and alarm systems.
3. Brackets, trim, fasteners and related accessories.

1.2 RELATED REQUIREMENTS

- A. Aluminum Frames Entrance Work: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- B. Door Hardware: Section 08 71 00, DOOR HARDWARE.
- C. Access Control Devices: Division 28, ELECTRONIC SAFETY AND SECURITY.
- D. Electric General Wiring, Connections and Equipment Requirements: Division 26, ELECTRICAL.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 1. B209-14 - Aluminum and Aluminum-Alloy Sheet and Plate.
 2. A1008/A1008M-15 - Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Baked Hardenable.
- C. Builders Hardware Manufacturers Association (BHMA):
 1. BHMA A156.10-11 - Power Operated Pedestrian Doors.
- D. National Fire Protection Association (NFPA):
 1. 101-15 - Life Safety Code.
 2. NFPA 80: Standard for Fire Doors and Windows.
- E. Underwriters Laboratories (UL):
 1. 325-13 - Standard for Doors, Drapery, Gate, Louver, and Window Operators and Systems.
 2. UL Building Materials Directory
- F. American National Standards Institute (ANSI):
 1. ANSI A156.19: Power Assist and Low Energy Operated Doors.

- G. American with Disabilities Act (ADA)

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and fabrication and installation details.
 - 2. Include complete elevations of the system(s); details and methods of anchorage; details of construction; finishes; methods of assembly; location and installation of hardware and reinforcement for same; size, shape and thickness of materials; joints and connections; details of joining with other work. Show locations of all components. Show proposed location for door activation switches.
 - a. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators, including activation and safety devices, with connections to power supplies fire alarm system and access control system
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Installation instructions.
 - 3. Warranty.
- D. Sustainable Construction Submittals:
 - 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
- E. Test reports: Certify each product complies with specifications.
- F. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Manufacturer with project experience list .
 - 2. Installer with project experience list .
- G. Operation and Maintenance Data:
 - 1. Care instructions for each exposed finish product.
 - 2. Start-up, maintenance, troubleshooting, emergency, and shut-down instructions for each operational product.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
 - 1. Regularly manufactures specified products.

2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.

a. Provide contact names and addresses for completed projects when requested by Contracting Officer's Representative.

B. Installer's Qualifications: Experienced installer, approved by the manufacturer.

C. Door operators and installation shall conform to ANSI 156.19 "Power Assist and Low Energy Power Operated Doors".

1.6 WARRANTY

A. Construction Warranty: Contractor's one-year labor and material warranty, FAR clause 52.246-21, "Warranty of Construction."

B. Manufacturer's Warranty: Warrant automatic door operators against material and manufacturing defects.

1. Warranty Period: Two years.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Comply with requirements of BHMA A156.10. Unless otherwise indicated on Drawings, provide operators that move doors from fully closed to fully opened position in five seconds maximum time interval, when speed adjustment is at maximum setting.

B. Equipment: Conforming to UL 325. Provide key operated power disconnect wall switch for each door installation.

C. Electrical Wiring, Connections and Equipment: Motors, starters, controls, access control, associated devices, and interconnecting wiring required for installation. Equipment and wiring as specified in Division 26, ELECTRICAL. Access Control Devices: Division 28, ELECTRONIC SAFETY AND SECURITY.

2.2 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.

1. Match finish materials for consistency with sliding door or swinging door system.

B. Provide door operators from one manufacturer.

C. Provide one type of operator throughout project.

D. Sustainable Construction Requirements:

1. Steel Recycled Content: 30 percent total recycled content, minimum.

2. Aluminum Recycled Content: 80 percent total recycled content, minimum.

2.3 SWING DOOR OPERATORS

A. General:

1. Type: Institutional type.
2. Size: As recommended by manufacturer for door weight and sizes.

B. Function:

1. Provide operators, enclosed in housing, permitting opening of door by energizing motor and stopped by electrically reducing Voltage and stalling motor against mechanical stop.
2. Door to close by means of spring energy, and closing force controlled by gear system and motor being used as dynamic brake without power, or controlled by hydraulic closer in electro-hydraulic operators.
3. Opening and Closing Speeds: Field adjustable.
4. Operators with checking mechanism providing cushioning action at last part of door travel, in both opening and closing cycle.
5. Operators capable of recycling doors instantaneously to full open position from any point in closing cycle when control switch is activated.
6. When automatic power is interrupted or shut-off, permit doors to easily open manually without damage to automatic operator system.

C. Connect hardware with drive arm attached to door with pin linkage rotating in a self-lubricating bearing. Prevent doors from pivoting on shaft of operator.

D. Operator Housing:

1. ASTM B209, Type 6063-T5 aluminum alloy, 112 mm (4-1/2 inches) wide by 140 mm (5.5 inches) high by 3.2 mm (0.125 inch) thick, aluminum extrusions with enclosed end caps for application to 100 mm (4 inches) and larger frame systems.

E. Power Operator:

1. Completely assembled and sealed unit including gear drive transmission, mechanical spring and bearings, located in aluminum case and filled with special lubricant for extreme temperature conditions. Rubber mounted units with provisions for easy

maintenance and replacement, without removing door from pivots or frame.

F. Motors:

1. Provide with interlock to prevent operation when doors are electrically locked from opening.

G. Electrical Control:

1. Self-contained electrical control unit, including necessary transformers, relays, rectifiers, and other electronic components for proper operation and switching of power operator.
2. Connecting Harnesses: Interlocking plugs.

115 VAC, single-phase, 15 amp fused circuit to door headers, two 24 VAC Class II wires between door headers and remote activation devices, 1/2 inch conduit and electrical boxes at activators. Low voltage wiring for fire, security, and alarm systems, and for other electrified hardware affecting door operation.

H. Accessories:

1. Metal mounting supports, brackets and other accessories necessary for installation of operators at head of door frames.

I. Microprocessor Controls:

1. Multi-function microprocessor control providing adjustable hold open time (1-30 seconds) with fully adjustable opening speed, LED indications for sensor input signals and operator status and power assist close options. Control capable of receiving activation signals from any device with normally open dry contact output.
2. Hold doors held open by low Voltage applied to the continuous duty motor.
3. Controls:
 - a. Adjustable safety circuit that monitors door operation and stops opening direction of door if obstruction is sensed.
 - b. Recycle feature that reopens door if obstruction is sensed at any point during closing cycle.
 - c. Standard three position key switch with functions for ON, OFF, and HOLD OPEN, mounted on operator enclosure, door frame, or wall, as indicated on drawings.

2.4 SLIDING DOOR OPERATORS

A. Operator Function:

1. Electric motor pulling door from closed to open position, stopping door by electrically reducing Voltage and stalling door against mechanical stop.
 2. Opening and Closing Speeds: Field adjustable.
 3. System permitting manual control of door in event of power failure.
- B. Power Operator:
1. Completely assembled and sealed electromechanical operating unit including 95 W (1/8 hp.) DC shunt-wound permanent magnet motor with sealed bearings, located in aluminum case and filled with special lubricant for extreme temperature conditions. Rubber mount units with provisions for easy maintenance and replacement, without removing door from pivots or frame.
 2. Opening and Closing Cycle: Field adjustable.
- C. Operator Housing:
1. ASTM B209, Type 6063-T5 aluminum alloy, 150 mm (6 inches) wide by 200 mm (8 inches) high by 3.2 mm (0.125 inch) thick, aluminum extrusions with enclosed end caps for application to 100 mm (4 inches) and larger frame systems.

2.5 SLIDING DOOR UNITS

- A. Provide door panels in compliance with NFPA 101, allowing "breakout" to full open position to provide instant egress at any point in door's movement.
1. Door Panels: ASTM A1008/A1008M, steel sheet, Type B, cold-rolled, reinforce frame structure, minimum 1.1-mm (0.043 inch) thick steel shapes.
- B. Sliding Door Hardware Guide Rollers, Door Carrier:
1. Rollers: Steel or plastic rollers with sealed bearings with each door having two support rollers and one anti-rise roller.
 - a. Vertical Adjustment: Minimum 9 mm (0.35 inch) with positive mechanical locks.
 - b. Include two urethane covered oil impregnated bearing bottom rollers attached with 5 mm (3/16 inch) thick formed steel guide brackets at each door.
 - c. Door Carriers: For each door carrier supporting door leaf, include vertical steel reinforcing member to prevent sagging when door is swung under breakaway conditions.

1) Carbon Steel Brackets And Fittings: Corrosion resistant.

C. Locking Hardware:

1. Locking hardware at interior doors not requiring physical security is not required.
2. Doors with flush concealed vertical rod panic hardware integrated into doors where physical security is required and free egress is required at all times.
3. Doors with manufacturers' standard hookbolt lock (keyed both sides) where physical security is required and free egress is not required at all times.
 - a. At doors with access control devices specified in Division 28 - ELECTRONIC SAFETY AND SECURITY, provide doors with electronic deadbolt locking to prevent doors from manually sliding open.

D. Door Closers: Breakout or swing-out panels with door closers concealed in top rail of door.

2.6 POWER UNITS

- A. Self-contained, electric operated and independent of door operator.
1. Capacity and size of power circuits according to automatic door operator manufacturer's specifications and Division 26 - ELECTRICAL.

2.7 DOOR CONTROLS

- A. Control Devices: BHMA A156.10; control opening and closing functions.
- B. Open doors when control device is actuated; hold doors in open positions; then, close doors after an adjustable time period, unless safety device or reactivated control interrupts operation.
- C. Manual Controls:
1. Push Plate Wall Switch: Recessed type, stainless steel push plate minimum 100 mm by 100 mm (4 inch by 4 inch), with 13 mm (1/2 inch) high letters "To Operate Door-Push" engraved on face of plate.
- D. Motion Detector:
1. Mounting: Surface or concealed.
 2. Detection Area: 1500 mm (60 inches) deep and 1500 mm (60 inches) across, plus or minus 150 mm (6 inches).
 3. Response Time: 25 milliseconds, maximum.
 4. Control Power: 24 Volt DC.
 5. Design units to be unaffected by cleaning material, solvents, dust, dirt and outdoor weather conditions.

2.8 SAFETY DEVICES

- A. Sliding Doors:
 - 1. Two photoelectric beams mounted at heights of 600 mm (24 inches) and 1200 mm (48 inches) in door frame.
 - 2. Overhead safety presence sensors at door head on both sides of opening.
 - 3. Recycle doors to full open position when beams are interrupted.
 - 4. Motion detector mounted on both sides of door for detection of traffic in both direction.
- B. Swing Doors: Install presence sensor on pull side of door to detect any person standing in door swing path and prevent door from opening.
 - 1. Time delay Switches: Adjustable between 3 to 60 seconds and control closing cycle of doors.
- C. Install decal signs with "In" or "Do Not Enter" on both faces of each door where shown.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
 - 1. Verify door opening is correctly sized and within acceptable tolerances.
- B. Protect existing construction and completed work from damage.

3.2 INSTALLATION

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Coordinate door installation with other related work.
- C. Install manual controls and power disconnect switches recessed or semi-flush mounted in partitions.
- D. Secure operator components to adjacent construction with suitable fastenings.
- E. Conceal conduits, piping, and electric equipment, in finish work.
- F. Install power units in locations shown.

1. Where units are mounted on walls, provide metal supports or shelves for units.
 2. Ensure equipment, including time delay switches, are accessible for maintenance and adjustment.
- G. Ensure operators are adjusted and function properly for type of expected traffic.
- H. Synchronize each leaf of pair doors to open and close simultaneously. Permit each door leaf to be opened manually, independent of other door leaf.
- I. Install controls at positions shown and ensuring convenience for expected traffic.
- .
- J. Push Plate Wall Switches Mounting Height: 1000 mm (40 inches) maximum, unless otherwise approved by Contracting Officer's Representative.

3.3 DEMONSTRATION AND TRAINING

- A. Instruct VA personnel in proper automatic door operator operation and maintenance.
1. Trainer: Manufacturer approved instructor.
 2. Training Time: 2 hours minimum.
- B. Coordinate instruction to VA personnel with VA Contracting Officer's Representative.

- - E N D - -

02-01-16
Renovate Tower of Building 1
VAMC, Sioux Falls, SD
VA Project #438-18-102

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SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies the following:
 - 1. Glass.
 - 2. Not Used.
 - 3. Not Used.
 - 4. Not Used.
- 2. Glazing materials and accessories for both factory and field glazed assemblies.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Factory glazed by manufacturer in following units:
 - 1. Aluminum Windows: Section 08 51 13, ALUMINUM WINDOWS.
 - 2. Color of spandrel glass, tinted (heat absorbing or light reducing) glass, and reflective (metallic coated) glass: Section 09 06 00, SCHEDULE FOR FINISHES.
 - 3. Access Control Systems: Section 28 13 11, PHYSICAL ACCESS CONTROL SYSTEMS.
 - 4. Wiring (120 V AC, 15A or 20A): Section 26 05 19, LOW VOLTAGE ELECTRICAL POWER AND CONDUCTORS AND CABLES.
 - 5. Junction and Switch Boxes: Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS.

1.3 LABELS:

- A. Temporary labels:
 - 1. Provide temporary label on each light of glass identifying manufacturer or brand and glass type, quality and nominal thickness.
 - 2. Label in accordance with NFRC label requirements.
 - 3. Temporary labels are to remain intact until glass is approved by Contracting Officer Representative (COR).
- B. Permanent labels:
 - 1. Locate in corner for each pane.
 - 2. Label in accordance with ANSI Z97.1 and SGCC label requirements.
 - a. Tempered glass.

- b. Laminated glass or have certificate for panes without permanent label.
- 4. Fire rated glazing assemblies: Mark in accordance with IBC.

1.4 PERFORMANCE REQUIREMENTS:

- A. General: Design glazing system consistent with guidance and practices presented in the GANA Glazing Manual, GANA Laminated Glazing Manual, and GANA Sealant Manual, as applicable to project. Installed glazing is to withstand applied loads, thermal stresses, thermal movements, building movements, permitted tolerances, and combinations of these conditions without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; unsafe engagement of the framing system; deflections beyond specified limits; or other defects in construction.
- B. Glazing Unit Design: Design glass, including engineering analysis meeting requirements of authorities having jurisdiction. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.
 - 1. Design glass in accordance with ASTM E1300, and for conditions beyond the scope of ASTM E1300, by a properly substantiated structural analysis.
 - 2. Design Wind Pressures: In accordance with applicable code.
 - 3. Wind Design Data: In accordance with applicable code.
 - 4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than the structural capacity of the glazing unit, the threshold at which frame engagement is no longer safely assured, 1/100 times the short-side length, or 19 mm (0.75 inch), whichever is less.
- C. Building Enclosure Vapor Retarder and Air Barrier:
 - 1. Utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.
 - 2. Maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

1.5 SUBMITTALS:

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Manufacturer's Certificates:
 - 1. Certificate stating that fire-protection and fire-resistive glazing units meet code requirements for fire-resistance-rated assembly and applicable safety glazing requirements.
 - 2. Certificate on solar heat gain coefficient when value is specified.
 - 3. Certificate on "R" value when value is specified.
- D. Manufacturer Warranty.
- E. Manufacturer's Literature and Data:
 - 1. Glass, each kind required.
 - 2. Insulating glass units.
 - 3. Not Used.
 - 4. Elastic compound for metal sash glazing.
 - 5. Not Used.
 - 6. Glazing cushion.
 - 7. Sealing compound.
- F. Samples:
 - 1. Size: 305 mm by 305 mm (12 inches by 12 inches).
- G. Preconstruction Adhesion and Compatibility Test Report: Submit glazing sealant manufacturer's test report indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

1.6 DELIVERY, STORAGE AND HANDLING:

- A. Delivery: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.
- B. Storage: Store cases according to printed instructions on case, in areas least subject to traffic or falling objects. Keep storage area clean and dry.

- C. Handling: Unpack cases following printed instructions on case. Stack individual windows on edge leaned slightly against upright supports with separators between each.
- D. Protect laminated security glazing units against face and edge damage during entire sequence of fabrication, handling, and delivery to installation location. Provide protective covering on exposed faces of glazing plastics, and mark inside as "INTERIOR FACE" or "PROTECTED FACE":
1. Treat security glazing as fragile merchandise, and packaged and shipped in export wood cases with width end in upright position and blocked together in a mass. Storage and handling to comply with manufacturer's directions and as required to prevent edge damage or other damage to glazing resulting from effects of moisture, condensation, temperature changes, direct exposure to sun, other environmental conditions, and contact with chemical solvents.
 2. Protect sealed-air-space insulating glazing units from exposure to abnormal pressure changes, as could result from substantial changes in altitude during delivery by air freight. Provide temporary breather tubes which do not nullify applicable warranties on hermetic seals.
 3. Temporary protections: The glass front and back of glazing are to be temporarily protected with compatible, peelable, heat-resistant film which will be peeled for inspections and re-applied and finally removed after doors and windows are installed at destination.
 4. Edge protection: To cushion and protect glass clad, and edges from contamination or foreign matter, the four (4) edges are to be sealed the depth of glazing with continuous standard-thickness thermoplastic rubber tape. Alternatively, continuous channel shaped extrusion of thermoplastic rubber are to be used, with flanges extending into face sides of glazing.
 5. Protect "Constant Temperature" units including every unit where glass sheet is directly laminated to or directly sealed with metal-tube type spacer bar to polycarbonate sheet, from exposures to ambient temperatures outside the range of 16 to 24 degrees C (60 to 75 degrees F), during the fabricating, handling, shipping, storing, installation, and subsequent protection of glazing.

1.7 PROJECT CONDITIONS:

Field Measurements: Field measure openings before ordering tempered glass products to assure for proper fit of field measured products.

1.8 WARRANTY:

- A. Construction Warranty: Comply with the FAR clause 52.246-21 "Warranty of Construction".
- B. Manufacturer Warranty: Manufacturer shall warranty their glazing from the date of installation and final acceptance by the Government as follows. Submit manufacturer warranty.
 - 1. Not Used
 - 2. Insulating glass units to remain sealed for ten (10) years.
 - 3. Not Used
 - 4. Not Used.
 - 5. Insulating plastic to not have more than 6 percent decrease in light transmission and be ultraviolet light stabilized for ten (10) years.
 - 6. Not Used.
 - 7. Not Used

1.9 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Architectural Manufacturers Association (AAMA):
 - 800Test Methods for Sealants
 - 810.1-77Expanded Cellular Glazing Tape
- C. American National Standards Institute (ANSI):
 - Z97.1-14Safety Glazing Material Used in Building -
Safety Performance Specifications and Methods
of Test
- D. American Society of Civil Engineers (ASCE):
 - 7-10Wind Load Provisions
- E. ASTM International (ASTM):
 - C542-05(R2011)Lock-Strip Gaskets
 - C716-06Installing Lock-Strip Gaskets and Infill
Glazing Materials
 - C794-10Adhesion-in-Peel of Elastomeric Joint Sealants
 - C864-05(R2011)Dense Elastomeric Compression Seal Gaskets,
Setting Blocks, and Spacers

C920-14aElastomeric Joint Sealants
C964-07 (R2012)Standard Guide for Lock-Strip Gasket Glazing
C1036-11 (R2012)Flat Glass
C1048-12Heat-Treated Flat Glass-Kind HS, Kind FT Coated
and Uncoated Glass.
C1172-14Laminated Architectural Flat Glass
C1349-10Standard Specification for Architectural Flat
Glass Clad Polycarbonate
C1376-10Pyrolytic and Vacuum Deposition Coatings on
Flat Glass
D635-10Rate of Burning and/or Extent and Time of
Burning of Self-Supporting Plastic in a
Horizontal Position
D4802-10Poly (Methyl Methacrylate) Acrylic Plastic
Sheet
E84-14Surface Burning Characteristics of Building
Materials
E119-14Standard Test Methods for Fire Test of Building
Construction and Material
E1300-12aLoad Resistance of Glass in Buildings
E1886-13aStandard Test Method for Performance of
Exterior Windows, Curtain Walls, Doors, and
Impact Protective Systems Impacted by
Missile(s) and Exposed to Cyclic Pressure
Differentials
E1996-14aStandard Specification for Performance of
Exterior Windows, Curtain Walls, Doors, and
Impact Protective Systems Impacted by Windborne
Debris in Hurricanes
E2141-12Test Methods for Assessing the Durability of
Absorptive Electrochromic Coatings on Sealed
Insulating Glass Units
E2190-10Insulating Glass Unit
E2240-06Test Method for Assessing the Current-Voltage
Cycling Stability at 90 Degree C (194 Degree F)
of Absorptive Electrochromic Coatings on Sealed
Insulating Glass Units

- E2241-06Test Method for Assessing the Current-Voltage
Cycling Stability at Room Temperature of
Absorptive Electrochromic Coatings on Sealed
Insulating Glass Units
- E2354-10Assessing the Durability of Absorptive
Electrochromic Coatings within Sealed
Insulating Glass Units
- E2355-10Test Method for Measuring the Visible Light
Transmission Uniformity of an Absorptive
Electrochromic Coating on a Glazing Surface
- F1233-08Standard Test Method for Security Glazing
Materials and Systems
- F1642-12Test Method for Glazing and Glazing Systems
Subject to Airblast Loadings
- E. Code of Federal Regulations (CFR):
- 16 CFR 1201-10Safety Standard for Architectural Glazing
Materials
- F. Glass Association of North America (GANA):
- 2010 EditionGANA Glazing Manual
- 2008 EditionGANA Sealant Manual
- 2009 EditionGANA Laminated Glazing Reference Manual
- 2010 EditionGANA Protective Glazing Reference Manual
- G. International Code Council (ICC):
- IBCInternational Building Code
- H. Insulating Glass Certification Council (IGCC)
- I. Insulating Glass Manufacturer Alliance (IGMA):
- TB-3001-13Guidelines for Sloped Glazing
- TM-3000North American Glazing Guidelines for Sealed
Insulating Glass Units for Commercial and
Residential Use
- J. Intertek Testing Services - Warnock Hersey (ITS-WHI)
- K. National Fire Protection Association (NFPA):
- 80-16Fire Doors and Windows
- 252-12Fire Tests of Door Assemblies
- 257-12Standard on Fire Test for Window and Glass
Block Assemblies
- L. National Fenestration Rating Council (NFRC)

- M. Safety Glazing Certification Council (SGCC) 2012:
Certified Products Directory (Issued Semi-Annually).
- N. Underwriters Laboratories, Inc. (UL):
 - 9-08 (R2009)Fire Tests of Window Assemblies
 - 263-14Fire Tests of Building Construction and
Materials
 - 752-11Bullet-Resisting Equipment.
- O. Unified Facilities Criteria (UFC):
 - 4-010-01-03 (R2007)DOD Minimum Antiterrorism Standards for
Buildings
- P. U.S. Veterans Administration:
 - Physical Security Design Manual for VA Facilities (VAPSDG); Life Safety
Protected
 - Physical Security Design Manual for VA Facilities (VAPSDG); Mission
Critical Facilities
 - Architectural Design Manual for VA Facilities (VASDM)
- Q. Environmental Protection Agency (EPA):
 - 40 CFR 59 (2014)National Volatile Organic Compound Emission
Standards for Consumer and Commercial Products

PART 2 - PRODUCT

2.1 GLASS:

- A. Provide minimum thickness stated and as additionally required to meet performance requirements.
 - 1. Provide minimum 6 mm (1/4 inch) thick glass units unless otherwise indicated.
- B. Obtain glass units from single source from single manufacturer for each glass type.
- C. Clear Glass:
 - 1. ASTM C1036, Type I, Class 1, Quality q3.

2.2 HEAT-TREATED GLASS:

- A. Roller Wave Limits for Heat-Treated Glass: Orient all roller wave distortion parallel to bottom surface of glazing, and provide units complying with the following limitations:
 - 1. Measurement Parallel to Line: Maximum peak to valley 0.203 mm (0.008 inch).
 - 2. Measurement Perpendicular to Line: Maximum 0.0254 mm (0.001 inch).

3. Bow/Warp: Maximum 50 percent of bow and warp allowed by ASTM C1048.

B. Clear Heat Strengthened Glass:

1. ASTM C1048, Kind HS, Condition A, Type I, Class 1, Quality q3.

C. Not Used.

D. Clear Tempered Glass:

1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.

2.3 NOT USED

2.4 NOT USED

2.5 NOT USED 2.6 NOT USED

2.7 NOT USED

2.8 INSULATING GLASS UNITS:

A. Provide factory fabricated, hermetically sealed glass unit consisting of two panes of glass separated by a dehydrated air space and comply with ASTM E2190.

B. Assemble units using glass types specified in Insulating Glass Schedule.

2.9 FIRE PROTECTION AND FIRE RESISTANCE GLAZING:

A. Fire-Protection-Rated Glazing: Glazing units tested for use in fire door assemblies or fire windows, UL, ITS-WHI or equivalent listed and labeled by testing agency in accordance with IBC, for fire-protection ratings as indicated on construction documents and scheduled, based upon positive-pressure testing per NFPA 257 or UL 9, and complying with NFPA 80.

1. Hose-Stream Test: Units must comply, except units having fire-protection rating of 20 minutes.

3. Labeling: Permanently label fire-protection-rated glazing units in accordance with IBC.

4. Safety Glazing: Comply with 16 CFR 1201, Category II.

5. Fire-Protection-Rated Tempered Glass: For specific-minute fire-protection-rated door assemblies as indicated /scheduled, of thickness scheduled.

B. Fire-Resistance-Rated Glazing: Glazing units tested for use in fire wall assemblies, UL, ITS-WHI or equivalent listed and labeled by testing agency in accordance with IBC for fire-resistance ratings of wall assemblies as indicated on construction documents and

as scheduled, based upon testing according to NFPA 252 and ASTM E119 or UL 263.

1. Labeling: Permanently label fire-resistance-rated glazing units in accordance with IBC.
2. Safety Glazing: Comply with 16 CFR 1201, Category II.
3. Fire-Resistance-Rated Laminated Glass with Intumescent Interlayers: Units made from multiple lites of uncoated, ultra-clear low-iron float glass, in intumescent interlayers, of thickness and rating scheduled.
4. Fire-Resistance-Rated Double Glazing Units with Gel Fill: Units made from two lites of uncoated, fully tempered, ultra-clear (low-iron) float glass, with perimeter metal spacer and edge seal forming cavity filled with clear, fully transparent, heat-absorbing gel, of thickness and fire-protection rating scheduled.

2.10 NOT USED

2.11 NOT USED

2.12 GLAZING ACCESSORIES:

- A. As required to supplement the accessories provided with the items to be glazed and to provide a complete installation. Ferrous metal accessories exposed in the finished work are to have a finish that will not corrode or stain while in service. Fire rated glazing to be installed with glazing accessories in accordance with the manufacturer's installation instructions.
- B. Setting Blocks: ASTM C864:
 1. Silicone type.
 2. Channel shape; having 6 mm (1/4 inch) internal depth.
 3. Shore A hardness of 80 to 90 Durometer.
 4. Block lengths: 50 mm (2 inches) except 100 to 150 mm (4 to 6 inches) for insulating glass.
 5. Block width: Approximately 1.6 mm (1/16 inch) less than the full width of the rabbet.
 6. Block thickness: Minimum 4.8 mm (3/16 inch). Thickness sized for rabbet depth as required.
- C. Spacers: ASTM C864:
 1. Channel shape having a 6 mm (1/4 inch) internal depth.

2. Flanges not less 2.4 mm (3/32 inch) thick and web 3 mm (1/8 inch) thick.
 3. Lengths: 25 to 76 mm (1 to 3 inches).
 4. Shore A hardness of 40 to 50 Durometer.
- D. Glazing Tapes:
1. Semi-solid polymeric based closed cell material exhibiting pressure-sensitive adhesion and withstanding exposure to sunlight, moisture, heat, cold, and aging.
 2. Shape, size and degree of softness and strength suitable for use in glazing application to prevent water infiltration.
 3. Complying with AAMA 800 for the following types:
 - a. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - b. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.
- E. Spring Steel Spacer: Galvanized steel wire or strip designed to position glazing in channel or rabbeted sash with stops.
- F. Not Used.
- G. Not Used.
- H. Glazing Gaskets: ASTM C864:
1. Firm dense wedge shape for locking in sash.
 2. Soft, closed cell with locking key for sash key.
 3. Flanges may terminate above the glazing-beads or terminate flush with top of beads.
- I. Lock-Strip Glazing Gaskets: ASTM C542, shape, size, and mounting as indicated.
- J. Glazing Sealants: ASTM C920, silicone neutral cure:
1. Type S.
 2. Class 25 or 50 as recommended by manufacturer for application.
 3. Grade NS.
 4. Shore A hardness of 25 to 30 Durometer.
 5. VOC Content: For sealants used inside the weatherproofing system, not more than 250 g/L or less when calculating according to 40 CFR 59, (EPA Method 24).
- K. Not Used

L. Not Used.

M. Color:

1. Color of glazing compounds, gaskets, and sealants used for aluminum color frames to match color of the finished aluminum and be nonstaining.
2. Color of other glazing compounds, gaskets, and sealants which will be exposed in the finished work and unpainted are to be black, gray, or neutral color.

N. Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verification of Conditions:

1. Examine openings for glass and glazing units; determine they are proper size; plumb; square; and level before installation is started.
2. Verify that glazing openings conform with details, dimensions and tolerances indicated on manufacturer is approved shop drawings.

B. Review for conditions which may adversely affect glass and glazing unit installation, prior to commencement of installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Verify that wash down of adjacent masonry is completed prior to erection of glass and glazing units.

3.2 PREPARATION:

A. For sealant glazing, prepare glazing surfaces in accordance with GANA Sealant Manual.

B. Determine glazing unit size and edge clearances by measuring the actual unit to receive the glazing.

C. Shop fabricate and cut glass with smooth, straight edges of full size required by openings to provide GANA recommended edge clearances.

D. Verify that components used are compatible.

E. Clean and dry glazing surfaces.

F. Prime surfaces scheduled to receive sealants, as determined by preconstruction sealant-substrate testing.

3.3 INSTALLATION - GENERAL:

A. Install in accordance with GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, and IGMA TM-3000 unless specified otherwise.

- B. Glaze in accordance with recommendations of glazing and framing manufacturers, and as required to meet the Performance Test Requirements specified in other applicable sections of specifications.
- C. Set glazing without bending, twisting, or forcing of units.
- D. Do not allow glass to rest on or contact any framing member.
- E. Glaze doors and operable sash, in a securely fixed or closed and locked position, until sealant, glazing compound, or putty has thoroughly set.
- F. Not Used
- G. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.
- H. Not Used
- I. Not Used
- J. Not Used
- K. Insulating Glass Units:
 - 1. Glaze in compliance with glass manufacturer's written instructions.
 - 2. When glazing gaskets are used, they are to be of sufficient size and depth to cover glass seal or metal channel frame completely.
 - 3. Do not use putty or glazing compounds.
 - 4. Do not grind, nip, cut, or otherwise alter edges and corners of fused glass units after shipping from factory.
 - 5. Install with tape or gunnable sealant in wood sash.
- L. Fire Protective and Fire Resistance Glass:
 - 1. Other fire protective and fire resistant glass: Glaze in accordance with manufacturer's installation instructions and NFPA 80.
- M. Not Used

3.4 NOT USED

3.5 NOT USED

3.6 INSTALLATION - WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

- A. Cut glazing tape to length and set against permanent stops, 5 mm (3/16 inch) below sight line. Seal corners by butting tape and dabbing with butyl sealant.
- B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
- C. Place setting blocks at 1/4 points with edge block no more than 152 mm (6 inches) from corners.

- D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to achieve full contact at perimeter of pane or glass unit.
- E. Install removable stops, with spacer strips inserted between glazing and applied stops, 6 mm (1/4 inch) below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.
- F. Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, but not more than 9 mm (3/8 inch) below sight line. Sealant type is to be compatible with glazing tape.
- G. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.7 INSTALLATION - WET METHOD (SEALANT AND SEALANT) :

- A. Place setting blocks at 1/4 points and install glazing pane or unit.
- B. Install removable stops with glazing centered in space by inserting spacer shims both sides at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.
- C. Fill gaps between glazing and stops with sealant to depth of bite on glazing, but not more than 9 mm (3/8 inch) below sight line to ensure full contact with glazing and continue the air and vapor seal.
- D. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.8 NOT USED

3.9 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT) :

- A. Cut glazing tape to length and install against permanent stops, projecting 1.6 mm (1/16 inch) above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 150 mm (6 inches) from corners.
- C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
- D. Install removable stops, spacer shims inserted between glazing and applied stops at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.
- E. Fill gaps between pane and applied stop with sealant to depth equal to bite on glazing, to uniform and level line. Sealant type is to be compatible with glazing tape.

F. Trim protruding tape edge.

3.10 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND) :

- A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 600 mm (24 inch) centers, kept 6 mm (1/4 inch) below sight line.
- B. Locate and secure glazing pane using glazers' clips.
- C. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.11 NOT USED

3.12 NOT USED

3.13 REPLACEMENT AND CLEANING:

- A. Clean new glass surfaces removing temporary labels, paint spots, and defacement after approval by COR.
- B. Replace cracked, broken, and imperfect glass, or glass which has been installed improperly.
- C. Leave glass, putty, and other setting material in clean, whole, and acceptable condition.

3.14 PROTECTION:

- A. Protect finished surfaces from damage during erection, and after completion of work. Strippable plastic coatings on colored anodized finish are not acceptable.

3.15 MONOLITHIC GLASS SCHEDULE:

- A. Glass Type MG#1: Clear fully tempered float glass.
 - 1. Unit Thickness: 6 mm (0.23 inch).
 - 2. Safety glazing label required.

3.16 NOT USED

3.17 INSULATING GLASS SCHEDULE:

- A. Glass Type IG#1: Clear insulating glass.
 - 1. Overall Unit Thickness: 25 mm (1 inch).
 - 2. Minimum Thickness of Each Glass Lite: 6 mm (0.23 inch).
 - 3. Outdoor Lite: Annealed float glass, fully tempered float glass.
 - 4. Interspace Content: Argon.
 - 5. Indoor Lite: Fully tempered float glass.
 - 6. Visible Light Transmittance: 80 percent minimum.
 - 7. Solar Heat Gain Coefficient: 0.75 maximum.
 - 8. Safety glazing label required.
- B. Glass Type IG#2/: Low-E-coated, clear insulating glass.

1. Overall Unit Thickness: 25 mm (1 inch).
 2. Minimum Thickness of Each Glass Lite: 6 mm (0.23 inch).
 3. Outdoor Lite: fully tempered float glass.
 4. Interspace Content: Argon.
 5. Indoor Lite: Fully tempered float glass.
 6. Low-E Coating: Sputtered on third surface.
 7. Visible Light Transmittance: 68 percent minimum.
 8. Solar Heat Gain Coefficient: 0.38 maximum.
 9. Safety glazing label required.
- C. Glass Type IG#3: High performance low-E-coated, clear insulating glass.
1. Overall Unit Thickness: 25 mm (1 inch).
 2. Minimum Thickness of Each Glass Lite: 6 mm (0.23 inch).
 3. Outdoor Lite: Annealed float glass, except heat-strengthened float glass where required, and fully tempered float glass where indicated.
 4. Interspace Content: Argon.
 5. Indoor Lite: Fully tempered float glass.
 6. Low-E Coating: Sputtered on third surface.
 7. Visible Light Transmittance: 62 percent minimum.
 8. Solar Heat Gain Coefficient: 0.27 maximum.

3.18 NOT USED

3.19 NOT USED

3.20 FIRE-PROTECTIVE AND FIRE-RESISTANCE GLAZING SCHEDULE:

- A. Glass Type FR# 1: Fire-protection-rated tempered glass.
1. Thickness: 6 mm (0.23 inch).
 2. Rating: 20 minutes.
 3. Application: Fire-protection-rated door assemblies with openings not over 0.65 sq. m (100 sq. in.).
- B. Glass Type FR# 2: Fire-protection-rated laminated ceramic glazing.
1. Thickness: 12 mm (0.47 inch).
 2. Rating: 90- minute.
 3. Application: Fire-protection-rated door and window assemblies.

3.21 NOT USED

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SECTION 08 90 00
LOUVERS AND VENTS

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies fixed and operable wall louvers, door louvers and wall vents.

1.2 RELATED WORK:

- A. Louvers in Steel Doors: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.
- B. Color of finish: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
 - 1. Each type, showing material, finish, size of members, , method of assembly, and installation and anchorage details.
- C. Manufacturer's Literature and Data:
 - 1. Each type of louver and vent.
- D. Color samples.

1.4 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. The Master Painters Institute (MPI):
Approved Product List - Updated Monthly
- C. ASTM International (ASTM):
 - A240/A240M-14Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - A653/A653M-13Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process
 - A1008/A1008M-13Steel, Sheet, Carbon, Cold Rolled, Structural, and High Strength Low-Alloy with Improved Formability
 - B209-14Aluminum and Aluminum Alloy, Sheet and Plate

- B209M-14Aluminum and Aluminum Alloy, Sheet and Plate
(Metric)
- B221-14Aluminum and Aluminum Alloy Extruded Bars,
Rods, Wire, Shapes, and Tubes
- B221M-13Aluminum and Aluminum Alloy Extruded Bars,
Rods, Wire, Shapes, and Tubes (Metric)
- D1187/D1187M-97(R2011) .Asphalt-Base Emulsions for Use as Protective
Coatings for Metal
- D. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06Metal Finishes Manual
- E. National Fire Protection Association (NFPA):
90A-15Installation of Air Conditioning and
Ventilating Systems
- G. American Architectural Manufacturers Association (AAMA):
2605-13High Performance Organic Coatings on
Architectural Extrusions and Panels
- H. Air Movement and Control Association, Inc. (AMCA):
500-L-07Testing Louvers

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Aluminum, Extruded: ASTM B221M (B221).
- B. Not Used.
- C. Galvanized Steel Sheet: ASTM A653/A653M; G90 min.
- D. Carbon Steel and Sheet: ASTM A1008/A1008M (interior use louvers only).
- E. Aluminum, Plate and Sheet: ASTM B209M (B209); alloy 3003 or 5005 with temper as required for forming.
- F. Fasteners: Fasteners for securing louvers and wall vents to adjoining construction, except as otherwise specified or indicated in construction documents, to be toggle or expansion bolts of size and type as required for each specific type of installation and service condition.
1. Where type, size, or spacing of fasteners is not shown or specified, submit shop drawings showing proposed fasteners, and method of installation.
 2. Fasteners for louvers, louver frames, and wire guards to be of stainless steel or aluminum with same finish as louvers.

3. Fasteners for louvers, louver frames and wire guards within mental health areas to be non-removable/tamper-proof type.

G. Inorganic Zinc Primer: MPI No. 19.

H. Bituminous Coating: ASTM D1187/D1187M; cold applied asphalt mastic emulsion.

2.2 EXTERIOR WALL LOUVERS:

A. General:

1. Provide fixed type louvers of size and design shown.
2. Heads, sills and jamb sections are to have formed caulking slots or be designed to retain caulking. Head sections are to have exterior drip lip, and sill sections an integral water stop.
3. Furnish louvers with sill extension or separate sill as shown.
4. Frame is to be mechanically fastened or welded construction with welds dressed smooth and flush.

B. Performance Characteristics:

1. Refer to Mechanical drawings for performance requirements of each louver..
2. Louvers are to bear AMCA certified rating seals for air performance and water penetration ratings.

C. Aluminum Louvers:

1. General: Frames, blades, sills and mullions; 2 mm (0.078-inch) thick extruded 6063-T5 or -T52 aluminum. Blades to be drainable type and have reinforcing bosses.
2. Louvers, fixed: Make frame sizes 13 mm (1/2-inch) smaller than openings. Single louvers frames are not to exceed 1676 mm (66 inches) wide. When openings exceed 1676 mm (66 inches), provide twin louvers separated by mullion members.
3. Louvers are to withstand the effects or gravity loads and the following wind loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors.

a. Wind load acting inward or outward of not less than 1436 Pa 30 lb. per sq. ft.).

4. Not Used

E. Not Used

2.3 CLOSURE ANGLES AND CLOSURE PLATES:

- A. Fabricate from 2 mm (0.078-inch) thick aluminum.
- B. Provide continuous closure angles and closure plates on inside head, jambs and sill of exterior wall louvers.
- C. Secure angles and plates to louver frames with screws, and to masonry or concrete with fasteners as indicated in construction documents.

2.4 WIRE GUARDS:

- A. Provide wire guards on outside of all exterior louvers, except on exhaust air louvers.
- B. Fabricate frames from 2 mm (0.078-inch) thick extruded or sheet aluminum designed to retain wire mesh.
- C. Wire mesh to be woven from not less than 1.6 mm (0.063-inch) diameter aluminum wire in 13 mm (1/2-inch) square mesh.
- D. Miter corners and join by concealed corner clips or locks extending not less than 57 mm (2-1/4 inches) into rails and stiles. Equip wire guards over 1219 mm (4 feet) in height with a mid-rail constructed as specified for frame components.
- E. Fasten frames to outside of louvers with aluminum or stainless steel devices of same finish as louvers designed to allow removal and replacement without damage to the wire guard or the louver.

2.5 NOT USED

2.6 NOT USED

2.7 INTERIOR DOOR LOUVERS:

- A. Fabricate louvers for interior doors 1.2 mm (0.0472-inch) thick steel .
- B. Make louvers sight-proof type with stationary blades, .

2.8 NOT USED

2.9 AIR INTAKE VENTS:

- A. Fabricate exterior louvered wall ventilators for fresh air intake for air conditioning units from extruded aluminum, ASTM B221M (B221). Form with integral horizontal louvers and frame, with drip extending beyond face of wall and integral water stops.
- B. Provide aluminum closures where shown for inside face of dummy vents.
- C. Provide 0.8 mm (0.032-inch) thick aluminum sleeves in cavity walls where indicated in construction documents .

2.10 NOT USED

2.11 FINISH:

- A. In accordance with NAAMM Metal Finishes Manual: AMP 500-505
- B. Aluminum Louvers Wire Guards:
 - 1. Anodized finish
 - a. Not Used.
 - b. Not Used.
 - c. AA-M10C22A42, Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 0.17 mm (0.7 mils) thick. Color as selected by Architect from manufacturers standard colors.
 - d. Not Used.
 - 2. Not Used.

2.12 PROTECTION:

- A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with a heavy coat of bituminous coating (complete coverage), or by separating the contact surfaces with a performed synthetic rubber tape having pressure sensitive adhesive coating on one side.
- B. Isolate the aluminum from plaster, concrete and masonry by coating aluminum with zinc-chromate primer.
- C. Protect finished surfaces from damage during fabrication, erection, and after completion of the work. Strippable plastic coating on anodized finish is not approved.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Set work accurately, in alignment and where indicated in construction documents. Install plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Furnish setting drawings and instructions for installation of anchors and for the positioning of items having anchors to be built into masonry construction. Provide temporary bracing for such items until masonry is set.
- C. Provide anchoring devices and fasteners as shown and as necessary for securing louvers to building construction as specified. Power actuated drive pins may be used, except for removal items and where members would be deformed or substrate damaged by their use.

- D. Set wall louvers and vents in masonry walls during progress of the work. If wall louvers and vents are not delivered to job in time for installation in prepared openings, make provision for later installation. Set in cast-in-place concrete in prepared openings.

3.2 CLEANING AND ADJUSTING:

- A. After installation, all exposed prefinished and plated items and all items fabricated from stainless steel and aluminum are to be cleaned as recommended by the manufacturer and protected from damage until completion of the project.
- B. All movable parts, including hardware, are to be cleaned and adjusted to operate as designed without binding or deformation of the members, so as to be centered in the opening of frame, and where applicable, to have all contact surfaces fit tight and even without forcing or warping the components.
- C. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Contracting Officer Representative (COR) damaged units and replace with new units.

- - - E N D - - -

SECTION 09 05 16
SUBSURFACE PREPARATION FOR FLOOR FINISHES

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies subsurface preparation requirements for areas to receive the installation of applied and resinous flooring. This section includes removal of existing floor coverings, testing concrete for moisture and pH, remedial floor coating for concrete floor slabs having unsatisfactory moisture or pH conditions, floor leveling and repair as required.

1.2 RELATED WORK

- A. Section 07 92 00, JOINT SEALANTS.
- B. Section 09 65 16, RESILIENT SHEET FLOORING; Section 09 68 00, CARPETING.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA and TEST DATA.
- B. Written approval confirming product compatibility with subfloor material manufacturer and the flooring manufacturer
- C. Product Data:
 - 1. Moisture remediation system
 - 2. Underlayment Primer
 - 3. Cementitious Self-Leveling Underlayment
 - 4. Cementitious Trowel-Applied Underlayment (Not suitable for resinous floor finishes)
- D. Test Data:
 - 1. Moisture test and pH results performed by a qualified independent testing agency or warranty holding manufacturer's technical representative.

1.4 DELIVERY AND STORAGE

- A. Deliver materials in containers with labels legible and intact and grade-seals unbroken.
- B. Store material to prevent damage or contamination.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in text by basic designation only.

B. American Society for Testing and Materials (ASTM):

D638-10 (2010)	Test Method for Tensile Properties of Plastics
D4259-88 (2012)	Standard Practice for Abrading Concrete to alter the surface profile of the concrete and to remove foreign materials and weak surface laitance.
C109/C109M -12 (2012)	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens) Modified Air Cure Only
D7234-12 (2012)	Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
E96/E96M - 12 (2012)	Standard Test Methods for Water Vapor Transmission of Materials
F710-11 (2011)	Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
F1869-11 (2011)	Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
F2170-11 (2011)	Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
C348-08 (2008)	Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars
C191-13 (2013)	Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle

PART 2 - PRODUCTS**2.1 MOISTURE REMEDIATION COATING**

A. System Descriptions:

1. High-solids, epoxy system designed to suppress excess moisture in concrete prior to an overlayment. For use under resinous products, VCT, tile and carpet where issues caused by moisture vapor are a concern.

- B. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up.
- C. System Components: Verify specific requirements as systems vary by manufacturer. Verify build up layers and installation method. Verify compatibility with substrate. Use manufacturer's standard components, compatible with each other and as follows:
1. Liquid applied coating:
 - a. Resin: epoxy.
 - b. Formulation Description: Multiple component high solids.
 - c. Application: Per manufacturer's written installation requirements.
 - d. Thickness: minimum 10 mils
- D. Material Vapor Permeance: Application shall achieve a permeance rating of less than 0.1 perm in accordance with ASTM E96/E96M.
- E. Maximum RH requirement: 100% testing in accordance with ASTM F2170.

2.2

Property	Test	Value
Tensile Strength	ASTM D638	4,400 psi
Volatile Organic Compound Limits (V.O.C.)	SCAMD Rule 1113	25 grams per liter
Permeance	ASTM E96	0.1 perms
Tensile Modulus	ASTM D638	1.9X10 ⁵ psi
Percent Elongation	ASTM D638	12%
Cure Rate	Per manufacture's Data	4 hours Tack free with 24hr recoat window
Bond Strength	ASTM D7234	100% bond to concrete failure

CEMENTITIOUS SELF-LEVELING UNDERLAYMENT

- A. System Descriptions:
1. High performance self-leveling underlayment resurfacer. Single component, self-leveling, cementitious material designed for easy application as an underlayment for all types of flooring materials. It is used for substrate repair and leveling.

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- B. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up. Gypsum-based products are unacceptable.
- C. System Characteristics:
1. Wearing Surface: smooth
 2. Thickness: Per architectural drawings, ranging from feathered edge to 1", per application. Applications greater than 1" require additional 3/8" aggregate to mix or as recommended by manufacturer.
- D. Underlayment shall be calcium aluminate cement-based, containing Portland cement. Gypsum-based products are unacceptable.
- E. Compressive Strength: Minimum 4100 psi in 28 days in accordance with ASTM C109/C109M.
- F. Flexural Strength: Minimum 1000 psi in 28 days in accordance with ASTM C348
- G. Dry Time: Underlayment shall receive the application of moisture insensitive tile in 6 hours, floor coverings in 16 hours.
- H. Primer: compatible and as recommended by manufacturer for use over intended substrate
- I. System Components: Manufacturer's standard components that are compatible with each other and as follows:
1. Primer:
 - a. Resin: copolymer
 - b. Formulation Description: single component ready to use.
 - c. Application Method: Squeegee and medium nap roller.
All puddles shall be removed, and material shall be allowed to dry, 1-2 hours at 70F/21C.
 - d. Number of Coats: (1) one.
 2. Grout Resurfacing Base:
 - a. Formulation Description: Single component, cementitious self-leveling high-early and high-ultimate strength grout.
 - b. Application Method: colloidal mix pump, cam rake, spike roll.
 - 1) Thickness of Coats: Per architectural scope, 1" lifts.
 - 2) Number of Coats: More than one if needed.
 - c. Aggregates: for applications greater than 1/2 inch, require additional 3/8" aggregate to mix.

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Property	Test	Value
Compressive Strength	ASTM C109/C109M	2,200 psi @ 24 hrs 3,000 psi @ 7 days
Initial set time	ASTM C191	30-45 min.
Final Set time		1 to 1.5 hours
Bond Strength	ASTM D7234	100% bond to concrete failure

2.3 CEMENTITIOUS TROWEL-APPLIED UNDERLAYMENT (NOT SUITABLE FOR RESINOUS FLOOR FINISHES)

- A. Underlayment shall be calcium aluminate cement-based, containing Portland cement. Gypsum-based products are unacceptable.
- B. Compressive Strength: Minimum 4000 psi in 28 days
- C. Trowel-applied underlayment shall not contain silica quartz (sand).
- D. Dry Time: Underlayment shall receive the application of floor covering in 15-20 minutes.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperature of work areas at not less than 16 degree C (60 degrees F), without interruption, for not less than 24 hours before testing and not less than three days after testing.
- B. Maintain higher temperatures for a longer period of time where required by manufacturer's recommendation.
- C. Do not install materials when the temperatures of the substrate or materials are not within 60-85 degrees F/ 16-30 degrees C.

3.2 SURFACE PREPARATION

- A. Existing concrete slabs with existing floor coverings:
 1. Conduct visual observation of existing floor covering for adhesion, water damage, alkaline deposits, and other defects.
 2. Remove existing floor covering and adhesives. Comply with local, state and federal regulations and the RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to the floor covering being removed.

- B. Concrete shall meet the requirements of ASTM F710 and be sound, solid, clean, and free of all oil, grease, dirt, curing compounds, and any substance that might act as a bond-breaker before application. As required prepare slab by mechanical methods. No chemicals or solvents shall be used.
- C. General: Prepare and clean substrates according to flooring manufacturer's written instructions for substrate indicated.
- D. Prepare concrete substrates per ASTM D4259 as follows:
 - 1. Dry abrasive blasting.
 - 2. Wet abrasive blasting.
 - 3. Vacuum-assisted abrasive blasting.
 - 4. Centrifugal-shot abrasive blasting.
 - 5. Comply with manufacturer's written instructions.
- E. Repair damaged and deteriorated concrete according to flooring manufacturer's written recommendations.
- F. Verify that concrete substrates are dry.
- G. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of per flooring manufactures formal and project specific written recommendation.
- H. Perform in situ probe test, ASTM F2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity per flooring manufacture's formal and project specific written recommendation.
- I. Provide a written report showing test placement and results.
- J. Prepare joints in accordance with Section 07 92 00, JOINT SEALANTS and material manufacturer's instructions.
- K. Alkalinity: Measure surface pH in accordance with procedures provided in ASTM F710 or as outlined by qualified testing agency or flooring manufacturer's technical representative.
- L. Tolerances: Subsurface shall meet the flatness and levelness tolerance specified on drawings or recommended by the floor finish manufacturer. Tolerance shall also not to exceed 1/4" deviation in 10'. As required, install underlayment to achieve required tolerance.

- M. Other Subsurface: For all other subsurface conditions, such as wood or metal, contact the floor finish or underlayment manufacturer, as appropriate, for proper preparation practices.

3.3 MOISTURE REMEDIATION COATING:

- A. Where results of relative humidity testing (ASTM F2170) exceed the requirements of the specified flooring manufacturer, apply remedial coating as specified to correct excessive moisture condition.
- B. Prior to remedial floor coating installation mechanically prepare the concrete surface to provide a concrete surface profile in accordance with ASTM D4259.
- C. Mix and apply moisture remediation coating in accordance with manufacturer's instructions.

3.4 CEMENTITIOUS UNDERLAYMENT:

- A. Install cementitious self-leveling underlayment as required to correct surface defects, floor flatness or levelness corrections to meet the tolerance requirements as or detailed on drawings, address non-moving cracks or joints, provide a smooth surface for the installation of floor covering, or meet elevation requirements detailed on drawings.
- B. Mix and apply in accordance with manufacturer's instructions.

3.5 PROTECTION

- A. Prior to the installation of the finish flooring, the surface of the underlayment should be protected from abuse by other trades by the use of plywood, tempered hardwood, or other suitable protection course

3.6 FIELD QUALITY CONTROL

- A. Where specified, field sampling of products shall be conducted by a qualified, independent testing facility.

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**SECTION 09 06 00
SCHEDULE FOR FINISHES**

SECTION 09 06 00-SCHEDULE FOR FINISHES

VAMC: Sioux Falls

Location: 2501 W 22nd St. Sioux Falls, South Dakota 57105

Project no. and Name: 438-18-102, Renovate Tower of Building 1

Submission

Date: 4/11/2019

SECTION 09 06 00
SCHEDULE FOR FINISHES

PART I - GENERAL

1.1 DESCRIPTION

This section contains a coordinated system in which requirements for materials specified in other sections shown are identified by abbreviated material names and finish codes in the room finish schedule or shown for other locations.

1.2 MANUFACTURERS

Manufacturer's trade names and numbers used herein are only to identify colors, finishes, textures and patterns. Products of other manufacturer's equivalent to colors, finishes, textures and patterns of manufacturers listed that meet requirements of technical specifications will be acceptable upon approval in writing by contracting officer for finish requirements.

1.3 SUBMITALS

Submit in accordance with SECTION 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES—provide quadruplicate samples for color approval of materials and finishes specified in this section.

1.4 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in text by basic designation only.

B. MASTER PAINTING INSTITUTE: (MPI)

2001Architectural Painting Specification Manual

PART 2- PRODUCTS

2.1 DIGITAL COLOR PHOTOS

A. Size 24 x 35 mm.

B. Labeled for:

1. Building name and Number.

2. Room Name and Number.

C. Include a series of photographic slides, representing a sequential walk-through. Show typical public, patient, staff and all specialized areas. The photography shall be of architectural quality and are to be the property of the Department of Veterans Affairs, Office of Facility Management.

2.2 DIVISION 31 & 32 - EARTHWORK & EXTERIOR IMPROVEMENTS

A. CHAIN LINK FENCES AND GATES

Finish Chain Link Fabric	Finish Posts and Rails	Manufacturer	Mfg. Color Name/No.
Galvanized	Galvanized	Construction Fence	See Civil

B. NOT USED

C. NOT USED

D. NOT USED

E. NOT USED

F. NOT USED

G. NOT USED

2.3 DIVISION 03 - CONCRETE

A. SECTION 03 30 00, CAST IN PLACE CONCRETE

Surface	Finish Description
Slab	See Specification section 03 30 00 for finish appropriate to flooring.

B. SECTION 03 45 00, PRECAST ARCHITECTURAL CONCRETE

Finish Color	Texture	Finish	Manufacturer	Mfg. Color Name/No.
Match existing adjacent precast concrete or stone surfaces, as applicable	Match existing adjacent precast concrete or stone surfaces, as applicable	Match existing adjacent precast concrete or stone surfaces, as applicable		

2.4 DIVISION 04 - MASONRY

A. Section 04 05 13, MASONRY MORTARING and Section 04 05 16, MASONRY GROUTING

Finish Code	Manufacturer	Mfg. Color Name
Exposed Mortar (at face brick)	Ashgrove	Match existing adjacent mortar color
Exposed Mortar (at precast concrete)	Ashgrove	Match existing adjacent mortar color
Exposed Mortar (at masonry repair / tuckpointing)	Ashgrove	Match existing adjacent mortar color

B. Section 04 20 00, UNIT MASONRY

1. FACE BRICK (FB)				
Finish Code	Size	Pattern	Manufacturer	Mfg. Color Name/No.
90% Harvest Blend and 10% 520 Cordovan (Special Blend)	Standard size- to match existing	Modified Flemish Bond (to match existing)	Bowerston Shale, Newark, Ohio, 43055 (740) 763-3921 www.bowerstonshale.com	Texture Finishes - Sand Face Velour

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2.CONCRETE MASONRY UNIT (CMU)				
Type	Size	Pattern	Finish	Mfg. Color Name/No.
CMU Standard	8" x 16" thickness as shown on drawings	Running Bond	Standard	Standard Gray

- C. NOT USED
- D. NOT USED
- E. NOT USED
- F. NOT USED

2.5 DIVISION 05 - METALS

- A. NOT USED
- B. NOT USED
- C. NOT USED
- D. NOT USED
- E. SECTION 05 50 00, METAL FABRICATIONS

Item	Finish
Exterior Modular Channel Units	Galvanized, prime coat, (2) coats of Exterior Alkyd, gloss level 1, color to match color of material directly adjacent - as applies
Interior Modular Channel Units	Galvanized, prime coat, (2) coats of Interior Alkyd, Semi-Gloss, color to match color of material directly

	adjacent - as applies
Steel Covers and Frames for pits and trenches	Galvanized, prime coat, (2) coats of Interior Alkyd, Semi-Gloss, color to match color of material directly adjacent - as applies
Cast Iron Covers and Frames for Pits and Trenches	Galvanized, prime coat, (2) coats of Interior Alkyd, Semi-Gloss, color to match color of material directly adjacent - as applies
Steel Grating and Frames	Galvanized, prime coat, (2) coats of Interior Alkyd, Semi-Gloss, color to match color of material directly adjacent - as applies
Aluminum Gratings and Frames	Anodic finish to match color anodic aluminum windows
Steel Plank Gratings	Galvanized, prime coat, (2) coats of Interior Alkyd, Semi-Gloss, color to match color of material directly adjacent - as applies
Cast Iron Gratings	Galvanized, prime coat, (2) coats of Interior Alkyd, Semi-Gloss, color to match color of material directly adjacent - as applies
Loose Lintels	Galvanized, prime coat, (2) coats of Interior Alkyd, Semi-Gloss, color to match color of material directly adjacent - as applies
Steel Ladders	Galvanized, prime coat, (2) coats of Interior Alkyd, Semi-Gloss, color to match color of material directly adjacent - as applies
Aluminum Ladders	Anodic finish to match color anodic aluminum of material directly adjacent - as applies
Steel Ladders	Gray powder coat finish.
Floor Trap Door and Ceiling Hatch	Galvanized, prime coat, (2) coats of Interior Alkyd, Semi-Gloss, color to match color of material directly adjacent - as applies
Steel Counter or Bench Top Frame and Legs.	Galvanized, prime coat, (2) coats of Interior Alkyd, Semi-Gloss, color to match color of material directly adjacent - as applies

	adjacent - as applies
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- F. NOT USED
- G. NOT USED

2.6 DIVISION 06 WOOD, PLASTICS, AND COMPOSITES

- A. NOT USED
- B. NOT USED

2.7 DIVISION 07 - THERMAL AND MOISTURE PROTECTION

- A. NOT USED
- B. NOT USED
- C. SECTION 07 31 26, SLATE SHINGLES

Size	Shape	Manufacturer	Mfg. Color Name/No.
Reuse existing slate shingles removed by demolition, or provide new slate shingles to match existing slate in color, size, exposure and texture.	Reuse existing slate shingles removed by demolition, or provide new slate shingles to match existing slate in color, size, exposure and texture.		Reuse existing slate shingles removed by demolition, or provide new slate shingles to match existing slate in color, size, exposure and texture.

- D. NOT USED
- E. NOT USED
- F. NOT USED
- G. NOT USED
- H. SETION 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING

Color	Manufacturer	Mfg. Color Name/No.
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Black	Carlisle	Fully Adhered, thickness; 1.5 mm (0.060 inch)

- I. NOT USED
- J. NOT USED
- K. NOT USED
- L. NOT USED
- M. NOT USED
- N. SECTION 07 60 00, FLASHING AND SHEET METAL

Item	Material	Finish
Copings	Copper	Prime coat, (2) coats of Exterior Alkyd, gloss level 1, color to match color of material directly adjacent
	Stainless steel	
	Aluminum	
Hanging Gutters and Downspouts	Copper	Prime coat, (2) coats of Exterior Alkyd, gloss level 1, color to match color of material directly adjacent
	Stainless steel	
	Aluminum	
Gravel Stops	Aluminum	Prime coat, (2) coats of Exterior Alkyd, gloss level 1, color to match color of material directly adjacent
	Copper	
	Stainless steel	
Scuppers		Prime coat, (2) coats of Exterior Alkyd, gloss level 1, color to match color of material directly adjacent

- O. NOT USED
- P. NOT USED
- Q. SECTION 07 71 00 / 07 72 00, ROOF SPECIALITIES AND ACCESSORIES

Item	Material	Finish	Manufacturer	Manufacturer/Color Name/Number.
Roof Access Hatch	Aluminum	Mill		Clear Anodized Aluminum
Equipment Support	Galv. Steel	Paint		Prime coat, (2) coats of Exterior Alkyd, gloss level 1, color to match color of material directly adjacent - Color:
Gravity Ventilators	Aluminum	Mill		

R. SECTION 07 92 00, JOINT SEALANTS

Location	Color	Manufacturer	Manufacturer Color
Masonry Expansion Joints	Match mortar		
CMU Control Joints	Match mortar		
Precast Concrete Panels	Match mortar		
New to Existing Walls	Match mortar		

2.8 DIVISION 08 - OPENINGS

A. SECTION 08 11 13, HOLLOW METAL DOORS AND FRAMES

Paint both sides of door and frames same color including ferrous metal louvers, and hardware attached to door	
Component	Color of Paint Type and Gloss
Door	See "Color Schedule" in Construction Documents
Frame	See "Color Schedule" in Construction Documents
Window frame (Interior hollow metal)	See "Color Schedule" in Construction Documents

B. SECTION 08 14 00, WOOD DOORS

Component	Finish/Color
Doors	See "Color Schedule" in Construction Documents
Frames	See "Color Schedule" in Construction Documents

C. SECTION 08 31 13, ACCESS DOORS AND FRAMES

Material	Finish/Color
Stainless steel	Factory finished - White

D. SECTION 08 34 83, FLOOR DOORS

Material	Manufacturer	Finish/Color
Frame: aluminum, angle profile Door: Single leaf; 1/4-inch-thick (6.4-mm-thick) aluminum plate with 1/8-inch-deep (3.2-mm-deep) recess for application of finish materials. Hardware: See Section 08 34 83 Floor Doors	Basis of Design: Bilco, Type T - Single Leaf, 24" x 24", or approved equal.	Frame: Mill finish Door: Mill finish aluminum plate with 1/8-inch-deep (3.2-mm-deep) recess for application of finish materials to match adjacent surfaces

- E. NOT USED
- F. NOT USED
- G. NOT USED

H. NOT USED

I. NOT USED

J. SECTION 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

Material	Finish	Manufacturer	Manufacturer Color Name/No.
Aluminum	Color Anodized	Basis of Design: Kawneer	Color to match existing window color exterior theme as selected by architect from manufacturer standard.
Glass	See Specs 08 80 00		

K. SECTION 08 42 29.23, SLIDING AUTOMATIC ENTRANCES

Material	Finish	Manufacturer	Mfg. Color Name/No.
Aluminum	Color Anodized	Basis of Design: Stanley, Dura- Max 5400 Series, 6-panel Telescoping	Color to match existing
Glass	See Specs 08 42 29.23		

L. NOT USED

M. SECTION 08 51 13, ALUMINUM WINDOWS

Type	Finish	Glazing	Manufacturer	Mfg. Color Name/No.
Casement	Color Anodized	See Specs 08 80 00	Kawneer	Color to match existing window color exterior theme as selected by architect from

			manufacturer standard.
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- N. NOT USED
- O. NOT USED
- P. NOT USED
- Q. NOT USED
- R. NOT USED
- S. NOT USED
- T. WINDOW STOOLS

Room No. and Name	Material	Finish
(All rooms with windows to be replaced per Construction Documents)	Solid Surface	See "Color Schedule" in Construction Documents

U. SECTION 08 71 00, BUILDERS HARDWARE: See Spec. Section 08 71 00 Door Hardware

Item	Material	Finish

V. SECTION 08 80 00, GLAZING See Spec. Section 08 80 00 Glazing

Glazing Type	Manufacturer	Mfg. Color Name/No.

- W. NOT USED

2.9 DIVISION 09 - FINISHES

A. SECTION 09 24 00, PORTLAND CEMENT PLASTERING

Finish code	Integral	Color	Manufacturer	Mfg. Color Name/No.
Match existing adjacent surfaces		See "Color Schedule" in Construction Documents		See "Color Schedule" in Construction Documents

B. NOT USED

C. SECTION 09 66 13, PORTLAND CEMENT TERRAZZO FLOORING

Finish Code	Manufacturer	Color Pattern/ Name/No.
Match existing adjacent surfaces		Match existing adjacent surfaces

D. NOT USED

E. NOT USED

F. SECTION 09 51 00, ACOUSTICAL CEILINGS

Finish Code	Component	Color Pattern	Manufacturer	Mfg Name/No.
	Exposed Suspension System	White	Armstrong	15/16" Prelude White
AT-1	Ceiling Tile	See "Color Schedule" in Construction Documents	Armstrong	See "Color Schedule" in Construction Documents

G. NOT USED

H. NOT USED

I. SECTION 09 65 16, RESILIENT SHEET FLOORING

Finish Code	Size	Material/Component	Manufacturer	Mfg Name/No.
WSF-1	5'-11" x 75' roll	Welded Seam Sheet Flooring	See "Color Schedule" in Construction Documents	See "Color Schedule" in Construction Documents

I. SECTION 09 65 19, RESILIENT TILE FLOORING

Finish Code	Size	Material/Component	Manufacturer	Mfg Name/No.
F-1	20" x 20"	Rubber Tile (For use in Elevators)	See "Color Schedule" in Construction Documents	See "Color Schedule" in Construction Documents
LVT-1	6" x 48"	Luxury Vinyl Tile	See "Color Schedule" in Construction Documents	See "Color Schedule" in Construction Documents
LVT-2	12' x 24"	Luxury Vinyl Tile	See "Color Schedule" in Construction Documents	See "Color Schedule" in Construction Documents

J. NOT USED

K. NOT USED

L. SECTION 09 65 13, RESILIENT BASE, STAIR TREADS AND ACCESSORIES

Finish Code	Item	Height	Manufacturer	Mfg Name/No.
(PRB)	Rubber or Vinyl Base (PRB)	See "Color Schedule" in Construction	See "Color Schedule" in Construction	See "Color Schedule" in Construction

		Documents	Documents	Documents
RST	Resilient Stair Treads (RST)	See Spec Section 09 65 13	See Spec Section 09 65 13	

M. SECTION 09 68 00, CARPET (CPT)

Finish Code	Pattern	Manufacture	Mfg. Color Name/No.
CPT-3 (Walk-Off Carpet)	See "Color Schedule" in Construction Documents	See "Color Schedule" in Construction Documents	See "Color Schedule" in Construction Documents
Floor Transitions	Stainless Steel	Schlute	Schiene transitions - As applies to create a smooth transition between dissimilar flooring materials to prevent bump or trip-hazard, and ADA compliant.

- N. NOT USED
- O. NOT USED
- P. NOT USED
- Q. NOT USED
- R. NOT USED
- S. NOT USED

T. SECTION 09 91 00, PAINT AND COATINGS

1. MPI Gloss and Sheen Standards

		Gloss @60	Sheen @85
Gloss Level 1	a traditional matte finish-flat	max 5 units, and	max 10 units
Gloss Level 2	a high side sheen flat-"a velvet-like"	max 10 units, and	

	finish		10-35 units
Gloss Level 3	a traditional "egg-shell like" finish	10-25 units, and	10-35 units
Gloss Level 4	a "satin-like" finish	20-35 units, and	min. 35 units
Gloss Level 5	a traditional semi-gloss	35-70 units	
Gloss Level 6	a traditional gloss	70-85 units	
Gloss level 7	a high gloss	more than 85 units	

2. Paint code	Gloss	Manufacturer	Mfg. Color Name/No.
P-1, P-2, P-4, P-5,	Gloss Level: MPI 5 Semi-gloss	See "Color Schedule" in Construction Documents	See "Color Schedule" in Construction Documents
P-6	Gloss Level: MPI 1 Matte finish - flat	See "Color Schedule" in Construction Documents	See "Color Schedule" in Construction Documents

- U. NOT USED
- V. NOT USED
- W. NOT USED
- X. NOT USED
- Y. NOT USED
- Z. NOT USED

2.10 DIVISION 10 - SPECIALTIES

- A. NOT USED
- B. NOT USED
- C. NOT USED
- D. NOT USED
- E. NOT USED
- F. SECTION 10 26 00, WALL AND DOOR PROTECTION

Item	Material	Manufacturer	Mfg. Color Name/No.
Corner Guards	See "Color Schedule" in Construction Documents	See "Color Schedule" in Construction Documents	See "Color Schedule" in Construction Documents
Wall Guard	See "Color Schedule" in Construction Documents	See "Color Schedule" in Construction Documents	See "Color Schedule" in Construction Documents

G. NOT USED

H. NOT USED

I. SECTION 10 14 00, EXTERIOR SIGNS - See specifications and drawings

Component	Finish	Manufacturer	Mfg. Color Name/No.
Aluminum Sheet	Factory Paint	Epcon or approved equal	Match Existing on campus

J. SECTION 10 14 00, INTERIOR SIGNS - See specifications and drawings

Sign Type	Component	Manufacturer	Mfg. Color Name/No.
Match Existing Theme in Building 1		Epcon	Match Existing

K. SECTION 10 44 13, FIRE EXTINGUISHER CABINETS

Component	Material	Finish
Recessed Fire Extinguisher Cabinet	Stainless Steel	White Polyester

2.11 DIVISION II - EQUIPMENT (NOT USED)

2.12 DIVISION 12- FURNISHINGS

A. NOT USED

B. SECTION 12 32 00, MANUFACTURED WOOD CASEWORK

Component	Finish	Manufacturer	Remarks
Cabinet face	Plastic Laminate with edge banding	See "Color Schedule" in Construction Documents	See "Color Schedule" in Construction Documents

C. SECTION 12 36 00, COUNTERTOPS, WINDOW STOOLS

Type	Finish/Color
Acrylic Solid Surface	See "Color Schedule" in Construction Documents

D. NOT USED

E. NOT USED

F. SECTION 12 24 00, WINDOW SHADES

Component	Material	Manufacturer	Mfg. Color Name/No.
WC-1 Solar Shades	37% Fiberglass, 63% Vinyl on Fiberglass	Insolroll Shade Type: Clutch shade with bead loop, bronze fascia	Mesa- solar screen fabric, Color: Beige / Pearl Gray, Density: 3%
Bronze Fascia		Insolroll	https://insolroll.com/fascia-system-colors/

G. SECTION 12 24 21, LIGHTPROOF SHADES

Component	Material	Manufacturer	Mfg. Color Name/No.
WC-2 Black-Out Shades	42% Fiberglass, 51% Acrylic, 7% Cotton flocked backing (PVC-free, fire-rated)	Insolroll Shade Type: Clutch shade with bead loop, bronze fascia	Twilight Blackout, Color: Mica
Bronze Fascia		Insolroll	https://insolroll.com/fascia-system-colors/

H. NOT USED

2.13 DIVISION 13 - SPECIAL CONSTRUCTION (NOT USED)

2.14 DIVISION 14 - CONVEYING EQUIPMENT

F. SECTION 14 21 00, TRACTION ELEVATORS

Elevator	Component	Material	Finish	Color
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Passenger Elevators "A", "B" & "C"	Hoistway Entrance	See Spec Section <u>14 21 00</u>	See Spec Section <u>14 21 00</u>	See Spec Section <u>14 21 00</u>
	Hoistway Doors			
	Corridor Position Indicator and Call Buttons			
	Car Canopy			
	Car Wainscot			
	Panels Above Wainscot			
	Car Floor			
	Car Operating Panel	↓	↓	↓

G. NOT USED

2.15 DIVISION 22 - PLUMBING

A. SECTION 22 40 00, PLUMBING FIXTURES AND TRIM (SEE Mechanical Construction Drawings and Specifications)

2.16 DIVISION 26 - ELECTRICAL (See Electrical Construction Drawings and Specifications)

PART III EXECUTION

3.1 FINISH SCHEDULES & MISCELLANEOUS ABBREVIATIONS: SEE "COLOR SCHEDULE" IN CONSTRUCTION DOCUMENTS

3.2 FINISH SCHEDULE SYMBOLS

Symbol Definition

** Same finish as adjoining walls
- No color required
E Existing
XX To match existing
EFTR Existing finish to remain
RM Remove

3.3 ROOM FINISH SCHEDULE

- A. Match adjoining or existing similar surfaces colors, textures or patterns where disturbed or damaged by alterations or new work when not scheduled.

- B. ROOM FINISH SCHEDULE (SEE DRAWINGS)

--- E N D---

SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies steel studs wall systems, shaft wall systems, ceiling or soffit suspended or furred framing, wall furring, fasteners, and accessories for the screw attachment of gypsum board, plaster bases or other building boards.

1.2 RELATED WORK

- A. Load bearing framing: Section 05 40 00, COLD-FORMED METAL FRAMING.
- B. Support for wall mounted items: Section 05 50 00, METAL FABRICATIONS.
- C. Pull down tabs in steel decking: Section 05 36 00, COMPOSITE METAL DECKING.
- D. Ceiling suspension systems for acoustical tile or panels and lay in gypsum board panels: Section 09 51 00, ACOUSTICAL CEILINGS, Section 09 29 00, GYPSUM BOARD.

1.3 TERMINOLOGY

- A. Description of terms shall be in accordance with ASTM C754, ASTM C11, ASTM C841 and as specified.
- B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by beams, trusses, or bar joists. In interstitial spaces with walk-on floors the underside of the walk-on floor is the underside of structure overhead.
- C. Thickness of steel specified is the minimum bare (uncoated) steel thickness.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Studs, runners and accessories.
 - 2. Hanger inserts.
 - 3. Channels (Rolled steel).
 - 4. Furring channels.
 - 5. Screws, clips and other fasteners.
- C. Shop Drawings:

1. Typical ceiling suspension system.
 2. Typical metal stud and furring construction system including details around openings and corner details.
 3. Typical shaft wall assembly
 4. Typical fire rated assembly and column fireproofing showing details of construction same as that used in fire rating test.
- D. Test Results: Fire rating test designation, each fire rating required for each assembly.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

In accordance with the requirements of ASTM C754.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society For Testing And Materials (ASTM)
- A641-09Zinc-Coated (Galvanized) Carbon Steel Wire
 - A653/653M-11Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.
 - C11-10Terminology Relating to Gypsum and Related Building Materials and Systems
 - C635-07Manufacture, Performance, and Testing of Metal Suspension System for Acoustical Tile and Lay-in Panel Ceilings
 - C636-08Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
 - C645-09Non-Structural Steel Framing Members
 - C754-11Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
 - C841-03 (R2008)Installation of Interior Lathing and Furring
 - C954-10Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
 - E580-11Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint.

PART 2 - PRODUCTS

2.1 PROTECTIVE COATING

Galvanize steel studs, runners (track), rigid (hat section) furring channels, "Z" shaped furring channels, and resilient furring channels, with coating designation of G40 or equivalent.

2.2 STEEL STUDS AND RUNNERS (TRACK)

- A. ASTM C645, modified for thickness specified and sizes as shown.
 - 1. Use C 645 steel, 0.75 mm (0.0296-inch) minimum base-metal (30 mil).
 - 2. Runners same thickness as studs.
 - 3. Not Used
- B. Provide not less than two cutouts in web of each stud, approximately 300 mm (12 inches) from each end, and intermediate cutouts on approximately 600 mm (24-inch) centers.
- C. Doubled studs for openings and studs for supporting concrete backer-board.
- D. Studs 3600 mm (12 feet) or less in length shall be in one piece.
- E. Shaft Wall Framing:
 - 1. Conform to rated wall construction.
 - 2. C-H Studs or C-T Studs.
 - 3. E Studs.
 - 4. J Runners.
 - 5. Steel Jamb-Strut.

2.3 FURRING CHANNELS

- A. Rigid furring channels (hat shape): ASTM C645.
- B. Resilient furring channels:
 - 1. Not less than 0.45 mm (0.0179-inch) thick bare metal.
 - 2. Semi-hat shape, only one flange for anchorage with channel web leg slotted on anchorage side, channel web leg on other side stiffens fastener surface but shall not contact anchorage surface other channel leg is attached to.
- C. "Z" Furring Channels:
 - 1. Not less than 0.45 mm (0.0179-inch)-thick base metal, with 32 mm (1-1/4 inch) and 19 mm (3/4-inch) flanges.
 - 2. Web furring depth to suit thickness of insulation.

- D. Rolled Steel Channels: ASTM C754, cold rolled; or, ASTM C841, cold rolled.

2.4 FASTENERS, CLIPS, AND OTHER METAL ACCESSORIES

- A. ASTM C754, except as otherwise specified.
- B. For fire rated construction: Type and size same as used in fire rating test.
- C. Fasteners for steel studs thicker than 0.84 mm (0.033-inch) thick. Use ASTM C954 steel drill screws of size and type recommended by the manufacturer of the material being fastened.
- D. Clips: ASTM C841 (paragraph 6.11), manufacturer's standard items. Clips used in lieu of tie wire shall have holding power equivalent to that provided by the tie wire for the specific application.
- E. Concrete ceiling hanger inserts (anchorage for hanger wire and hanger straps): Steel, zinc-coated (galvanized), manufacturers standard items, designed to support twice the hanger loads imposed and the type of hanger used.
- F. Tie Wire and Hanger Wire:
 - 1. ASTM A641, soft temper, Class 1 coating.
 - 2. Gage (diameter) as specified in ASTM C754 or ASTM C841.
- G. Attachments for Wall Furring:
 - 1. Manufacturers standard items fabricated from zinc-coated (galvanized) steel sheet.
 - 2. For concrete or masonry walls: Metal slots with adjustable inserts or adjustable wall furring brackets. Spacers may be fabricated from 1 mm (0.0396-inch) thick galvanized steel with corrugated edges.
- H. Power Actuated Fasteners: Type and size as recommended by the manufacturer of the material being fastened.

2.5 NOT USED

PART 3 - EXECUTION

3.1 INSTALLATION CRITERIA

- A. Where fire rated construction is required for walls, partitions, columns, beams and floor-ceiling assemblies, the construction shall be same as that used in fire rating test.
- B. Construction requirements for fire rated assemblies and materials shall be as shown and specified, the provisions of the Scope paragraph (1.2)

of ASTM C754 and ASTM C841 regarding details of construction shall not apply.

3.2 INSTALLING STUDS

- A. Install studs in accordance with ASTM C754, except as otherwise shown or specified.
- B. Space studs not more than 610 mm (24 inches) on center.
- C. Cut studs 6 mm to 9 mm (1/4 to 3/8-inch) less than floor to underside of structure overhead when extended to underside of structure overhead.
- D. Where studs are shown to terminate above suspended ceilings, provide bracing as shown or extend studs to underside of structure overhead.
- E. Extend studs to underside of structure overhead for fire, rated partitions, smoke partitions, shafts, and sound rated partitions and insulated exterior wall furring.
- F. Not Used
- G. Openings:
 - 1. Frame jambs of openings in stud partitions and furring with two studs placed back to back or as shown.
 - 2. Fasten back to back studs together with 9 mm (3/8-inch) long Type S pan head screws at not less than 600 mm (two feet) on center, staggered along webs.
 - 3. Studs fastened flange to flange shall have splice plates on both sides approximately 50 X 75 mm (2 by 3 inches) screwed to each stud with two screws in each stud. Locate splice plates at 600 mm (24 inches) on center between runner tracks.
- H. Fastening Studs:
 - 1. Fasten studs located adjacent to partition intersections, corners and studs at jambs of openings to flange of runner tracks with two screws through each end of each stud and flange of runner.
 - 2. Do not fasten studs to top runner track when studs extend to underside of structure overhead.
- I. Chase Wall Partitions:
 - 1. Locate cross braces for chase wall partitions to permit the installation of pipes, conduits, carriers and similar items.
 - 2. Use studs or runners as cross bracing not less than 63 mm (2-1/2 inches wide).

- J. Form building seismic or expansion joints with double studs back to back spaced 75 mm (three inches) apart plus the width of the seismic or expansion joint.
- K. Form control joint, with double studs spaced 13 mm (1/2-inch) apart.

3.3 INSTALLING WALL FURRING FOR FINISH APPLIED TO ONE SIDE ONLY

- A. In accordance with ASTM C754, or ASTM C841 except as otherwise specified or shown.
- B. Wall furring-Stud System:
 - 1. Framed with 63 mm (2-1/2 inch) or narrower studs, 600 mm (24 inches) on center.
 - 2. Brace as specified in ASTM C754 for Wall Furring-Stud System or brace with sections or runners or studs placed horizontally at not less than three foot vertical intervals on side without finish.
 - 3. Securely fasten braces to each stud with two Type S pan head screws at each bearing.
- C. Direct attachment to masonry or concrete; rigid channels or "Z" channels:
 - 1. Install rigid (hat section) furring channels at 600 mm (24 inches) on center, horizontally or vertically.
 - 2. Install "Z" furring channels vertically spaced not more than 600 mm (24 inches) on center.
 - 3. At corners where rigid furring channels are positioned horizontally, provide mitered joints in furring channels.
 - 4. Ends of spliced furring channels shall be nested not less than 200 mm (8 inches).
 - 5. Fasten furring channels to walls with power-actuated drive pins or hardened steel concrete nails. Where channels are spliced, provide two fasteners in each flange.
 - 6. Locate furring channels at interior and exterior corners in accordance with wall finish material manufacturers printed erection instructions. Locate "Z" channels within 100 mm (4 inches) of corner.
- D. Installing Wall Furring-Bracket System: Space furring channels not more than 400 mm (16 inches) on center.

3.4 INSTALLING SUPPORTS REQUIRED BY OTHER TRADES

- A. Provide for attachment and support of electrical outlets, plumbing, laboratory or heating fixtures, recessed type plumbing fixture

accessories, access panel frames, wall bumpers, wall-hung casework, handrail brackets, recessed fire extinguisher cabinets and other items like auto door buttons and auto door operators supported by stud construction.

- B. Provide additional studs where required. Install metal backing plates, or special metal shapes as required, securely fastened to metal studs.

3.5 INSTALLING SHAFT WALL SYSTEM

- A. Conform to UL Design No. U438 for two-hour fire rating.
- B. Position J runners at floor and ceiling with the short leg toward finish side of wall. Securely attach runners to structural supports with power driven fasteners at both ends and 600 mm (24 inches) on center.
- C. After liner panels have been erected, cut C-H studs and E studs, from 9 mm (3/8-inch) to not more than 13 mm (1/2-inch) less than floor-to-ceiling height. Install C-H studs between liner panels with liner panels inserted in the groove.
- D. Install full-length steel E studs over shaft wall line at intersections, corners, hinged door jambs, columns, and both sides of closure panels.
- E. Suitably frame all openings to maintain structural support for wall:
 - 1. Provide necessary liner fillers and shims to conform to label frame requirements.
 - 2. Frame openings cut within a liner panel with E studs around perimeter.
 - 3. Frame openings with vertical E studs at jambs, horizontal J runner at head and sill.

3.6 INSTALLING FURRED AND SUSPENDED CEILINGS OR SOFFITS

- A. Install furred and suspended ceilings or soffits in accordance with ASTM C754 or ASTM C841 except as otherwise specified or shown for screw attached gypsum board ceilings and for plaster ceilings or soffits.
 - 1. Space framing at 400 mm (16-inch) centers for metal lath anchorage.
 - 2. Space framing at 600 mm (24-inch) centers for gypsum board anchorage.
- B. New exposed concrete slabs:
 - 1. Use metal inserts required for attachment and support of hangers or hanger wires with tied wire loops for embedding in concrete.

2. Furnish for installation under Division 3, CONCRETE.
 3. Suspended ceilings under concrete rib construction shall have runner channels at right angles to ribs and be supported from ribs with hangers at ends and at 1200 mm (48-inch) maximum intervals along channels. Stagger hangers at alternate channels.
- C. Concrete slabs on steel decking composite construction:
1. Use pull down tabs when available.
 2. Use power activated fasteners when direct attachment to structural framing can not be accomplished.
- D. Where bar joists or beams are more than 1200 mm (48 inches) apart, provide intermediate hangers so that spacing between supports does not exceed 1200 mm (48 inches). Use clips, bolts, or wire ties for direct attachment to steel framing.
- E. Existing concrete construction exposed or concrete on steel decking:
1. Use power actuated fasteners either eye pin, threaded studs or drive pins for type of hanger attachment required.
 2. Install fasteners at approximate mid height of concrete beams or joists. Do not install in bottom of beams or joists.
- F. Steel decking without concrete topping:
1. Do not fasten to steel decking 0.76 mm (0.0299-inch) or thinner.
 2. Toggle bolt to decking 0.9 mm (0.0359-inch) or thicker only where anchorage to steel framing is not possible.
- G. Installing suspended ceiling system for gypsum board (ASTM C635 Option):
1. Install only for ceilings to receive screw attached gypsum board.
 2. Install in accordance with ASTM C636.
 - a. Install main runners spaced 1200 mm (48 inches) on center.
 - b. Install 1200 mm (four foot) tees not over 600 mm (24 inches) on center; locate for edge support of gypsum board.
 - c. Install wall track channel at perimeter.
- H. Installing Ceiling Bracing System:
1. Construct bracing of 38 mm (1-1/2 inch) channels for lengths up to 2400 mm (8 feet) and 50 mm (2 inch) channels for lengths over 2400 mm (8 feet) with ends bent to form surfaces for anchorage to carrying channels and over head construction. Lap channels not less

than 600 mm (2 feet) at midpoint back to back. Screw or bolt lap together with two fasteners.

2. Install bracing at an approximate 45 degree angle to carrying channels and structure overhead; secure as specified to structure overhead with two fasteners and to carrying channels with two fasteners or wire ties.
3. Brace suspended ceiling or soffit framing in seismic areas in accordance with ASTM E580.

3.7 TOLERANCES

- A. Fastening surface for application of subsequent materials shall not vary more than 3 mm (1/8-inch) from the layout line.
- B. Plumb and align vertical members within 3 mm (1/8-inch.)
- C. Level or align ceilings within 3 mm (1/8-inch.)

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06-01-18
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VA Project #438-18-102

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SECTION 09 24 00
PORTLAND CEMENT PLASTERING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies lathing and portland cement based plaster.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Steel framing members for attachment of plaster bases: Section 05 40 00, COLD-FORMED METAL FRAMING, and Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- C. Access Doors: Section 08 31 13, ACCESS DOORS AND FRAMES.
- D. Room Finish Schedule and Color: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 TERMINOLOGY:

- A. Definitions and description of terms to be in accordance with ASTM C11, ASTM C926, ASTM C1063 and as specified.
- B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead is defined as the underside of the floor or roof construction supported by beams, trusses, and bar joists.
- C. Self-furring Lath: Metal plastering bases having dimples or crimps designed to hold the back plane of the lath 6 to 10 mm (1/4 to 3/8 inch) away from the plane of the solid backing.
- D. Solid Backing or Solid Bases: Concrete, masonry, sheathing, rigid insulation, and similar materials to which plaster is directly applied.
- E. Wet Areas: Areas of a building where cyclic or continuous exposure to very humid or wet conditions, or in which a dew point condition may occur in the plaster.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Postconsumer and preconsumer recycled content as described in PART 2 - PRODUCTS.
- C. Manufacturer's Literature and Data:

1. Accessories for plaster, each type.
2. Metal plastering bases, each type.
3. Fasteners.
4. Bonding compounds, including application instructions.
5. Admixtures, including mixing and application instructions.

D. Samples:

1. Accessories for plaster, each type, not less than 152 mm (6 inches) long.
2. Panel showing finish coat 152 to 305 mm (6 by 12 inches) minimum.

E. Installers qualifications.

1.5 DELIVERY, STORAGE AND PROTECTION:

- A. Deliver manufactured materials in the manufacturers' original unbroken packages or containers which are labeled plainly with the manufacturers' names and brands. Keep cementitious materials dry and stored off the ground, under cover, and away from sweating walls and other damp surfaces until ready for use.

1.6 PROJECT CONDITIONS:

- A. Maintain work areas for interior work at a temperature of not less than 4 degrees C (40 degrees F) for not less than 48 hours prior to application of plaster, during application of plaster and 1 week after plaster has set or until plaster has dried.
- B. Do not apply exterior plaster when the ambient temperature is less than 4 degrees C (40 degrees F), or when a drop in temperature below 4 degrees C (40 degrees F) is expected within 24 hours after application.
- C. Do not apply plaster to frozen surfaces or surfaces containing frost.
- D. Do not use frozen materials in the mix.
- E. Protect plaster coats against freezing for a period of not less than 24 hours after application.

1.7 QUALITY ASSURANCE:

- A. Installers Qualifications: Work is to be performed by installer having a minimum of three (3) years' experience for work relating to this Section. Submit installer qualifications.
- B. Mockup: Build 9.29 sq. m (100 sq. ft.) mockup for each substrate and finish texture indicated for cement plastering including accessories. For interior plaster work, simulate finished lighting for review of mockups. Approved mockups may become part of completed work.

1.8 PERFORMANCE REQUIREMENTS:

- A. Where indicated on construction documents, provide cement plaster assemblies identical to those of assemblies tested for fire resistance according to ASTM E119 by a qualified testing agency.
- B. Where indicated on construction documents provide cement plaster assemblies identical to those of assemblies tested for STC ratings according to ASTM E90 and classified according to ASTM E413 by a qualified testing agency.

1.9 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.
- B. ASTM International (ASTM):
 - A653/A653M-13Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - A1064/A1064M-14Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
 - C11-13Terminology Relating to Gypsum and Related Building Materials and Systems.
 - C91/C91M-12Masonry Cement
 - C150/C150M-12Portland Cement
 - C206-14Finishing Hydrated Lime
 - C207-06 (R2011)Hydrated Lime for Masonry Purposes
 - C260/C260M-10aAir Entraining Admixtures for Concrete.
 - C847-14aMetal Lath
 - C897-05 (R2014)Aggregate for Job-Mixed Portland Cement Based Plasters
 - C926-14aApplication of Portland Cement-Based Plaster
 - C932-06 (R2013)Surface-Applied Bonding Compounds for Exterior Plastering
 - C933-14Welded Wire Lath
 - C979/C979M-10Pigments for Integrally Colored Concrete
 - C1002-14Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs

- C1063-14dInstallation of Lathing and Furring to Receive
Interior and Exterior Portland Cement-Based
Plaster
- E90-09Test Method for Laboratory Measurement of
Airborne Sound Transmission Loss of Building
Partitions and Elements
- E119-14Test Methods for Fire Tests of Building
Construction and Materials
- E413-10Classification for Rating Sound Insulation
- C. Commercial Item Description (CID):
A-A-55615-95 (R2006)Shield, Expansion (Wood Screw and Lag Bolt
Self-Threading Anchors)

PART 2 - PRODUCTS

2.1 METAL PLASTERING BASES:

- A. Expanded Lath:
1. ASTM C847, galvanized except as modified by ASTM C1063 and this specification. Self-furring where applied over solid backing.
 2. Flat diamond mesh weighing not less than 1.8 kg per square meter (3.4 pounds per square yard).
- B. Stucco Mesh: Flat expanded diamond mesh pattern, with openings approximately 38 by 75 mm (1-1/2 by 3 inches), weighing not less than 1.9 kg per square meter (3.6 pounds per square yard), with backing as specified.
- C. Wire Lath:
1. Zinc coated (Galvanized).
 2. Welded Wire Lath: ASTM C933, with backing as specified.
 3. Self-furring where applied over solid backing.
 4. Recycled Content of Metal Products: Post consumer content plus one-half of preconsumer content not less than 30 percent.
- D. Building Paper Backing for Metal Plastering Bases:
1. Backing attached to lath as specified in ASTM C933.
 2. Vapor Permeable Backing: Fed. Spec. UU-B-790, Type I, Grade D.
 3. Water Resistant Backing: Fed. Spec. UU-B-790, Type I, Grade B.

2.2 ACCESSORIES FOR CEMENT PLASTER:

- A. Provide accessories that are roll formed galvanized steel, except that cornerite and strip lath that are formed from steel sheets with manufacturer's standard galvanized coating.

- B. Provide welded wire corner reinforcements of galvanized 1.4 mm (17 gauge) steel wire conforming to ASTM A1064/A1064M.
- C. Provide furring, including hangers, bolts, inserts, clips, fastenings, and attachments of number, size, and design to develop the full strength of the members.
- D. Control Joints: ASTM C1063, zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanged and removable protective tape on plaster face of control joint.
- E. Foundation Weep Screed: Fabricated from hot-dip galvanized-steel sheet, ASTM A653/A653M, G60 (Z180) zinc coating.
- F. Cornerite: Fabricated from metal lath with ASTM A653/A653M, G60 (Z180), hot-dip galvanized-zinc coating.
- G. External- (Outside-) Corner Reinforcement: Fabricated from metal lath with ASTM A653/A653M, G60 (Z180), hot-dip galvanized-zinc coating.
- H. Cornerbeads: Fabricated from zinc-coated (galvanized) steel.
 - 1. Smallnose cornerbead with expanded flanges; use unless otherwise indicated on construction documents.
 - 2. Smallnose cornerbead with perforated flanges; use on curved corners.
 - 3. Smallnose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing unit masonry corners.
 - 4. Bullnose cornerbead, radius 19 mm (3/4 inch) minimum, with expanded flanges; use at locations indicated on construction documents.
- I. Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style; with expanded flanges.

2.3 FASTENERS:

- A. Tie, wire, screws, staples, clips, nails, and other fasteners ASTM C1063, except as otherwise specified.
- B. Provide fasteners for securing metal plastering bases having heads, or inserted through washers large enough to engage two (2) strands (two (2) on each side of screw) of the metal plastering base.
- C. For fire rated construction; provide fasteners of type and size as used in fire rated test.
- D. Screws: ASTM C1002.
- E. Expansion Shields: CID A-A-55615, of the Type and Class applicable.

2.4 CEMENT:

- A. Portland: ASTM C150/C150M, Type I.
- B. Masonry: ASTM C91/C91M, Type N.
- C. White where required for white finish coat.

2.5 LIME:

- A. ASTM C206, Type S; or ASTM C207, Type S.

2.6 AGGREGATES (SAND):

- A. ASTM C897, graded as required to suit texture of finish specified.
- B. White where white finish coat is specified.

2.7 BONDING AGENT:

- A. ASTM C932.

2.8 FACTORY PREPARED FINISH COAT FOR CEMENT PLASTER :

- A. Factory prepared dry blend of materials, integrally colored, designed for exterior finish coat application.
- B. Pigments: ASTM C979/C979M, lime proof mineral oxide.
- C. Particle Size: Not more than 35 percent, by weight of all ingredients, including cement, aggregate, hydrated lime, admixture and coloring pigment is to pass a number 100 sieve.

2.9 ADMIXTURES:

- A. Air Entrainment: ASTM C260/C260M.

PART 3 - EXECUTION

3.1 METAL PLASTERING BASES (LATH) LOCATIONS:

- A. Where plaster is required on solid concrete or masonry bases, metal plastering bases are not required, unless shown on the construction documents. Where shown use wire lath or stucco mesh.
- B. On ceiling or soffit framing use flat diamond mesh lath.
- C. On interior wall framing:
 - 1. Provide expanded lath.
 - 2. Provide metal lath with water resistant backing in wet areas.
- D. Over steel columns, provide expanded lath.
- E. Where metal plastering bases are used as a base for exterior cement plaster over wall sheathing, provide wire lath or stucco mesh with water resistant backing.

3.2 APPLYING METAL PLASTERING BASES:

- A. In accordance with ASTM C1063, except as otherwise specified or indicated on construction documents.

- B. Form true surfaces, straight or in curves where shown on construction documents, without sags or buckles and with long dimension of lath at right angles to direction of supports.
- C. Terminate lath for ceiling or soffit construction at casing bead (floating angle construction) at perimeter angles between walls and ceilings or soffits.
- D. Lath with backing to be applied to produce a paper to paper and metal to metal lap at ends and sides of adjacent sheets, whether full sheets or less than full sheets are provided:
 - 1. Lap backing 50 mm (2 inches) for both horizontal and vertical laps.
 - 2. Install horizontal laps in a ship lap fashion to conduct water to the outside and over flashing or waterproofing.
- E. Do not install continuous metal plastering bases through expansion and control joints. Terminate at each side of joint.
- F. Attach lath directly to masonry and concrete with hardened nails, power actuated drive pins or other approved fasteners. Install fasteners at dimples or crimps only.
- G. Wood plugs are not acceptable.

3.3 INSTALLING PLASTERING ACCESSORIES:

- A. Install accessories in accordance with ASTM C1063, except as otherwise specified.
 - 1. Set plastering accessories plumb, level and true to line, neatly mitered at corners and intersections, and securely attach to supporting surfaces.
 - 2. Install in one (1) piece, within the limits of the longest commercially available lengths.
- B. Corner Beads: External-corner reinforcement corner bead at exterior corners, as required to establish grounds.
- C. Strip Lath:
 - 1. Install centered over joints between dissimilar materials, such as hollow tile, brick, concrete masonry units, concrete, and joints with expanded lath on framing or furring, where both such surfaces are required to be plastered and are in contact with each other in same plane, except where expansion joints and casing beads are required.
 - 2. Wire tie or fasten strip lath to base along both edges at not over 152 mm (6 inches) on centers.

D. Casing Beads:

1. Provide at locations where shown on construction documents and at following locations where plaster terminates to provide finish trim:
 - a. Against non-plastered surfaces such as masonry, concrete, and wood.
 - b. Against trim of steel frames and trim of other materials and equipment, except where trim overlaps plaster.
 - c. Around perimeter of openings except where edge is covered by flanges. Locate to conform to dimensions shown on shop drawings.
 - d. Where plaster for new walls or furring (vertical or horizontal) terminates against existing construction.
 - e. Both sides of expansion and control joints unless shown otherwise on construction documents.
2. Provide at perimeter angles between walls and ceilings so as to provide floating angle (unrestrained) construction in accordance with ASTM C1063.

E. Cornerites:

1. Provide at interior corners of walls, partitions, and other vertical surfaces to be plastered, except where lath is carried around angle.
2. Fasten only as necessary to retain position during plastering.
3. Omit cornerites at junction of new plastered walls with existing plastered walls at locations where casing beads are specified.

F. Control Joints:

1. Where control joints are placed parallel to framing members, install joints within 101 mm (4 inches) of the framing member.
2. Install control joints only to the edges of abutting sheets of lath so that the lath is not continuous or tied across the joint.
3. Extend joints the full width and height of the wall or length of soffit/ceiling plaster membrane.

3.4 SURFACE PREPARATION OF SOLID BASES:

- A. Surfaces that are to receive plaster are to be prepared and conditioned in accordance with ASTM C926, except as otherwise specified.
- B. New surfaces of masonry and concrete:
 1. Remove projections and clean concrete surface of form oil.
 2. Fill depressions, holes, cracks and similar voids flush with Portland cement plaster to provide substrate within the tolerance specified in ASTM C926.

3. Use bonding agent.
 4. Cover with self-furring lath where required to keep the total plaster thickness as specified in Table 4 of ASTM C926.
- C. Existing surfaces of concrete and masonry:
1. Clean surface of dirt and other foreign matter which will prevent bond.
 2. Apply dash bond coat or bonding agent as specified herein.
 3. Where existing surfaces have a coating such as paint or bituminous waterproofing apply metal plastering base as indicated.

3.5 PORTLAND CEMENT BASED PLASTER:

- A. Provide portland cement based plaster where cement plaster is shown and specified, and as follows:
1. Three-Coat work is to be used over all metal plastering bases, with or without solid backing.
 2. Two-Coat work may only be used over solid bases conforming to requirements of Paragraph, SURFACE PREPARATION OF SOLID BASES.
- B. Proportion, mix and apply plaster in accordance with ASTM C926, except as otherwise specified.
1. Provide air entrained plaster for all exterior work.
 4. Factory prepared finish coat: Add water, mix, and apply as specified by manufacturer.
 5. Color:
 - a. Provide natural cement color when painted or other coating is specified.
 - b. Other colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES.
 6. Finish coat is to have a sand float finish.

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10-01-15
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SECTION 09 29 00
GYPSUM BOARD

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies installation and finishing of gypsum board.

1.2 RELATED WORK

- A. Installation of steel framing members for walls, partitions, furring, soffits, and ceilings: Section 05 40 00, COLD-FORMED METAL FRAMING, and Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- B. Sound deadening board: Section 07 21 13, THERMAL INSULATION.
- C. Acoustical Sealants: Section 07 92 00, JOINT SEALANTS.

1.3 TERMINOLOGY

- A. Definitions and description of terms shall be in accordance with ASTM C11, C840, and as specified.
- B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by the trusses or bar joists.
- C. "Yoked": Gypsum board cut out for opening with no joint at the opening (along door jamb or above the door).

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Cornerbead and edge trim.
 - 2. Finishing materials.
 - 3. Laminating adhesive.
 - 4. Gypsum board, each type.
- C. Shop Drawings:
 - 1. Typical gypsum board installation, showing corner details, edge trim details and the like.
 - 2. Typical sound rated assembly, showing treatment at perimeter of partitions and penetrations at gypsum board.
 - 3. Typical shaft wall assembly.
 - 4. Typical fire rated assembly and column fireproofing, indicating details of construction same as that used in fire rating test.

D. Samples:

1. Cornerbead.
2. Edge trim.
3. Control joints.

E. Test Results:

1. Fire rating test, each fire rating required for each assembly.
2. Sound rating test.

F. Certificates: Certify that gypsum board types, gypsum backing board types, cementitious backer units, and joint treating materials do not contain asbestos material.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

In accordance with the requirements of ASTM C840.

1.6 ENVIRONMENTAL CONDITIONS

In accordance with the requirements of ASTM C840.

1.7 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American Society for Testing And Materials (ASTM):

- C11-15Terminology Relating to Gypsum and Related Building Materials and Systems
- C475-15Joint Compound and Joint Tape for Finishing Gypsum Board
- C840-13Application and Finishing of Gypsum Board
- C919-12Sealants in Acoustical Applications
- C954-15Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Stud from 0.033 in. (0.84mm) to 0.112 in. (2.84mm) in thickness
- C1002-14Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
- C1047-14Accessories for Gypsum Wallboard and Gypsum Veneer Base
- C1177-13Glass Mat Gypsum Substrate for Use as Sheathing
- C1658-13Glass Mat Gypsum Panels
- C1396-14Gypsum Board

- C. Underwriters Laboratories Inc. (UL):
Latest EditionFire Resistance Directory
- D. Inchcape Testing Services (ITS):
Latest EditionsCertification Listings

PART 2 - PRODUCTS

2.1 GYPSUM BOARD

- A. Gypsum Board: ASTM C1396, Type X, 16 mm (5/8 inch) thick unless shown otherwise.
- B. Coreboard or Shaft Wall Liner Panels.
 - 1. ASTM C1396, Type X.
 - 2. ASTM C1658: Glass Mat Gypsum Panels,
 - 3. Coreboard for shaft walls 300, 400, 600 mm (12, 16, or 24 inches) wide by required lengths 25 mm (one inch) thick with paper faces treated to resist moisture.
- C. Water Resistant Gypsum Backing Board: ASTM C620, Type X, 16 mm (5/8 inch) thick.
- D. Not Used.

2.2 GYPSUM SHEATHING BOARD

- A. ASTM C1396, Type X, water-resistant core, 16 mm (5/8 inch) thick.
- B. ASTM C1177, Type X.

2.3 ACCESSORIES

- A. ASTM C1047, except form of 0.39 mm (0.015 inch) thick zinc coated steel sheet or rigid PVC plastic.
- B. Flanges not less than 22 mm (7/8 inch) wide with punchouts or deformations as required to provide compound bond.

2.4 FASTENERS

- A. ASTM C1002 and ASTM C840, except as otherwise specified.
- B. ASTM C954, for steel studs thicker than 0.04 mm (0.33 inch).
- C. Select screws of size and type recommended by the manufacturer of the material being fastened.
- D. For fire rated construction, type and size same as used in fire rating test.
- E. Clips: Zinc-coated (galvanized) steel; gypsum board manufacturer's standard items.

2.5 FINISHING MATERIALS AND LAMINATING ADHESIVE

ASTM C475 and ASTM C840. Free of antifreeze, vinyl adhesives, preservatives, biocides and other VOC. Adhesive shall contain a maximum VOC content of 50 g/l.

PART 3 - EXECUTION

3.1 GYPSUM BOARD HEIGHTS

- A. Extend all layers of gypsum board from floor to underside of structure overhead on following partitions and furring:
 - 1. Two sides of partitions:
 - a. Fire rated partitions.
 - b. Smoke partitions.
 - c. Sound rated partitions.
 - d. Full height partitions shown (FHP).
 - e. Corridor partitions.
 - 2. One side of partitions or furring:
 - a. Inside of exterior wall furring or stud construction.
 - b. Room side of room without suspended ceilings.
 - c. Furring for pipes and duct shafts, except where fire rated shaft wall construction is shown.
 - 3. Extend all layers of gypsum board construction used for fireproofing of columns from floor to underside of structure overhead, unless shown otherwise.
- B. In locations other than those specified, extend gypsum board from floor to heights as follows:
 - 1. Not less than 100 mm (4 inches) above suspended acoustical ceilings.
 - 2. At ceiling of suspended gypsum board ceilings.
 - 3. At existing ceilings.

3.2 INSTALLING GYPSUM BOARD

- A. Coordinate installation of gypsum board with other trades and related work.
- B. Install gypsum board in accordance with ASTM C840, except as otherwise specified.
- C. Moisture and Mold-Resistant Assemblies: Provide and install moisture and mold-resistant glass mat gypsum wallboard products with moisture-resistant surfaces complying with ASTM C1658 where shown and in

locations which might be subject to moisture exposure during construction.

- D. Use gypsum boards in maximum practical lengths to minimize number of end joints.
- E. Bring gypsum board into contact, but do not force into place.
- F. Ceilings:
 - 1. For single-ply construction, use perpendicular application.
 - 2. For two-ply assemblies:
 - a. Use perpendicular application.
 - b. Apply face ply of gypsum board so that joints of face ply do not occur at joints of base ply with joints over framing members.
- G. Walls (Except Shaft Walls):
 - 1. When gypsum board is installed parallel to framing members, space fasteners 300 mm (12 inches) on center in field of the board, and 200 mm (8 inches) on center along edges.
 - 2. When gypsum board is installed perpendicular to framing members, space fasteners 300 mm (12 inches) on center in field and along edges.
 - 3. Stagger screws on abutting edges or ends.
 - 4. For single-ply construction, apply gypsum board with long dimension either parallel or perpendicular to framing members as required to minimize number of joints except gypsum board shall be applied vertically over "Z" furring channels.
 - 5. For two-ply gypsum board assemblies, apply base ply of gypsum board to assure minimum number of joints in face layer. Apply face ply of wallboard to base ply so that joints of face ply do not occur at joints of base ply with joints over framing members.
 - 6. For three-ply gypsum board assemblies, apply plies in same manner as for two-ply assemblies, except that heads of fasteners need only be driven flush with surface for first and second plies. Apply third ply of wallboard in same manner as second ply of two-ply assembly, except use fasteners of sufficient length enough to have the same penetration into framing members as required for two-ply assemblies.
 - 7. No offset in exposed face of walls and partitions will be permitted because of single-ply and two-ply or three-ply application requirements.

8. Installing Two Layer Assembly Over Sound Deadening Board:
 - a. Apply face layer of wallboard vertically with joints staggered from joints in sound deadening board over framing members.
 - b. Fasten face layer with screw, of sufficient length to secure to framing, spaced 300 mm (12 inches) on center around perimeter, and 400 mm (16 inches) on center in the field.

9. Control Joints ASTM C840 and as follows:
 - a. Locate at both side jambs of openings if gypsum board is not "yoked". Use one system throughout.
 - b. Not required for wall lengths less than 9000 mm (30 feet).
 - c. Extend control joints the full height of the wall or length of soffit/ceiling membrane.

- H. Acoustical or Sound Rated Partitions, Fire and Smoke Partitions:
 1. Cut gypsum board for a space approximately 3 mm to 6 mm (1/8 to 1/4 inch) wide around partition perimeter.
 2. Coordinate for application of caulking or sealants to space prior to taping and finishing.
 3. For sound rated partitions, use sealing compound (ASTM C919) to fill the annular spaces between all receptacle boxes and the partition finish material through which the boxes protrude to seal all holes and/or openings on the back and sides of the boxes. STC minimum values as shown.

- I. Electrical and Telecommunications Boxes:
 1. Seal annular spaces between electrical and telecommunications receptacle boxes and gypsum board partitions.

- J. Accessories:
 1. Set accessories plumb, level and true to line, neatly mitered at corners and intersections, and securely attach to supporting surfaces as specified.
 2. Install in one piece, without the limits of the longest commercially available lengths.
 3. Corner Beads:
 - a. Install at all vertical and horizontal external corners and where shown.
 - b. Use screws only. Do not use crimping tool.

4. Edge Trim (casings Beads):

- a. At both sides of expansion and control joints unless shown otherwise.
- b. Where gypsum board terminates against dissimilar materials and at perimeter of openings, except where covered by flanges, casings or permanently built-in equipment.
- c. Where gypsum board surfaces of non-load bearing assemblies abut load bearing members.
- d. Where shown.

3.3 INSTALLING GYPSUM SHEATHING

- A. Install in accordance with ASTM C840, except as otherwise specified or shown.
- B. Use screws of sufficient length to secure sheathing to framing.
- C. Space screws 9 mm (3/8 inch) from ends and edges of sheathing and 200 mm (8 inches) on center. Space screws a maximum of 200 mm (8 inches) on center on intermediate framing members.
- D. Apply 600 mm by 2400 mm (2 foot by 8 foot) sheathing boards horizontally with tongue edge up.
- E. Apply 1200 mm by 2400 mm or 2700 mm (4 ft. by 8 ft. or 9 foot) gypsum sheathing boards vertically with edges over framing.

3.4 CAVITY SHAFT WALL

- A. Coordinate assembly with Section 09 22 16, NON-STRUCTURAL METAL FRAMING, for erection of framing and gypsum board.
- B. Conform to UL Design No. U438 or FM WALL CONSTRUCTION 12-2/HR (Nonbearing for two-hour fire rating. Conform to FM WALL CONSTRUCTION 25-1/HR (Non-loadbearing) for one-hour fire rating where shown.
- C. Cut coreboard (liner) panels 25 mm (one inch) less than floor-to-ceiling height, and erect vertically between J-runners on shaft side.
 1. Where shaft walls exceed 4300 mm (14 feet) in height, position panel end joints within upper and lower third points of wall.
 2. Stagger joints top and bottom in adjacent panels.
 3. After erection of J-struts of opening frames, fasten panels to J-struts with screws of sufficient length to secure to framing staggered from those in base, spaced 300 mm (12 inches) on center.

D. Gypsum Board:

1. Two hour wall:

- a. Erect base layer (backing board) vertically on finish side of wall with end joints staggered. Fasten base layer panels to studs with 25 mm (one inch) long screws, spaced 600 mm (24 inches) on center.
- b. Use laminating adhesive between plies in accordance with UL or FM if required by fire test.
- c. Apply face layer of gypsum board required by fire test vertically over base layer with joints staggered and attach with screws of sufficient length to secure to framing staggered from those in base, spaced 300 mm (12 inches) on center.

2. One hour wall with one layer on finish side of wall: Apply face layer of gypsum board vertically. Attach to studs with screws of sufficient length to secure to framing, spaced 300 mm (12 inches) on center in field and along edges.

3. Where coreboard is covered with face layer of gypsum board, stagger joints of face layer from those in the coreboard base.

E. Treat joints, corners, and fasteners in face layer as specified for finishing of gypsum board.

3.5 FINISHING OF GYPSUM BOARD

A. Finish joints, edges, corners, and fastener heads in accordance with ASTM C840. Use Level 4 finish for all finished areas open to public view.

B. Before proceeding with installation of finishing materials, assure the following:

1. Gypsum board is fastened and held close to framing or furring.
2. Fastening heads in gypsum board are slightly below surface in dimple formed by driving tool.

C. Finish joints, fasteners, and all openings, including openings around penetrations, on that part of the gypsum board extending above suspended ceilings to seal surface of non-decorated smoke barrier, fire rated and sound rated gypsum board construction. After the installation of hanger rods, hanger wires, supports, equipment, conduits, piping and similar work, seal remaining openings and maintain the integrity of the smoke barrier, fire rated and sound rated construction Sanding is not required of non-decorated surfaces.

3.6 REPAIRS

- A. After taping and finishing has been completed, and before decoration, repair all damaged and defective work, including nondecorated surfaces.
- B. Patch holes or openings 13 mm (1/2 inch) or less in diameter, or equivalent size, with a setting type finishing compound or patching plaster.
- C. Repair holes or openings over 13 mm (1/2 inch) diameter, or equivalent size, with 16 mm (5/8 inch) thick gypsum board secured in such a manner as to provide solid substrate equivalent to undamaged surface.
- D. Tape and refinish scratched, abraded or damaged finish surfaces including cracks and joints in non-decorated surface to provide smoke tight construction, fire protection equivalent to the fire rated construction and STC equivalent to the sound rated construction .

3.7 UNACCESSIBLE CEILINGS

At areas accessible to patients and not continuously observable by staff (e.g., patient bedrooms, day rooms), ceilings should be a solid material such as gypsum board. This will limit patient access. Access doors are needed to access electrical and mechanical equipment above the ceiling. These doors should be locked to prevent unauthorized access and secured to ceiling using tamper resistant fasteners.

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SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Acoustical units.
 2. Metal ceiling suspension system for acoustical ceilings.
 3. Adhesive application.

1.2 RELATED REQUIREMENTS

- A. Adhesive VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Color, pattern, and location of each type of acoustical unit: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Access doors in adhesive applied tile: Section 08 31 13, ACCESS DOORS AND FRAMES.
- D. Ceiling Suspension System: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- E. Lay in gypsum board ceiling panels: Section 09 29 00, GYPSUM BOARD.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
1. A641/A641M-09a(2014) - Zinc-coated (Galvanized) Carbon Steel Wire.
 2. A653/A653M-15e1 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process.
 3. C423-09a - Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 4. C634-13 - Terminology Relating to Environmental Acoustics.
 5. C635/C635M-13a - Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
 6. C636/C636M-13 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
 7. D1779-98(2011) - Adhesive for Acoustical Materials.
 8. E84-15b - Surface Burning Characteristics of Building Materials.
 9. E119-16 - Fire Tests of Building Construction and Materials.
 10. E413-16 - Classification for Rating Sound Insulation.

11. E580/E580M-14 - Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.

12. E1264-14 - Classification for Acoustical Ceiling Products.

C. International Organization for Standardization (ISO):

1. ISO 14644-1 - Classification of Air Cleanliness.

1.4 PREINSTALLATION MEETINGS

A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.

1. Required Participants:

- a. Contracting Officer's Representative.
- b. Contractor.
- c. Installer.
- d. Other installers responsible for adjacent and intersecting work.

2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.

- a. Installation schedule.
- b. Installation sequence.
- c. Preparatory work.
- d. Protection before, during, and after installation.
- e. Installation.
- f. Terminations.
- g. Transitions and connections to other work.
- h. Inspecting and testing.
- i. Other items affecting successful completion.

3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Show size, configuration, and fabrication and installation details.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Ceiling suspension system indicating manufacturer recommendation for each application.

3. Installation instructions.
 4. Warranty.
- D. Samples:
1. Acoustical units, 150 mm (6 inches) in size, each type, including units specified to match existing.
 - a. Submit quantity required to show full color and texture range.
 2. Suspension system, trim and molding, 300 mm (12 inches) long.
 3. Colored markers for access service.
 4. Approved samples may be incorporated into work.
- E. Sustainable Construction Submittals:
1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
 2. Biobased Content:
 - a. Show type and quantity for each product.
 - b. Show volatile organic compound types and quantities.
- F. Certificates: Certify each product complies with specifications.
1. Acoustical units, each type.
- G. Qualifications: Substantiate qualifications comply with specifications.
1. Manufacturer with project experience list .
- H. Operation and Maintenance Data:
1. Care instructions for each exposed finish product.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
1. Regularly manufactures specified products.
 2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.
 - a. Project Experience List: Provide contact names and addresses for completed projects.

1.7 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight conditioned facility.

- B. Protect products from damage during handling and construction operations.

1.9 FIELD CONDITIONS

- A. Environment:
 - 1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.
 - 2. Work Area Ambient Conditions: HVAC systems are complete, operational, and maintaining facility design operating conditions continuously, beginning 48 hours before installation until Government occupancy.
 - 3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

1.10 WARRANTY

- A. Construction Warranty: Contractor's one-year labor and material warranty, FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Ceiling System: Acoustical ceilings units on exposed grid suspension systems.

2.2 SYSTEM PERFORMANCE

- A. Design product complying with specified performance:
 - 1. Maximum Deflection: 1/360 of span, maximum.
- B. Not Used.
- C. Surface Burning Characteristics: When tested according to ASTM E84.
 - 1. Flame Spread Rating: 75 maximum.
 - 2. Smoke Developed Rating: 450 maximum.

2.3 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide acoustical units from one manufacturer.
 - 1. Provide each product exposed to view from one production run.
- C. Provide suspension system from same manufacturer.
- D. Sustainable Construction Requirements:

1. Mineral Base Recycled Content: 65 percent, total recycled content, minimum. Select products with recycled content to achieve overall Project recycled content requirement.
2. Steel Recycled Content: 30 percent total recycled content, minimum.
3. Aluminum Recycled Content: 50 percent total recycled content, minimum.
4. Biobased Content: 37 percent by weight biobased material, minimum.
5. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Non-flooring adhesives and sealants.

2.4 ACOUSTICAL UNITS

A. General:

1. Ceiling Panel and Tile: ASTM E1264, bio-based content according to USDA Bio-Preferred Product requirements.
 - a. Mineral Fiber: 3.6 kg/sq. m (3/4 psf) weight, minimum.
2. Classification: Provide type and form as follows:
 - a. Type III Units - Mineral base with water-based painted finish maximum 10 g/l VOC; Form 2 - Water felted, minimum 16 mm (5/8 inch) thick.
 - b. NRC (Noise Reduction Coefficient): ASTM C423, minimum 0.55 unless specified otherwise.
 - c. CAC (Ceiling Attenuation Class): ASTM E413, 40-44 range unless specified otherwise.
 - d. LR (Light Reflectance): Minimum 0.75.
3. Lay-in panels: Sizes as indicated on Drawings, with reveal edges.
 - a. Sizes:
 - 1) Exposed Grid Upward Access System: . 600 by 600 (24 by 24)
 - 2) Not Used.
 - 3) Edge and Joint Detail: Reveal edges and joints as required to suit suspension and access system.
4. Adhesive Applied Tile:
 - a. Size: 300 by 300 mm (12 by 12 inch) size.
 - b. Edges: Square.
5. Type III-A Units - Mineral base with painted finish.
 - a. Form 1, modular, cast or molded.

- b. NRC: 0.75 minimum.
- c. Thickness: 19 mm (3/4 inch) minimum.
- d. Weight, 4.9 kg/sq. m (one pound per square foot).

2.5 METAL SUSPENSION SYSTEM

- A. General: ASTM C635, heavy-duty system, except as otherwise specified.
 - 1. Suspension System: Provide the following:
 - a. Galvanized cold-rolled steel, bonderized.
 - 2. Main and Cross Runner: Use same construction Do not use lighter-duty sections for cross runners.
- B. Exposed Grid Suspension System: Support of lay-in panels.
 - 1. Grid Width: 22 mm (7/8 inch) minimum with 8 mm (5/16 inch) minimum panel bearing surface.
 - 2. Molding: Fabricate from the same material with same exposed width and finish.
 - 3. Finish: Baked-on enamel flat texture finish.
 - a. Color: To match adjacent acoustical units unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Carrying Channels Secondary Framing: Cold-rolled or hot-rolled steel, black asphaltic paint finish, rust free.
 - 1. Weight per 300 m (per thousand linear feet), minimum:

Size		Cold-rolled		Hot-rolled	
mm	inches	kg	pound	kg	pound
38	1-1/2	215.4	475	508	1120
50	2	267.6	590	571.5	1260

- D. Anchors and Inserts: Provide anchors or inserts to support twice the loads imposed by hangers.
 - 1. Hanger Inserts: Steel, zinc-coated (galvanized after fabrication).
 - a. Nailing type option for wood forms:
 - 1) Upper portion designed for anchorage in concrete and positioning lower portion below surface of concrete approximately 25 mm (one inch).
 - 2) Lower portion provided with minimum 8 mm (5/16 inch) hole to permit attachment of hangers.
 - b. Flush ceiling insert type:

- 1) Designed to provide a shell covered opening over a wire loop to permit attachment of hangers and keep concrete out of insert recess.
 - 2) Insert opening inside shell approximately 16 mm (5/8 inch) wide by 9 mm (3/8 inch) high over top of wire.
 - 3) Wire 5 mm (3/16 inch) diameter with length to provide positive hooked anchorage in concrete.
- E. Clips: Galvanized steel, designed to secure framing member in place.
- F. Tile Splines: ASTM C635.
- G. Wire: ASTM A641.
1. Size:
 - a. Wire Hangers: Minimum diameter 2.68 mm (0.1055 inch).
 - b. Bracing Wires: Minimum diameter 3.43 mm (0.1350 inch).

2.6 ACCESSORIES

- A. Adhesives: Low pollutant-emitting, water based type recommended by adhered product manufacturer for each application.
- B. Perimeter Seal: Vinyl, polyethylene or polyurethane open cell sponge material, density of 1.3 plus or minus 10 percent, compression set less than 10 percent with pressure sensitive adhesive coating on one side.
1. Thickness: As required to fill voids between back of wall molding and finish wall.
 2. Size: Minimum 9 mm (3/8 inch) wide strip.
- C. Access Identification Markers: Colored markers with pressure sensitive adhesive on one side, paper or plastic, 6 to 9 mm (1/4 to 3/8 inch) diameter.
1. Color Code: Provide the following color markers for service identification:

Color	Service
Red	Sprinkler System: Valves and Controls
Green	Domestic Water: Valves and Controls
Yellow	Chilled Water and Heating Water
Orange	Ductwork: Fire Dampers
Blue	Ductwork: Dampers and Controls
Black	Gas: Laboratory, Medical, Air and Vacuum

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Remove existing acoustical panels suspension system to permit new installation.
 - 1. Dispose of removed materials.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings .
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 ACOUSTICAL UNIT INSTALLATION

- A. Applications:
 - 1. Cut acoustic units for perimeter borders and penetrations to fit tight against penetration for joint not concealed by molding.
- B. Layout acoustical unit symmetrically, with minimum number of joints.
- C. Installation:
 - 1. Install acoustic tiles after wet finishes have been installed and solvents have cured.
 - 2. Install lay-in acoustic panels in exposed grid with minimum 6 mm (1/4 inch) bearing at edges on supports.
 - a. Install tile to lay level and in full contact with exposed grid.
 - b. Replace cracked, broken, stained, dirty, or tile.
 - 3. Tile in concealed grid upward access suspension system:
 - a. Install acoustical tile with joints close, straight and true to line, and with exposed surfaces level and flush at joints.
 - b. Make corners and arises full, and without worn or broken places.
 - c. Locate acoustical units providing access to service systems.
 - 4. Adhesive applied tile:
 - a. Condition of surface according to ASTM D1779, Note 1, Cleanliness of Surface, and Note 4, Rigidity of Base Surface.
 - b. Size or seal surface as recommended by manufacturer of adhesive and allow to dry before installing units.
 - 5. Markers:

- a. Install color coded markers to identify the various concealed piping, mechanical, and plumbing systems.
 - b. Attach colored markers to exposed grid on opposite sides of the units providing access.
 - c. Attach marker on exposed ceiling surface of upward access acoustical unit.
- D. Touch up damaged factory finishes.
1. Repair painted surfaces with touch up primer.

3.4 CEILING SUSPENSION SYSTEM INSTALLATION

- A. General: Install according to ASTM C636.
1. Use direct or indirect hung suspension system or combination of both.
 2. Support a maximum area of 1.48 sq. m (16 sq. ft.) of ceiling per hanger.
 3. Prevent deflection in excess of 1/360 of span of cross runner and main runner.
 4. Provide additional hangers located at each corner of support components.
 5. Provide minimum 100 mm (4 inch) clearance from the exposed face of the acoustical units to the underside of ducts, pipe, conduit, secondary suspension channels, concrete beams or joists; and steel beam or bar joist unless furred system is shown.
 6. Provide main runners minimum 1200 mm (48 inches) in length.
 7. Install hanger wires vertically. Angled wires are not acceptable except for seismic restraint bracing wires.
- B. Direct Hung Suspension System: ASTM C635.
1. Support main runners by hanger wires attached directly to the structure overhead.
 2. Maximum spacing of hangers, 1200 mm (4 feet) on centers unless interference occurs by mechanical systems. Use indirect hung suspension system where not possible to maintain hanger spacing.
- C. Anchorage to Structure:
1. Concrete:
 - a. Install hanger inserts and wire loops required for support of hanger and bracing wire. Install hanger wires with looped ends

through steel deck when steel deck does not have attachment device.

- b. Use eye pins or threaded studs with screw-on eyes in existing or already placed concrete structures to support hanger and bracing wire. Install in sides of concrete beams or joists at mid height.
2. Steel:
- a. Install carrying channels for attachment of hanger wires.
 - 1) Size and space carrying channels to support load within performance limit.
 - 2) Attach hangers to steel carrying channels, spaced four feet on center, unless area supported or deflection exceeds the amount specified.
 - b. Attach carrying channels to the bottom flange of steel beams spaced not 1200 mm (4 feet) on center before fireproofing is installed. Weld or use steel clips for beam attachment.
 - c. Attach hangers to bottom chord of bar joists or to carrying channels installed between the bar joists when hanger spacing prevents anchorage to joist. Rest carrying channels on top of the bottom chord of the bar joists, and securely wire tie or clip to joist.
- D. Indirect Hung Suspension System: ASTM C635.
1. Space carrying channels for indirect hung suspension system maximum 1200 mm (4 feet) on center. Space hangers for carrying channels maximum 2400 mm (8 feet) on center or for carrying channels less than 1200 mm (4 feet) on center so as to insure that specified requirements are not exceeded.
 2. Support main runners by specially designed clips attached to carrying channels.
- E. Seismic Ceiling Bracing System:
1. Install according to ASTM E580.
 2. Connect bracing wires to structure above as specified for anchorage to structure and to main runner or carrying channels of suspended ceiling at bottom.

3.5 CEILING TREATMENT

- A. Moldings:

1. Install metal wall molding at perimeter of room, column, or edge at vertical surfaces.
2. Install special shaped molding at changes in ceiling heights and at other breaks in ceiling construction to support acoustical units and to conceal their edges.

B. Perimeter Seal:

1. Install perimeter seal between vertical leg of wall molding and finish wall, partition, and other vertical surfaces.
2. Install perimeter seal to finish flush with exposed faces of horizontal legs of wall molding.

C. Existing ceiling:

1. Where extension of existing ceilings occurs, match existing.
2. Where acoustical units are salvaged and reinstalled or joined, use salvaged units within a space. Do not mix new and salvaged units within a space which results in contrast between old and new acoustic units.
3. Comply with specifications for new acoustical units for new units required to match appearance of existing units.

D. Fire-Rated System:

1. Total assembly, consisting of the ceiling suspension system, acoustical units, penetrations, structural components and floor or roof construction above, shall have a // 1 hour // 2 hour fire rating based on tests conducted in conformance with ASTM E119.
2. Provide concealed fire protection around penetrations in ceilings for electric and mechanical work, and other penetrations as required to maintain the integrity of the fire-rated assembly.
3. Install fire rated ceiling systems to conform to tested assembly.

3.6 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Clean exposed surfaces. Remove contaminants and stains.

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SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient base (RB) adhered to interior walls and partitions.
2. Resilient stair treads (RST) adhered to interior stair tread at landings where Resilient Sheet Flooring is indicated.
3. Not Used.

1.2 RELATED REQUIREMENTS

- A. Sheet Flooring Integral Base: Section 09 65 16, RESILIENT SHEET FLOORING.
- B. Not Used.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
1. F1344-15 - Rubber Floor Tile.
 2. F1859-14 - Rubber Sheet Floor Covering without Backing.
 3. F1860-14 - Rubber Sheet Floor Covering with Backing.
 4. F1861-08(2012)e1 - Resilient Wall Base.
 5. D4259-88(2012) - Abrading Concrete.
- C. Federal Specifications (Fed. Spec.):
1. RR-T-650E - Treads, Metallic and Non-Metallic, Skid-Resistant.
- D. International Concrete Repair Institute (ICRI):
1. 310.2R-13 - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
1. Description of each product.
 2. Adhesives and primers indicating manufacturer's recommendation for each application.
 3. Installation instructions.
- C. Samples:

1. Resilient Base: 150 mm (6 inches) long, each type and color.
2. Resilient Stair Treads: 150 mm (6 inches) long, each type and color.
3. Sheet Rubber Flooring: 300 mm (12 inches) square, each type and color.

D. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
2. Low Pollutant-Emitting Materials:
 - a. Show volatile organic compound types and quantities.

E. Operation and Maintenance Data:

1. Care instructions for each exposed finish product.

1.5 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.6 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight facility.
- B. Protect products from damage when handling and during construction operations.

1.7 FIELD CONDITIONS

A. Environment:

1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.
2. Work Area Ambient Temperature Range: 21 to 27 degrees C (70 to 80 degrees F) continuously, beginning 48 hours before installation.
3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

1.8 WARRANTY

- A. Construction Warranty: Contractor's one-year labor and material warranty, FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide each product from one manufacturer and from one production run.
- C. Provide resilient stair treads and resilient base from same manufacturer.
- D. Sustainable Construction Requirements:
 - 1. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Flooring Adhesives and Sealants.

2.2 RESILIENT BASE

- A. Resilient Base: 3 mm (1/8 inch) thick, 100 mm (4 inches) high.
 - 1. Type: Rubber or vinyl; use one type throughout.
 - 2. ASTM F1861, Type TP thermoplastic rubber or Type TV thermoplastic vinyl, Group 2 - layered.
- B. Applications:
 - 1. Carpet Flooring Locations: Style A - Straight.
 - 2. Other Locations: Style B - Cove.

2.3 RESILIENT STAIR TREADS

- A. Resilient Stair Treads: Rubber, skid-resistant abrasive strip nosing, 5 mm (3/16 inch) thick nosing wear surface tapered to 3 mm (1/8 inch) thick at riser.
 - 1. Fed. Spec. RR-T-650, Composition A, Type 2.
 - 2. Abrasive Strips: Design for access by visually impaired.
 - 3. Nosing: Flexible, accommodating angle between tread and riser; shape suiting sub-tread.
 - 4. Size: Single piece full stair tread width and depth.

2.4 NOT USED

2.5 PRIMER (FOR CONCRETE FLOORS)

- A. Primer: Type recommended by adhesive manufacturer.

2.6 LEVELING COMPOUND (FOR CONCRETE FLOORS)

- A. Leveling Compound: Provide products mixed with latex or polyvinyl acetate resins.

2.7 ADHESIVES

- A. Adhesives: Low pollutant-emitting, water based type recommended by adhered product manufacturer for each application.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Remove existing base to permit new installation.
 - 1. Dispose of removed materials.
- D. Correct substrate deficiencies.
 - 1. Fill cracks, pits, and depressions with leveling compound.
 - 2. Remove protrusions; grind high spots.
 - 3. Apply leveling compound to achieve 3 mm (1/8 inch) in 3 m (10 feet) maximum surface variation.
- E. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.
 - 1. Mechanically clean concrete floor substrate according to ASTM D4259.
 - 2. Surface Profile: ICRI Guideline No. 310.2R.
- F. Allow substrate to dry and cure.
- G. Perform flooring manufacturer's recommended bond, substrate moisture content, and pH tests.

3.2 INSTALLATION GENERAL

- A. Install products according to manufacturer's instructions.
 - 1. When instructions deviate from specifications, submit proposed resolution for Contracting Officer consideration.

3.3 RESILIENT BASE INSTALLATION

- A. Applications:
 - 1. Install resilient base in rooms scheduled on Drawings.
 - 2. Install resilient base on casework, and other curb supported fixed equipment.
 - 3. Extend resilient base into closets, alcoves, and cabinet knee spaces, and around columns within scheduled room.
- B. Lay out resilient base with minimum number of joints.
 - 1. Length: 600 mm (24 inches) minimum, each piece.

2. Locate joints 150 mm (6 inches) minimum from corners and intersection of adjacent materials.

C. Installation:

1. Apply adhesive uniformly for full contact between resilient base and substrate.
2. Set resilient base with hairline butted joints aligned along top edge.

D. Field form corners and end stops.

1. V-groove back of outside corner.
2. V-groove face of inside corner and notch cove for miter joint.

E. Roll resilient base ensuring complete adhesion.

3.4 NOT USED

3.5 NOT USED

3.6 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Clean exposed resilient base surfaces. Remove contaminants and stains.
 1. Clean with mild detergent. Leave surfaces free of detergent residue.
- C. Polish exposed resilient base to gloss sheen.

3.7 PROTECTION

- A. Protect products from construction traffic and operations.
 1. Maintain protection until directed by Contracting Officer's Representative.
- B. Replace damaged products and re-clean.
 1. Damaged Products include cut, gouged, scraped, torn, and unbonded products.

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SECTION 09 65 16
RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient sheet flooring (RSF) with chemically welded seams.
2. Welded seam sheet flooring (WSF) with heat welded seams.

1.2 RELATED REQUIREMENTS

- A. Adhesive VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Color, Pattern and Texture: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Resilient Base over Base of Lockers, Equipment and Casework: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
1. D4259-88(2012) - Abrading Concrete.
 2. E648-15e1 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
 3. E662-15a - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
 4. F1303-04(2014) - Sheet Vinyl Floor Covering with Backing.
 5. F1860-14 - Rubber Sheet Floor Covering With Backing.
 6. F1913-04(2014) - Vinyl Sheet Floor Covering Without Backing.
- C. International Concrete Repair Institute (ICRI):
1. 310.2R-13 - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays, and Concrete Repair.
- D. SCS Global Services (SCS):
1. FloorScore.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
1. Show size, configuration, and fabrication and installation details.
- B. Manufacturer's Literature and Data:
1. Description of each product.

2. Application, Installation, instructions.
3. Warranty.

C. Samples:

1. Sheet material, 38 mm by 300 mm (1-1/2 inch by 12 inch), of each color and pattern with welded seam using specified welding rod, 300 mm (12 inches) square for each type, pattern and color.
2. Cap strip and fillet strip, 300 mm (12 inches) for integral base.
3. Shop Drawings and Certificates: Layout of joints showing patterns where joints are expressed, and type and location of obscure type joints. Indicate orientation of directional patterns.
4. Certificates: Quality Control Certificate Submittals and lists specified in paragraph, QUALIFICATIONS.
5. Edge strips: 150 mm (6 inches) long each type.
6. Primer: Pint container, each type.

D. Sustainable Construction Submittals:

1. Low Pollutant-Emitting Materials:
 - a. Sheet Flooring: Submit FloorScore label.
 - b. Identify volatile organic compound types and quantities.

E. Certificates: Certify each product complies with specifications.

1. Heat welded seaming is manufacturer's prescribed method of installation.

F. Qualifications: Substantiate qualifications comply with specifications.

1. Manufacturer with project experience list.
2. Installer with project experience list.

1.5 **QUALITY ASSURANCE**

A. Installer Qualifications: A company specializing in installation with minimum three (3) years' experience and employs experienced flooring installers who have retained, and currently hold, an INSTALL Certification, or a certification from a comparable certification program.

1. Installers to be certified by INSTALL or a comparable certification program with the following minimum criteria:
 - a. US Department of Labor approved four (4) year apprenticeship program, 160 hours a year.
 - b. Career long training.
 - c. Manufacturer endorsed training.

- d. Fundamental journeyman skills certification.
- B. Not Used.
- C. Furnish product type materials from the same production run.

1.6 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight conditioned facility.
- B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

- A. Environment:
 - 1. Work Area Ambient Temperature Range: Minimum 18 to 38 degrees C (65 to 100 degrees F) continuously, beginning 48 hours before installation. Maintain room temperature above 18 degrees C (65 degrees F) after installation.
 - 2. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

1.9 WARRANTY

- A. Construction Warranty: Contractor's one-year labor and material warranty, FAR clause 52.246-21, "Warranty of Construction."
- B. Manufacturer's Warranty: Warrant resilient sheet flooring against material and manufacturing defects.
 - 1. Warranty Period: 2 years.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Sheet Flooring:
 - 1. Critical Radiant Flux: ASTM E648; 0.45 watts per sq.cm or more, Class I.
 - 2. Smoke Density: ASTM E662; less than 450.

2.2 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide vinyl sheet color and pattern from one production run.
- C. Sustainable Construction Requirements:
 - 1. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Flooring Adhesives and Sealants.
 - b. Vinyl Sheet Flooring.

2.3 RESILIENT SHEET FLOORING

- A. Resilient Sheet Flooring (RSF): ASTM F1913; Vinyl, without backing.
 - 1. Wear Surface: Smooth.
 - 2. Thickness: 2 mm (0.080 inches).
- B. Resilient Sheet Flooring (RSF): ASTM F1303; Type II, Grade 1, vinyl, with backing.
 - 1. Wear Surface: Smooth.
 - 2. Wear Layer Thickness: Minimum 0.51 mm (0.020 inches).
 - 3. Total Thickness: 2 mm (0.080 inches).
- C. Sheet Size: Provide maximum size sheet produced by manufacturer to minimize joints.
 - 1. Minimum Width: 1200 mm (48 inches).

2.4 WELDED SEAM SHEET FLOORING

- A. Welded Seam Sheet Flooring (WSF): ASTM F1860; Type I or Type II rubber, with backing.
 - 1. Wear Surface: Smooth.
 - 2. Wear Layer Thickness: Minimum 1.0 mm (0.040 inches).
 - 3. Total Thickness: 2 mm (0.080 inches).
- B. Sheet Size: Provide maximum size sheet produced by manufacturer to minimize joints.
 - 1. Minimum Width: 1200 mm (48 inches).

2.5 ACCESSORIES

- A. Bonding Chemical: Flooring manufacturer's standard seam bonding chemical.
- B. Welding Rod: Flooring manufacturer's standard, in color matching field color of sheet flooring.

- C. Adhesives: Water resistant type recommended by flooring manufacturer to suit application.
- D. Leveling Compound:
 - 1. Provide cementitious type with latex or polyvinyl acetate resins additive.
- E. Primer:
 - 1. Type recommended by adhesive or flooring manufacturer.
- F. Edge Strips:
 - 1. Extruded aluminum, mill finish, mechanically cleaned.
 - 2. 28 mm (1-1/8 inch) wide, 6 mm (1/4 inch) thick, bevel one edge to 3 mm (1/8 inch) thick.
 - 3. Drill and counter sink edge strips for flat head screws. Space holes near ends and approximately 225 mm (9 inches) on center.
 - 4. Fasteners: Stainless steel, type to suit application.
- G. Sealant:
 - 1. As specified in Section 07 92 00, JOINT SEALANTS.
 - 2. Compatible with flooring.
- H. Polish: Type recommended by flooring manufacturer to suit application and anticipated traffic.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Remove existing sheet flooring to permit new installation.
 - 1. Do not use solvents for removing adhesives.
 - 2. Dispose of removed materials.
- D. Ensure interior finish work such as plastering, drywall finishing, concrete, terrazzo, ceiling work, and painting work is complete and dry before installation.
 - 1. Complete mechanical, electrical, and other work above ceiling line.
 - 2. Ensure heating, ventilating, and air conditioning systems are installed and operating in order to maintain temperature and humidity requirements.
- E. Correct substrate deficiencies.
 - 1. Fill cracks, pits, and dents with leveling compound.

2. Grind, sand, or cut away protrusions. Grind high spots.
3. Level flooring substrate to 3 mm (1/8 inch) maximum variation.
- F. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.
 1. Mechanically clean concrete floor substrate according to ASTM D4259.
 2. Surface Profile: ICRI 310.2R CSP 3 to CSP 4.
- G. Perform flooring manufacturer's recommended bond, substrate moisture content, and pH tests.
- H. Broom or vacuum clean substrates immediately before flooring installation.
- I. Primer: Apply primer according to manufacturer's instructions.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions.
 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 INSTALLATION OF FLOORING

- A. Flooring Layout:
 1. Arrange pattern in one direction with side and end joints pattern matched.
 2. Extend flooring wall-to-wall, under cabinets, casework, laboratory and pharmacy furniture, and other equipment for seamless flooring installation.
 3. Arrange sheets to minimize seams.
 4. Locate seams in inconspicuous and low traffic areas, minimum 150 mm (6 inches) away from parallel joints in flooring substrates.
- B. Match edges of flooring for color shading and pattern at seams.
- C. Install flooring flush with adjacent floor finishes.
- D. Extend flooring into toe spaces, door reveals, closets, and similar openings.
- E. Install flooring fully adhered to substrate.
 1. Air pockets or loose edges are not acceptable.
 2. Trim sheet materials tight to flooring penetrations; seal joints at pipe with waterproof sealant specified in Section 07 92 00, JOINT SEALANTS.
- F. Butt joints tight, without gaps and bulges.

G. Installation of Edge Strips:

1. Install edge strips at flooring terminations and transitions to other floor finishes.
2. Locate edge strips under center lines of doors unless otherwise indicated.
3. Set edge strips in adhesive and mechanically fasten to substrate.

3.4 HEAT WELDING

- A. Heat weld joints of flooring and base using welding rod.
- B. Rout joint, insert welding rod into routed space, and fuse flooring and welding rods for seamless, watertight installation.
 1. Fuse joints for seamless weld.
- C. Finish joints flush, free from voids, and recessed or raised areas.

3.5 CHEMICAL WELDING

- A. Chemically weld joints of flooring and base using bonding chemical.
 1. Avoid excess bonding chemical and damage to flooring surfaces.
- B. Apply bonding chemical to fuse flooring for seamless, watertight installation.
- C. Finish joints flush, free from voids, and recessed or raised areas.

3.6 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Vacuum floor thoroughly.
- C. Perform initial maintenance according to flooring manufacturer's instructions.
 1. Delay washing flooring until adhesive is fully set and welded joints can contain wash water.

3.7 PROTECTION

- A. Protect flooring from traffic and construction operations.
- B. Keep traffic off sheet flooring for minimum 24 hours after installation.
- C. Cover flooring with reinforced kraft paper, and plywood or hardboard.
- D. Remove protective materials immediately before acceptance.
- E. Repair damage.
- F. Buff flooring to uniform sheen.

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SECTION 09 65 19
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies the installation of luxury vinyl tile, rubber tile and accessories required for a complete installation.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Resilient Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
- C. Subfloor Testing and Preparation: Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.
- D. Not Used.
- E. Color, Pattern and Texture for Resilient Tile Flooring and Accessories: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals as described below:
 - 1. Volatile organic compounds per volume as described in PART 2 - PRODUCTS.
 - 2. Postconsumer and preconsumer recycled content as described in PART 2 - PRODUCTS.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Resilient material manufacturer's recommendations for adhesives, underlayment, primers, and polish.
 - 3. Application, installation and maintenance instructions.
- D. Samples:
 - 1. Tile: Each type, color, thickness and finish.
 - 2. Edge Strips: Each type, color, thickness and finish.
 - 3. Feature Strips: Each type, color, thickness and finish.
- E. Shop Drawings:
 - 1. Layout of patterns as shown on the construction documents.
 - 2. Edge strip locations showing types and detail cross sections.
- F. Test Reports:

1. Abrasion resistance: Depth of wear for each tile type and color and volume loss of tile, certified by independent laboratory. Tested per ASTM F510/F510M.
2. Moisture and pH test results as per Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

1.4 DELIVERY:

- A. Deliver materials to the site in original sealed packages or containers, clearly marked with the manufacturer's name or brand, type and color, production run number and date of manufacture.
- B. Materials from containers which have been distorted, damaged or opened prior to installation are not acceptable.

1.5 STORAGE:

- A. Store materials in a clean, dry, enclosed space off the ground, protected from harmful weather conditions and at temperature and humidity conditions recommended by the manufacturer. Protect adhesives from freezing. Store flooring, adhesives, and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

1.6 QUALITY ASSURANCE:

- A. Installer Qualifications: A company specializing in installation with minimum three (3) years' experience and employs experienced flooring installers who have retained, and currently hold, an INSTALL Certification, or a certification from a comparable certification program.
 1. Installers to be certified by INSTALL or a comparable certification program with the following minimum criteria:
 - a. US Department of Labor approved four (4) year apprenticeship program, 160 hours a year.
 - b. Career long training.
 - c. Manufacturer endorsed training.
 - d. Fundamental journeyman skills certification.
- B. Not Used.
- C. Furnish product type materials from the same production run.

1.7 WARRANTY:

- A. Construction Warranty: Contractor's one-year labor and material warranty, Comply with FAR clause 52.246-21, "Warranty of Construction".

1.8 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. ASTM International (ASTM):
 - D2047-11Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine
 - D2240-05 (R2010)Test Method for Rubber Property—Durometer Hardness
 - D4078-02 (R2008)Water Emulsion Floor Finish
 - E648-14cCritical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source
 - E662-14Specific Optical Density of Smoke Generated by Solid Materials
 - E1155/E1155M-14Determining Floor Flatness and Floor Levelness Numbers
 - F510/F510M-14Resistance to Abrasion of Resilient Floor Coverings Using an Abrader with a Grit Feed Method
 - F710-11Preparing Concrete Floors to Receive Resilient Flooring
 - F925-13Test Method for Resistance to Chemicals of Resilient Flooring
 - F1344-12 (R2013)Rubber Floor Tile
 - F1700-13aSolid Vinyl Floor Tile
 - F1869-11Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
 - F2170-11Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes
 - F2195-13Linoleum Floor Tile
- C. Code of Federal Regulation (CFR):
 - 40 CFR 59Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating
- D. International Standards and Training Alliance (INSTALL):

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS:

- A. Provide adhesives, underlayment, primers, and polish recommended by resilient floor material manufacturer.
- B. Critical Radiant Flux: 0.45 watts per sq. cm or more, Class I, per ASTM E648.
- C. Smoke Density: Less than 450 per ASTM E662.
- D. Slip Resistance - Not less than 0.5 when tested with ASTM D2047.

2.2 RUBBER TILE:

- A. Tile Standard: ASTM F1344, Class I-B, homogeneous rubber tile, through mottled .
- B. Hardness: Manufacturer's standard hardness .
- C. Wearing Surface: Molded pattern.
 - 1. Molded-Pattern Figure: Hammered.
- D. Thickness: 3.2 mm (0.125 inch) .
- E. Size: 508 x 508 mm (20 x 20 inches).

2.3 NOT USED

2.4 NOT USED

2.5 LUXURY VINYL TILE:

- A. ASTM F1700, Class III, Printed Film Vinyl Tile, Type A.
- B. Thickness: 3.0mm (.120 inch).
- C. Size & Wear Layer: Varies: See 09 06 00 Schedule for Finishes, and Color Schedule in Construction Drawings.
- D. Not Used.
- E. Chemical Resistance: ASTM F925; pass.

2.6 ADHESIVES:

- A. Provide water resistant type adhesive for flooring, base and accessories as recommended by the manufacturer to suit substrate conditions. VOC content to be less than the 50 grams/L when calculated according to 40 CFR 59 (EPA Method 24). Submit manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics.

2.7 PRIMER FOR CONCRETE SUBFLOORS:

- A. Provide in accordance with Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

2.8 LEVELING COMPOUND FOR CONCRETE FLOORS:

- A. Provide cementitious products with latex or polyvinyl acetate resins in the mix in accordance with Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

2.9 POLISH AND CLEANERS:

- A. Cleaners: As recommended in writing by floor tile manufacturer.
- B. Polish: ASTM D4078.

2.10 MOULDING:

- A. Provide tapered mouldings of vinyl or clear anodized aluminum and types as indicated on the construction documents for both edges and transitions of flooring materials specified. Provide vertical lip on moulding of maximum 6 mm (1/4 inch). Provide bevel change in level between 6 and 13 mm (1/4 and 1/2 inch) with a slope no greater than 1:2.
- B. Fasteners for Aluminum Mouldings: Stainless steel of type required for substrate condition.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS:

- A. Maintain flooring materials and areas to receive resilient flooring at a temperature above 20 degrees C (68 degrees F) for three (3) days before application, during application and two (2) days after application, unless otherwise directed by the flooring manufacturer for the flooring being installed. Maintain a minimum temperature of 13 degrees C (55 degrees F) thereafter. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.
- B. Do not install flooring until building is permanently enclosed and wet construction in or near areas to receive tile materials is complete, dry and cured.

3.2 SUBFLOOR TESTING AND PREPARATION:

- A. Prepare and test surfaces to receive resilient tile and adhesive as per Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.
 - 1. Remove existing resilient floor and existing adhesive.
- B. Prepare concrete substrates in accordance with ASTM F710.
- C. Not Used

3.3 INSTALLATION:

- A. Install in accordance with manufacturer's instructions for application and installation unless specified otherwise.
- B. Mix tile from at least two containers. An apparent line either of shades or pattern variance is not acceptable.
- C. Tile Layout:
 - 1. If layout is not shown on construction documents, lay tile symmetrically about center of room or space with joints aligned.
 - 2. Vary edge width as necessary to maintain full size tiles in the field, no edge tile to be less than 1/2 the field tile size, except where irregular shaped rooms make it impossible.
 - 3. Place tile pattern in the same direction; do not alternate tiles unless specifically indicated in the construction documents to the contrary.
- D. Application:
 - 1. Adhere floor tile to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
 - 2. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
 - 3. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
 - 4. Roll tile floor with a minimum 45 kg (100 pound) roller.
- E. Seal joints at pipes with sealants in accordance with Section 07 92 00, JOINT SEALANTS.
- F. Installation of Edge Strips:
 - 1. Locate edge strips under center line of doors unless otherwise shown on construction documents.
 - 2. Set resilient edge strips in adhesive. Anchor metal edge strips with anchors and screws.
 - 3. Where tile edge is exposed, butt edge strip to touch along tile edge.
 - 4. Where thin set ceramic tile abuts resilient tile, set edge strip against floor file and against the ceramic tile edge.

3.4 CLEANING AND PROTECTION:

- A. Clean adhesive marks on exposed surfaces during the application of resilient materials before the adhesive sets. Exposed adhesive is not acceptable.
- B. Keep traffic off resilient material for a minimum 72 hours after installation.
- C. Clean flooring as recommended in accordance with manufacturer's printed maintenance instructions and within the recommended time frame. As required by the manufacturer, apply the recommended number of coats and type of polish and/or finish in accordance with manufacturer's written instructions.
- D. When construction traffic occurs over tile, cover resilient materials with reinforced kraft paper properly secured and maintained until removal is directed by COR. At entrances and where wheeled vehicles or carts are used, cover tile with plywood, hardboard, or particle board over paper, secured and maintained until removal is directed by COR.
- E. When protective materials are removed and immediately prior to acceptance, replace damaged tile and mouldings, re-clean resilient materials.

3.5 LOCATION:

- A. Unless otherwise indicated in construction documents, install tile flooring, under areas where casework, laboratory and pharmacy furniture and other equipment occur.
- B. Extend tile flooring for room into adjacent closets and alcoves.

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SECTION 09 66 13
PORTLAND CEMENT TERRAZZO FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section covers the maintenance requirements for existing terrazzo flooring areas requiring repair or and replacement with new poured-in-place cementitious terrazzo including adhesively bonded monolithic terrazzo systems, where indicated on the drawings.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Concrete Sub Floor: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- C. Color and Location of each Terrazzo Formula: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 QUALITY ASSURANCE:

- A. Comply with recommendations of National Terrazzo and Mosaic Association, Inc. (NTMA).
- B. Submit certification that materials conform to specified NTMA properties.
- C. Manufacturer's Qualifications: Obtain each color, grade, type, and variety of granular materials from a single source that has provided Portland Cement Terrazzo Flooring for a minimum of three (3) years. Submit manufacturer qualifications.
- D. Installer's Qualifications: An installer who is a contractor member of NTMA and has a minimum of three (3) years' experience in the installation of products specified. Submit installer qualifications.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals as described below:
 - 1. Postconsumer and preconsumer recycled content as specified in PART 2 - PRODUCTS.
 - 2. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Samples: Preliminary samples for approval:

1. Each terrazzo formula size 305 x 305 mm (12 x 12 inches) not more than 25 mm (1 inch) thick.
2. Divider strips:
 - a. One (1), 152 mm (6 inch) length of each type and kind of divider strip as herein specified.

D. Manufacturer's Literature and Data:

1. Cleaning and preservative solutions for terrazzo
2. Terrazzo formula
3. Nonslip aggregate
4. Divider strips
5. Adhesive for adhesively bond monolithic terrazzo

E. Manufacturer's qualifications.

F. Installer's qualifications.

G. Manufacturer's warranty.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Materials are to be delivered in the manufacturer's unopened containers marked with the brand name. Materials are to be delivered, handled, and stored in accordance with manufacturer's instructions in a manner that will prevent deterioration and contamination.

1.6 ENVIRONMENTAL REQUIREMENTS:

- A. Areas to receive terrazzo are to be maintained at a temperature above 10 degree C (50 degrees F) 24 hours prior to the time terrazzo mixtures are placed and until completely cured.

1.7 WARRANTY:

- A. Construction Warranty: Contractor's one-year labor and material warranty, FAR clause 52.246-21 "Warranty of Construction".

1.9 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. ASTM International (ASTM):
 - A1064/A1064M-14Carbon-Steel Wire and Welded Wire
Reinforcement, Plain and Deformed, for Concrete
 - C33/C33M-13Concrete Aggregates
 - C150/C150M-12Portland Cement
 - C241/C241M-13Test Method for Abrasion Resistance of Stone
Subjected to Foot Traffic

D2047-11Test Method for Static Coefficient of Friction
of Polish-Coated Flooring Surfaces as Measured
by the James Machine

C. Code of Federal Regulation (CFR):

40 CFR 59Determination of Volatile Matter Content, Water
Content, Density Volume Solids, and Weight
Solids of Surface Coating

D. National Terrazzo and Mosaic Association (NTMA):

Terrazzo Specifications and Design Guide

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT TERRAZZO SYSTEM:

A. Portland Cement Terrazzo System: Bonded.

2.2 PORTLAND CEMENT:

A. Provide Portland cement conforming to ASTM C150/C150M, Type I of colors
required to match existing adjacent terrazzo areas consistent with NTMA
Info Guide color plate indicated in Section 09 06 00, SCHEDULE FOR
FINISHES.

2.3 SAND:

A. Conform to ASTM C33/C33M for fine aggregate.

2.4 MARBLE GRANULES:

A. Marble chips are to be of domestic origin of sizes and colors required
to match existing adjacent terrazzo areas consistent with NTMA Info
Guide color plate indicated in Section 09 06 00, SCHEDULE FOR FINISHES.
Provide marble chips with an abrasive hardness of not less than 10 when
tested in accordance with ASTM C241/C241M; containing no deleterious or
foreign matter; and having a dust content less than one (1) percent by
weight.

2.5 DECORATIVE AGGREGATES:

A. Provide decorative aggregate material of sizes, kind, and color as
required to match existing adjacent terrazzo areas as indicated in
Section 09 06 00, SCHEDULE FOR FINISHES and shall be compatible with
the portland cement terrazzo flooring material.

B. Size shall conform with NTMA gradation standards. Aggregate shall not
contain any deleterious or foreign matter. Dust shall be less than
one (1) percent by weight. Aggregate shall be maintained in a perfectly
clean and dry state throughout tenure of work.

2.7 MATRIX PIGMENTS:

- A. Pure mineral or synthetic pigments, alkali resistant, durable under exposure to sunlight, and compatible with terrazzo matrix.

2.8 NONSLIP AGGREGATE:

- A. Aluminum oxide or carborundum particles, uniformly graded from 0.8 mm to 6 mm (1/32 to 1/4 inch) and black or dark color.

2.9 NONSLIP NOSING INSERTS:

- A. Precast semivitreous, dark color containing not less than thirty-five percent of nonslip aggregate bonded by vitrified ceramic material; not less than 101 mm (4 inches) wide, nor less than 13 mm (1/2 inch) thick. Color as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

2.10 BASE BEADS:

- A. Flush type with zinc-alloy nosing to match existing adjacent terrazzo areas, and 24 gage galvanized steel backing.

2.11 METAL STRIPS:

- A. Provide metal strips to match existing adjacent terrazzo areas and in accordance with NTMA Design Guide.
- B. White-zinc alloy types specified below.
- C. Base Divider Strips: One (1) piece, 3 mm (1/8 inch) thick, shaped to profile of base from top edges to toe edge of base.
- D. Floor Divider Strips (Strips): 32 mm (1-1/4 inch) deep strip with 3 mm (1/8 inch) thick top and 16 gage bottom member.
- E. Floor Divider Strips (T-Strips): 3 mm (1/8 inch) thick top with 16 gage backing 38 mm (1-1/2 inches) wide.
- F. Not Used.
- G. Floor Divider Strips (Adhesively Bonded Monolithic Terrazzo): 16 Brown & Sharpe (B&S) gage, folded, T-type formed for double expansion 16 mm (5/8 inch) deep.

2.12 ADHESIVE FOR MONOLITHIC TERRAZZO:

- A. Liquid polymer formulation, modified with epoxy resin, mixed in accordance with manufacturer's recommendations. Adhesive is to resist embrittlement, remain flexible and be resistant to impact.
 - 1. Adhesive to have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, (EPA Method 24). //

2.13 CLEANING SOLUTION:

- A. Use a neutral chemical cleaner, produced by manufacturer of preservative solution that will not change color of or damage terrazzo.

2.14 SEALER:

- A. Provide sealer with a pH factor between 7 and 10 and that is a penetrating type specially prepared for the terrazzo trade. The sealer is not permitted to discolor or amber the terrazzo. Sealer is required to produce a slip resistant surface. (Not less than 0.5 when tested in accordance with ASTM D2047.)
 - 1. Sealant to have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, (EPA Method 24).

2.15 TERRAZZO PROPORTIONS:

- A. Underbed: Comply with NTMA's Design Guide for terrazzo system indicated for component proportions and mixing.
- B. Terrazzo Topping: Comply with NTMA's Design Guide for terrazzo system indicated for matrix and aggregate proportions and mixing. Mixing color as required to match existing adjacent terrazzo areas and as indicated in Section 09 06 00, SCHEDULE FOR FINISHES.

PART 3 - EXECUTION

3.1 INSTALLING METAL STRIPS:

- A. Set strips with close, butt joints, true and square; hold in place with cement mortar, except where specified to be held with adhesive.
- B. Provide floor divider strips, T-strips, 3 mm (1/8 inch thick top) between cast-in-place terrazzo base and floors, and to divide floors into approximately 1800 mm (6 feet) squares, or pattern indicated in construction documents.
- C. Not Used.
- D. Provide special floor divider strips where cast-in-place terrazzo abuts resilient flooring.
- E. Set base divider strips plumb for cast-in-place base. Anchor and space them not over 1524 mm (5 feet) on centers, or to align with floor divider strips. Set divider strips symmetrically at doors other openings and wall breaks and in line with field divider strips of floor.
- F. Use floor divider, T-strips for adhesive bonded monolithic terrazzo floors, located as indicated in construction documents. Set strips with same adhesive used for bonding terrazzo topping, and shim where necessary to produce a straight and level floor. Tightly butt strips at intersection, and install 24 hours prior to floor installation.

3.2 INSTALLING TERRAZZO FLOORS:

A. Bonded to Concrete Terrazzo:

1. Provide bonded to concrete terrazzo consisting of an underbed and terrazzo topping on a rough concrete slab.
2. Finish terrazzo floors a minimum of 44 mm (1-3/4 inches) above rough concrete slab.
3. Clean surfaces of concrete slabs to receive terrazzo to remove plaster, oil, grease, and foreign matter. Saturate slabs with water, remove excess water and then, immediately before placing underbed, slush and broom concrete with neat cement.
4. Provide underbed that is a minimum of 32 mm (1-1/8 inches) thick. Wet cement-sand mix to proper consistency and spread evenly over surfaces to receive terrazzo.
5. Provide shrinkage reinforcement of 50 mm (2 inch) wire mesh (16 gage).
6. Finish underbed to true, level surface, and prepare and condition it to receive terrazzo topping and ensure permanent bond.

B. Not Used

C. Adhesively Bonded Monolithic Terrazzo: Provide adhesively bonded monolithic terrazzo consisting of terrazzo topping adhesively applied to concrete slab.

1. Clean concrete slabs so that they are free of dirt, dust, oil, paint and other foreign materials.
2. Damp mop surface before applying adhesive.
3. On porous concrete slabs, apply a prime coat of same adhesive used for bonding terrazzo topping, 24 hours in advance of application of bonding coat.
4. Install specified divider strips.
5. Apply adhesive evenly to concrete slabs to approximately 10 mils thickness.
6. When spray or broom application is used reduce viscosity of adhesive with solvents as recommended by adhesive manufacturer. Allow minimum of 1/2 hour lapse before applying bond coat.
7. Immediately broadcast marble chips over adhesive film and continue with placing terrazzo topping in one continuous operation. //

D. Topping:

1. Spread topping to provide finished thickness of 10 mm (3/8 inch), after grinding, on vertical surfaces, and 16 mm (5/8 inch) on horizontal surfaces.
2. Provide topping in uniform composition, and use same marble granules that appear on surface for its entire thickness.
3. Trowel and pack base to proper form, and roll floor and thresholds with heavy roller so that terrazzo will be dense with even surface showing at least 70 percent marble granules.
4. Lay terrazzo topping full above strips to permit grinding terrazzo down to finish floor level.

3.3 INSTALLING BASES:

- A. Provide base 140 mm (5-1/2 inches) high, and with 25 mm (1 inch) radius cove at bottom, or as required to match existing adjacent terrazzo areas. Make external corners of base conform to contour of wall finish above. Provide cove at corners of floor field.
- B. Round top of projecting base to 6 mm (1/4 inch) radius.
- C. At openings, having metal door frames, return base on itself, with toe and cove in line with back edge of metal frame.

3.4 REPAIRING TERRAZZO CONCRETE STAIRS: (WHERE INDICATED ON THE DRAWINGS)

- A. Divide landings and intermediate platforms into approximately 300 mm (12 inch) squares with 3 mm (1/8 inch) thick top floor divider strips. Stair treads, landings, and platforms are to be finished 38 mm (1-1/2 inches) above rough concrete slab unless otherwise indicated in construction documents.
- B. Nonslip Aggregate: Sprinkle 113 grams (1/4 pound) of nonslip aggregate to each .09 square meter (1 square foot) of terrazzo surface for stair treads, platforms, and floors within stair wells.
 1. At stair treads and nosing areas of stair platforms, and floor landings provide tile nosing inserts or nonslip filled-grooves in addition to nonslip aggregate.
- C. Nosings: In addition to nonslip abrasive, install nosing edge on terrazzo treads, platforms and landings. Nosing are to be nonslip inserts extending to within 101 mm (4 inches) of ends of treads and landings; bond them to terrazzo.
 1. In lieu of inserts, provide three (3) grooves, 6 mm (1/4 inch) wide and not less than 9.5 mm (3/8 inch) deep, approximately 32 mm

(1-1/4 inches) on centers, filled flush with nonslip aggregate mixed with suitable binder which will bond with terrazzo.

2. Start grooves at not less than 19 mm (3/4 inch) from nosing edges and extend them continuously to within 101 mm (4 inches) of ends of treads and landings.

3.5 CURING:

- A. Cure terrazzo topping at least six (6) days before grinding and until it sets sufficiently hard to permit coarse stone grinding without dislodging surface aggregate.
 1. Curing time for terrazzo base may be reduced to four (4) days, subject to approval of Contracting Officer Representative (COR).
 2. During curing period, cover terrazzo with either waterproof paper, cotton mats, or 25 mm (1 inch) of clean wet sand. Lap and secure against displacement of joints in paper or mats.
 3. Keep sand (if used) wet by sprinkling with clean water at intervals of not more than eight (8) hours.
 4. Do final grinding or rubbing of terrazzo before finish coat of plaster or other connecting wall finish is applied.

3.6 FINISHING:

- A. Finishing is to be in accordance with NTMA Design Guide for terrazzo and accessory installation.
- B. Rough Grinding: After topping has cured, machine grind terrazzo using the wet method, to a true even surface using No. 24 or finer grit followed by No. 80 grit or finer grit stone.
 1. Grind terrazzo surfaces with electric grinding machines.
 2. Where impossible to use machines, hand rub surfaces.
 3. Dry grinding of terrazzo is prohibited.
- C. Grouting: After rough grinding, wash and rinse floor with clean water.
 1. After removing excess rinse water, grout floor using identical portland cement, color and pigments as used in the topping taking care to fill voids.
 2. After the grout has attained its initial set, cure surface for a minimum of 72 hours.
- D. Fine Grinding: After grout has cured, fine grind terrazzo to remove scratches, and produce true surface of uniform color and texture, without irregularities.

1. When tested with steel straight edge, terrazzo base surfaces are to not show wave exceeding 1.6 mm (1/16 inch) between divider strips.
2. When tested with steel straight edge 900 mm (3 feet) long, floor surfaces are to not show wave exceeding 0.8 mm (1/32 inch).
3. Upon completion of grinding, the terrazzo flooring is to show a minimum of 70 percent of marble chips.
4. Protect adjacent walls, floors, and other connecting work from rubbing stones and from splashing, while grinding is in progress.

3.7 REPAIR:

- A. Cut out and replace terrazzo areas that evidence lack of bond with substrate or underbed, including areas that emit a "hollow" sound if tapped. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by COR.

3.8 CLEANING:

- A. After final grinding, clean terrazzo and condition to counteract efflorescence. Apply mixture in accordance with manufacturer's instructions.

3.9 SEALING:

- A. After surfaces are dry, wash and rinse terrazzo and (except on terrazzo surfaces containing nonslip aggregate) apply coat of sealer in accordance with the manufacturer's instructions. Buff terrazzo surfaces with a weighted polishing brush or electric buffing machine.

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Renovate Tower of Building 1
VAMC, Sioux Falls, SD
VA Project #438-18-102

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SECTION 09 68 00
CARPETING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Section specifies walk-off carpet, edge strips, adhesives, and other items required for complete installation.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Manufacturer, Color and Style of Carpet and Edge Strip: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Resilient Wall Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
- D. Testing of Concrete Floors Before Installation: Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

1.3 QUALITY ASSURANCE:

- A. Installer Qualifications: A company specializing in carpet installation with a minimum three (3) years' experience and employing experienced flooring installers who have retained, and currently hold, an INSTALL Certification, or a certification from a comparable certification program, and a valid OSHA 10 certification.
 - 1. Installers to be certified by INSTALL or a comparable certification program with the following minimum criteria:
 - a. US Department of Labor approved four (4) year apprenticeship program, 160 hours a year.
 - b. Career long training.
 - c. Manufacturer endorsed training.
 - d. Fundamental journeyman skills certification.
- B. Mockup: Install 3.04 x 3.04 m (10 x 10 ft.) minimum mockup to verify selections made under sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation. Engage a qualified independent inspector approved by COR is to examine carpet installation workmanship of mockup and evaluate the workmanship according to the criteria established by INSTALL's Certification Program submit a report of installation evaluation. COR approved mockups may become part of the completed Project if undisturbed at the time of Substantial Completion.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Product Data:
 - 1. Manufacturer's catalog data and printed documentation stating physical characteristics, durability, resistance to fading and flame resistance characteristics for each type of carpet material and installation accessory.
 - 2. Manufacturer's printed installation instructions for the carpet, including preparation of installation substrate, seaming techniques and recommended adhesives and tapes.
- D. Samples:
 - 1. Carpet: "Production Quality" samples 305 x 305 mm (12 x 12 inches) of carpets, showing quality, pattern and color specified in Section 09 06 00, SCHEDULE FOR FINISHES.
 - 2. Floor Edge Strip (Molding): 152 mm (6 inches) long of each color and type specified.
 - 3. Base Edge Strip (Molding): 152 mm (6 inches) long of each color specified.
- E. Shop Drawings: Installers layout plan showing seams and cuts for sheet carpet and carpet module.
- F. Maintenance Data: Carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods and cleaning cycles.
- G. Installer's Qualifications.
- H. Manufacturer's warranty.

1.5 DELIVERY AND STORAGE:

- A. Deliver carpet in manufacturer's original wrappings and packages clearly labeled with manufacturer's brand name, size, dye lot number and related information. Transport carpet to job site in a manner that prevents damage and distortion that might render it unusable. When bending or folding is unavoidable for delivery purposes, unfold carpet and lay flat immediately.

- B. Deliver adhesives in containers clearly labeled with manufacturer's brand name, number, installation instructions, safety instructions and flash points.
- C. Store in a clean, dry, well-ventilated area, protected from damage and soiling. Before installation, acclimate carpet to the atmospheric conditions of the areas in which it will be installed for 2 days prior to installation.

1.6 ENVIRONMENTAL REQUIREMENTS:

- A. Maintain areas in which carpeting is to be installed at a temperature between 18 - 35 degrees C (65 - 95 degrees F) with a maximum relative humidity of 65 percent for two (2) days before installation, during installation and for three (3) days after installation.
- B. Minimum Substrate Surface Temperature: 18 degrees C (65 degrees F) at time of installation.
- C. Three (3) days after installation, maintain minimum temperature of 10 degrees C (50 degrees F) for the duration of the contract.

1.7 WARRANTY:

- A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".
- B. Manufacturer Warranty: Manufacturer shall warranty their carpet for a minimum of ten (10) years from date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.8 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American National Standards Institute (ANSI):
ANSI/NSF 140-10Sustainable Carpet Assessment Standard
- C. American Association of Textile Chemists and Colorists (AATCC):
16-04Colorfastness to Light
134-11Electric Static Propensity of Carpets
165-08Colorfastness to Crocking: Textile Floor
Coverings-AATCC Crockmeter Method
174-11Antimicrobial Activity Assessment of New
Carpets
- D. ASTM International (ASTM):

- D1335-12Tuft Bind of Pile Yarn Floor Coverings
- D3278-96(R2011)Flash Point of Liquids by Small Scale Closed-Cup Apparatus
- D5116-10Determinations of Organic Emissions from Indoor Materials/Products
- D5252-11Operation of the Hexapod Tumble Drum Tester
- D5417-11Operation of the Vettermann Drum Tester
- E648-14cCritical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

E. Code of Federal Regulation (CFR):

- 40 CFR 59Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating

F. The Carpet and Rug Institute (CRI):

- CISCarpet Installation Standard

G. International Standards and Training Alliance (INSTALL)

H. International Organization for Standardization (ISO):

- 2551-81Machine-Made Textile Floor Coverings

I. U.S. Consumer Product and Safety Commission (CPSC):

- 16 CFR 1630Surface Flammability of Carpets and Rugs

PART 2 - PRODUCTS

2.1 CARPET:

A. Physical Characteristics:

1. Carpet free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains and other physical and manufacturing defects.
2. Type:
 - a. Carpet Construction: Tufted, Woven, Bonded or Needlebond as indicated
 - b. Carpet Type: (Walk-off) Modular tile 610 by 610 mm square 24 by 24inch square) with 0.15 percent growth/shrink rate in accordance with ISO 2551.
 - c. Pile Type: . Hi UV Polypropylene pile. Tufted Weight 43.0. 100% Solution Dyed. Pile type and thickness must conform to ADA requirements.

- d. Pile Fiber: Commercial 100 percent branded (federally registered trademark), Hi UV Polyporpylene.
3. Static Control: Provide static control to permanently regulate static buildup to less than 3.5 kV when tested at 20 percent relative humidity and 21 degrees C (70 degrees F) in accordance with AATCC 134.
4. Backing Materials: Provide backing for glue-down installations. For healthcare installations, provide impervious moisture backing that is 100 percent PVC free.
 - b. Modular Tile:
 - 1) Primary Backing/Backcoating: Manufacturer's standard composite materials
 - 2) Secondary Backing: Manufacturer's standard material Ecoworx Tile.
5. Appearance Retention Rating (ARR): Carpet to be tested and have the minimum 3.5 - 4.0 severe ARR when tested in accordance with either the ASTM D5252 (Hexapod) or ASTM D5417 (Vettermann) test methods using the number of cycles for short and long term tests as specified in the ASTM standard.
6. Tuft Bind: Comply with ASTM D1335 for tuft bind force required to pull a tuft or loop free from carpet backing with a minimum 36 N (8 pound) average force for modular carpet tile .
7. Colorfastness to Crocking: Dry and wet crocking and water bleed, comply with AATCC 165 Color Transference Chart for colors, minimum class 4 rating.
8. Colorfastness to Light (AATCC 16, Option 3): Color change between the exposed and unexposed carpet areas equivalent to a minimum of Grade 4 on the Gray Scale for Color Change after an exposure of 40 AFU (AATCC fading units) for all specified colors.
9. Delamination Strength: Minimum of 440 N/m (2.5 lb./inch) between secondary backing.
10. Flammability and Critical Radiant Flux Requirements:
 - a. Comply with 16 CFR 1630.
 - b. Test Carpet in accordance with ASTM E648.
 - c. Class I: Minimum critical radiant flux of 0.45 watts per square centimeter (2.9 watts per square inch).

- e. Carpet in corridors, exits and Medical Facilities to be Class I.
- 11. Average Pile Yarn Density (APYD):
 - a. Corridors, lobbies, entrances, common areas or multipurpose rooms, open offices, waiting areas and dining areas: Minimum APYD 6000.
 - b. Other areas: Minimum APYD 4000.
- 12. Antimicrobial: Nontoxic antimicrobial treatment in accordance with AATCC 174 Part I (qualitative), guaranteed by the carpet manufacturer to last the life of the carpet.
- 13. VOC Limits: Use carpet that complies with the following limits for VOC content when tested according to ASTM D5116:
 - a. Carpet, Total VOCs: 0.5 mg/sq.m x hr.
 - b. Carpet, 4-PC (4-Phenylcyclohexene): 0.05 mg/sq.m x hr.
 - c. Carpet, Formaldehyde: 0.05 mg/sq.m x hr.
 - d. Carpet, Styrene: 0.4 mg/sq.m x hr.

2.2 ADHESIVE AND CONCRETE PRIMER:

- A. Provide water resistant, mildew resistant, nonflammable, and nonstaining adhesives and concrete primers for carpet installation. Provide release adhesive for modular tile carpet as recommended by the carpet manufacturer. Provide adhesives flashpoint of minimum 60 degrees C (140 degrees F) in accordance with ASTM D3278. Materials are to have a VOC maximum of 50 g/L when calculated according to 40 CFR 59, (EPA Method 24).

2.3 NOT USED

A.

2.4 EDGE STRIPS (MOLDING) :

- A. Metal:
 - 1. Hammered surface aluminum, pinless, clamp down type designed for the carpet being installed.
 - 2. Floor flange not less than 38 mm (1-1/2 inches) wide, face not less than 16 mm (5/8 inch) wide.
 - 3. Finish: Clear anodic coating unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Vinyl Edge Strip:
 - 1. Beveled floor flange minimum 50 mm (2 inches) wide.
 - 2. Beveled surface to finish flush with carpet for tight joint and other side to floor finish.

3. Color as specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Carpet Base Top Edge Strip:
1. Vinyl "J" strip wall flange minimum of 38 mm (1-1/2 inches) wide with cap beveled from wall to finish flush with carpet being installed.
 2. Color as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION:

- A. Contractor to prepare and test surfaces to receive carpet and adhesives as per Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

3.2 GENERAL INSTALLATION:

- A. Isolate area of installation from rest of building.
- B. Perform all work by manufacturer's approved installers. Conduct installation in accordance with the manufacturer's printed instructions and CRI CIS.
- C. Protect edges of carpet meeting hard surface flooring with molding and install in accordance with the molding manufacturer's printed instructions.
- D. Follow ventilation, personal protection, and other safety precautions recommended by the adhesive manufacturer. Continue ventilation during installation and for at least three (3) days following installation.
- E. Do not permit traffic or movement of furniture or equipment in carpeted area for 24 hours after installation.
- F. Complete other work which would damage the carpet prior to installation of carpet.
- G. Follow carpet manufacturer's recommendations for matching pattern and texture directions.
- H. Cut openings in carpet where required for installing equipment, pipes, outlets, and penetrations. Bind or seal cut edge of sheet carpet. Use additional adhesive to secure carpets around pipes and other vertical projections.

3.4 MODULAR TILE INSTALLATION:

- A. Install per CRI CIS, Adhesive Application.
- B. Lay carpet modules with pile in same direction unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

- C. Install carpet modules so that cleaning methods and solutions do not cause dislocation of modules.
- D. Lay carpet modules uniformly to provide tight flush joints free from movement when subject to traffic, install in quarter-turn pattern.

3.5 EDGE STRIPS INSTALLATION

- A. Install edge strips over exposed carpet edges adjacent to uncarpeted finish flooring.
- B. Anchor metal strips to floor with suitable fasteners. Apply adhesive to edge strips, insert carpet into lip and press it down over carpet.
- C. Anchor vinyl edge strip to floor with adhesive. Apply adhesive to edge strip and insert carpet into lip and press lip down over carpet.
- D. Carpet Base Top Edge Strip Installation:
 - 1. Place carpet molding at top edge of carpet where turned up as base.
 - 2. Install molding in accordance with manufacturer's instructions.

3.6 PROTECTION AND CLEANING:

- A. Once a carpet installation is complete, clean up scrap materials and debris, and vacuum the area, using manufacturer-approved equipment. Inspect seams carefully for evenness and protruding backing yarns, and inspect the perimeter of the installation for an acceptable finished appearance.
- B. Protect installed carpet if furniture is being moved, by laying plywood, fiberboard or porous non-staining sheeting material for minimum time practical. Based on manufacturer guidelines, protect carpet from rolling or foot traffic. Protect against other materials or renovation or construction activities, including dust, debris, paint, contractor traffic, until it is ready for its final use.
- C. Do not move furniture or equipment on unprotected carpeted surfaces.
- D. Just before final acceptance of work, remove protection and vacuum carpet clean.

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SECTION 09 91 00
PAINTING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the painting and finishing as shown on the construction documents and/or specified herein, including, but not limited to, the following:
1. Prime coats which may be applied in shop under other sections.
 2. Prime painting unprimed surfaces to be painted under this Section.
 3. Painting items furnished with a prime coat of paint, including touching up of or repairing of abraded, damaged or rusted prime coats applied by others.
 4. Painting ferrous metal (except stainless steel) exposed to view.
 5. Painting galvanized ferrous metals exposed to view.
 6. Painting interior concrete block exposed to view.
 7. Painting gypsum drywall exposed to view.
 8. Painting of wood exposed to view, except items which are specified to be painted or finished under other Sections of these specifications. Back painting of all wood in contact with concrete, masonry or other moisture areas.
 9. Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.
 10. Painting surfaces above, behind or below grilles, gratings, diffusers, louvers lighting fixtures, and the like, which are exposed to view through these items.
 11. Painting includes shellacs, stains, varnishes, coatings specified, and striping or markers and identity markings.
 12. Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.
 13. Painting of any surface not specifically mentioned to be painted herein or on construction documents, but for which painting is obviously necessary to complete the job, or work which comes within the intent of these specifications, is to be included as though specified.

1.2 RELATED WORK:

- A. Activity Hazard Analysis: Section 01 35 26, SAFETY REQUIREMENTS.
- B. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS.
- C. Lead Paint Removal: Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL.
- D. Masonry Repairs: Section 04 05 13, MASONRY MORTARING, Section 04 05 16, MASONRY GROUTING .
- E. Shop prime painting of steel and ferrous metals: Division 05 - METALS, Division 08 - OPENINGS; Division 10 - SPECIALTIES; Division 11 - EQUIPMENT; Division 12 - FURNISHINGS; Division 13 - SPECIAL CONSTRUCTION; Division 14 - CONVEYING EQUIPMENT; Division 21 - FIRE SUPPRESSION; Division 22 - PLUMBING; Division 23 - HEATING; VENTILATION AND AIR-CONDITIONING; Division 26 - ELECTRICAL; Division 27 - COMMUNICATIONS; and Division 28 - ELECTRONIC SAFETY AND SECURITY sections.
- F. Prefinished flush doors with transparent finishes: Section 08 14 00, INTERIOR WOOD DOORS.
- G. Type of Finish, Color, and Gloss Level of Finish Coat: Section 09 06 00, SCHEDULE FOR FINISHES..

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Painter qualifications.
- D. Manufacturer's Literature and Data:
 - 1. Before work is started, or sample panels are prepared, submit manufacturer's literature and technical data, the current Master Painters Institute (MPI) "Approved Product List" indicating brand label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use subsequent MPI "Approved Product List", however, only one (1) list may be used for the entire contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single

manufacturer. No variation from the MPI "Approved Product List" where applicable is acceptable.

E. Sample Panels:

1. After painters' materials have been approved and before work is started submit sample panels showing each type of finish and color specified.
2. Panels to Show Color: Composition board, 100 x 250 mm (4 x 10 inch).
3. Panel to Show Transparent Finishes: Wood of same species and grain pattern as wood approved for use, 100 x 250 mm (4 x 10 inch face) minimum, and where both flat and edge grain will be exposed, 250 mm (10 inches) long by sufficient size, 50 x 50 mm (2 x 2 inch) minimum or actual wood member to show complete finish.
4. Attach labels to panel stating the following:
 - a. Federal Specification Number or manufacturers name and product number of paints used.
 - b. Specification code number specified in Section 09 06 00, SCHEDULE FOR FINISHES.
 - c. Product type and color.
 - d. Name of project.
5. Strips showing not less than 50 mm (2 inch) wide strips of undercoats and 100 mm (4 inch) wide strip of finish coat.

F. Sample of identity markers if used.

G. Manufacturers' Certificates indicating compliance with specified requirements:

1. Manufacturer's paint substituted for Federal Specification paints meets or exceeds performance of paint specified.
2. High temperature aluminum paint.
3. Epoxy coating.
4. Intumescent clear coating or fire retardant paint.

1.4 DELIVERY AND STORAGE:

A. Deliver materials to site in manufacturer's sealed container marked to show following:

1. Name of manufacturer.
2. Product type.
3. Batch number.
4. Instructions for use.
5. Safety precautions.

- B. In addition to manufacturer's label, provide a label legibly printed as following:
 - 1. Federal Specification Number, where applicable, and name of material.
 - 2. Surface upon which material is to be applied.
 - 3. Specify Coat Types: Prime; body; finish; etc.
- C. Maintain space for storage, and handling of painting materials and equipment in a ventilated, neat and orderly condition to prevent spontaneous combustion from occurring or igniting adjacent items.
- D. Store materials at site at least 24 hours before using, at a temperature between 7 and 30 degrees C (45 and 85 degrees F).

1.5 QUALITY ASSURANCE:

- A. Qualification of Painters: Use only qualified journeyman painters for the mixing and application of paint on exposed surfaces. Submit evidence that key personnel have successfully performed surface preparation and application of coating on a minimum of three (3) similar projects within the past three (3) years.
- B. Paint Coordination: Provide finish coats which are compatible with the prime paints used. Review other Sections of these specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Upon request from other subcontractors, furnish information on the characteristics of the finish materials proposed to be used, to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify the Contracting Officer Representative (COR) in writing of any anticipated problems using the coating systems as specified with substrates primed by others.

1.6 NOT USED

1.7 REGULATORY REQUIREMENTS:

- A. Paint materials are to conform to the restrictions of the local Environmental and Toxic Control jurisdiction.
 - 1. Volatile Organic Compounds (VOC) Emissions Requirements: Field-applied paints and coatings that are inside the waterproofing system to not exceed limits of authorities having jurisdiction.
 - 2. Lead-Base Paint:

- a. Comply with Section 410 of the Lead-Based Paint Poisoning Prevention Act, as amended, and with implementing regulations promulgated by Secretary of Housing and Urban Development.
 - b. Regulations concerning prohibition against use of lead-based paint in federal and federally assisted construction, or rehabilitation of residential structures are set forth in Subpart F, Title 24, Code of Federal Regulations, Department of Housing and Urban Development.
 - c. Do not use coatings having a lead content over 0.06 percent by weight of non-volatile content.
 - d. For lead-paint removal, see Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL.
3. Asbestos: Provide materials that do not contain asbestos.
 4. Chromate, Cadmium, Mercury, and Silica: Provide materials that do not contain zinc-chromate, strontium-chromate, Cadmium, mercury or mercury compounds or free crystalline silica.
 5. Human Carcinogens: Provide materials that do not contain any of the ACGIH-BKLT and ACGHI-DOC confirmed or suspected human carcinogens.
 6. Use high performance acrylic paints in place of alkyd paints.

1.8 SAFETY AND HEALTH

- A. Apply paint materials using safety methods and equipment in accordance with the following:
 1. Comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis (AHA) as specified in Section 01 35 26, SAFETY REQUIREMENTS. The AHA is to include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.
- B. Safety Methods Used During Paint Application: Comply with the requirements of SSPC PA Guide 10.
- C. Toxic Materials: To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:
 1. The applicable manufacturer's Material Safety Data Sheets (MSDS) or local regulation.
 2. 29 CFR 1910.1000.
 3. ACHIH-BKLT and ACGHI-DOC, threshold limit values.

1.9 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by basic designation only.
- B. American Conference of Governmental Industrial Hygienists (ACGIH):
 - ACGIH TLV-BKLT-2012Threshold Limit Values (TLV) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs)
 - ACGIH TLV-DOC-2012Documentation of Threshold Limit Values and Biological Exposure Indices, (Seventh Edition)
- C. ASME International (ASME):
 - A13.1-07(R2013)Scheme for the Identification of Piping Systems
- D. Code of Federal Regulation (CFR):
 - 40 CFR 59Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating
- E. Commercial Item Description (CID):
 - A-A-1272APlaster Gypsum (Spackling Compound)
- F. Federal Specifications (Fed Spec):
 - TT-P-1411APaint, Copolymer-Resin, Cementitious (For Waterproofing Concrete and Masonry Walls) (CEP)
- G. Master Painters Institute (MPI):
 - 1Aluminum Paint
 - 4Interior/ Exterior Latex Block Filler
 - 5Exterior Alkyd Wood Primer
 - 7Exterior Oil Wood Primer
 - 8Exterior Alkyd, Flat MPI Gloss Level 1
 - 9Exterior Alkyd Enamel MPI Gloss Level 6
 - 10Exterior Latex, Flat
 - 11Exterior Latex, Semi-Gloss
 - 18Organic Zinc Rich Primer
 - 22Aluminum Paint, High Heat (up to 590° - 1100F)
 - 27Exterior / Interior Alkyd Floor Enamel, Gloss
 - 31Polyurethane, Moisture Cured, Clear Gloss
 - 36Knot Sealer
 - 43Interior Satin Latex, MPI Gloss Level 4
 - 44Interior Low Sheen Latex, MPI Gloss Level 2

- 45Interior Primer Sealer
- 46Interior Enamel Undercoat
- 47Interior Alkyd, Semi-Gloss, MPI Gloss Level 5
- 48Interior Alkyd, Gloss, MPI Gloss Level 6
- 50Interior Latex Primer Sealer
- 51Interior Alkyd, Eggshell, MPI Gloss Level 3
- 52Interior Latex, MPI Gloss Level 3
- 53Interior Latex, Flat, MPI Gloss Level 1
- 54Interior Latex, Semi-Gloss, MPI Gloss Level 5
- 59Interior/Exterior Alkyd Porch & Floor Enamel, Low
Gloss
- 60Interior/Exterior Latex Porch & Floor Paint, Low
Gloss
- 66Interior Alkyd Fire Retardant, Clear Top-Coat (ULC
Approved)
- 67Interior Latex Fire Retardant, Top-Coat (ULC
Approved)
- 68Interior/ Exterior Latex Porch & Floor Paint,
Gloss
- 71Polyurethane, Moisture Cured, Clear, Flat
- 77Epoxy Cold Cured, Gloss
- 79Marine Alkyd Metal Primer
- 90Interior Wood Stain, Semi-Transparent
- 91Wood Filler Paste
- 94Exterior Alkyd, Semi-Gloss
- 95Fast Drying Metal Primer
- 98High Build Epoxy Coating
- 101Epoxy Anti-Corrosive Metal Primer
- 108High Build Epoxy Coating, Low Gloss
- 114Interior Latex, Gloss
- 119Exterior Latex, High Gloss (acrylic)
- 134Galvanized Water Based Primer
- 135Non-Cementitious Galvanized Primer
- 138Interior High Performance Latex, MPI Gloss Level 2
- 139Interior High Performance Latex, MPI Gloss Level 3
- 140Interior High Performance Latex, MPI Gloss Level 4

141Interior High Performance Latex (SG) MPI Gloss
Level 5

163Exterior Water Based Semi-Gloss Light Industrial
Coating, MPI Gloss Level 5

G. Society for Protective Coatings (SSPC):

SSPC SP 1-82(R2004)Solvent Cleaning

SSPC SP 2-82(R2004)Hand Tool Cleaning

SSPC SP 3-28(R2004)Power Tool Cleaning

SSPC SP 10/NACE No.2 ...Near-White Blast Cleaning

SSPC PA Guide 10Guide to Safety and Health Requirements

H. Maple Flooring Manufacturer's Association (MFMA):

I. U.S. National Archives and Records Administration (NARA):

29 CFR 1910.1000Air Contaminants

J. Underwriter's Laboratory (UL)

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Conform to the coating specifications and standards referenced in PART 3. Submit manufacturer's technical data sheets for specified coatings and solvents.

2.2 PAINT PROPERTIES:

- A. Use ready-mixed (including colors), except two component epoxies, polyurethanes, polyesters, paints having metallic powders packaged separately and paints requiring specified additives.
- B. Where no requirements are given in the referenced specifications for primers, use primers with pigment and vehicle, compatible with substrate and finish coats specified.
- C. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only to recommended limits.
- D. VOC Content: For field applications that are inside the weatherproofing system, paints and coating to comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Flat Paints and Coatings: 50 g/L.
 2. Non-flat Paints and Coatings: 150 g/L.
 3. Dry-Fog Coatings: 400 g/L.
 4. Primers, Sealers, and Undercoaters: 200 g/L.

- 5. Anticorrosive and Antirust Paints applied to Ferrous Metals: 250 g/L.
- 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
- 7. Pretreatment Wash Primers: 420 g/L.
- 8. Shellacs, Clear: 730 g/L.
- 9. Shellacs, Pigmented: 550 g/L.

E. VOC test method for paints and coatings is to be in accordance with 40 CFR 59 (EPA Method 24). Part 60, Appendix A with the exempt compounds' content determined by Method 303 (Determination of Exempt Compounds) in the South Coast Air Quality Management District's (SCAQMD) "Laboratory Methods of Analysis for Enforcement Samples" manual.

2.3 PLASTIC TAPE:

- A. Pigmented vinyl plastic film in colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES or specified.
- B. Pressure sensitive adhesive back.
- C. Snap on coil plastic markers.
- D. Widths as shown on construction documents.

2.4 BIOBASED CONTENT

A. Paint products shall comply with following bio-based standards for biobased materials:

Material Type	Percent by Weight
Interior Paint	20 percent biobased material
Interior Paint- Oil Based and Solvent Alkyd	67 percent biobased material
Exterior Paint	20 percent biobased material
Wood & Concrete Stain	39 percent biobased content
Polyurethane Coatings	25 percent biobased content
Water Tank Coatings	59 percent biobased content
Wood & Concrete Sealer- Membrane Concrete Sealers	11 percent biobased content
Wood & Concrete Sealer- Penetrating Liquid	79 percent biobased content

B. The minimum-content standards are based on the weight (not the volume) of the material.

PART 3 - EXECUTION

3.1 JOB CONDITIONS:

- A. Safety: Observe required safety regulations and manufacturer's warning and instructions for storage, handling and application of painting materials.
 - 1. Take necessary precautions to protect personnel and property from hazards due to falls, injuries, toxic fumes, fire, explosion, or other harm.
 - 2. Deposit soiled cleaning rags and waste materials in metal containers approved for that purpose. Dispose of such items off the site at end of each day's work.
- B. Atmospheric and Surface Conditions:
 - 1. Do not apply coating when air or substrate conditions are:
 - a. Less than 3 degrees C (5 degrees F) above dew point.
 - b. Below 10 degrees C (50 degrees F) or over 35 degrees C (95 degrees F), unless specifically pre-approved by the COR and the product manufacturer. Under no circumstances are application conditions to exceed manufacturer recommendations.
 - c. When the relative humidity exceeds 85 percent; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.
 - 2. Maintain interior temperatures until paint dries hard.
 - 3. Do no exterior painting when it is windy and dusty.
 - 4. Do not paint in direct sunlight or on surfaces that the sun will warm.
 - 5. Apply only on clean, dry and frost free surfaces except as follows:
 - a. Apply water thinned acrylic and cementitious paints to damp (not wet) surfaces only when allowed by manufacturer's printed instructions.
 - b. Concrete and masonry when permitted by manufacturer's recommendations, dampen surfaces to which water thinned acrylic and cementitious paints are applied with a fine mist of water on hot dry days to prevent excessive suction and to cool surface.
 - 6. Varnishing:
 - a. Apply in clean areas and in still air.
 - b. Before varnishing vacuum and dust area.
 - c. Immediately before varnishing wipe down surfaces with a tack rag.

3.2 INSPECTION:

- A. Examine the areas and conditions where painting and finishing are to be applied and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.3 GENERAL WORKMANSHIP REQUIREMENTS:

- A. Application may be by brush or roller. Spray application only upon acceptance from the COR in writing.
- B. Furnish to the COR a painting schedule indicating when the respective coats of paint for the various areas and surfaces will be completed. This schedule is to be kept current as the job progresses.
- C. Protect work at all times. Protect all adjacent work and materials by suitable covering or other method during progress of work. Upon completion of the work, remove all paint and varnish spots from floors, glass and other surfaces. Remove from the premises all rubbish and accumulated materials of whatever nature not caused by others and leave work in a clean condition.
- D. Remove and protect hardware, accessories, device plates, lighting fixtures, and factory finished work, and similar items, or provide in place protection. Upon completion of each space, carefully replace all removed items by workmen skilled in the trades involved.
- E. When indicated to be painted, remove electrical panel box covers and doors before painting walls. Paint separately and re-install after all paint is dry.
- F. Materials are to be applied under adequate illumination, evenly spread and flowed on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.
- G. Apply materials with a coverage to hide substrate completely. When color, stain, dirt or undercoats show through final coat of paint, the surface is to be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Government.
- H. All coats are to be dry to manufacturer's recommendations before applying succeeding coats.
- I. All suction spots or "hot spots" in plaster after the application of the first coat are to be touched up before applying the second coat.

- J. Do not apply paint behind frameless mirrors that use mastic for adhering to wall surface.

3.4 SURFACE PREPARATION:

A. General:

1. The Contractor shall be held wholly responsible for the finished appearance and satisfactory completion of painting work. Properly prepare all surfaces to receive paint, which includes cleaning, sanding, and touching-up of all prime coats applied under other Sections of the work. Broom clean all spaces before painting is started. All surfaces to be painted or finished are to be completely dry, clean and smooth.
2. See other sections of specifications for specified surface conditions and prime coat.
3. Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.
4. Clean surfaces before applying paint or surface treatments with materials and methods compatible with substrate and specified finish. Remove any residue remaining from cleaning agents used. Do not use solvents, acid, or steam on concrete and masonry. Schedule the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.
5. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Concrete: 12 percent.
 - b. Fiber-Cement Board: 12 percent.
 - c. Masonry (Clay and CMU's): 12 percent.
 - d. Wood: 15 percent.
 - e. Gypsum Board: 12 percent.
 - f. Plaster: 12 percent.

B. Wood:

1. Sand to a smooth even surface and then dust off.
2. Sand surfaces showing raised grain smooth between each coat.
3. Wipe surface with a tack rag prior to applying finish.

4. Surface painted with an opaque finish:
 - a. Coat knots, sap and pitch streaks with MPI 36 (Knot Sealer) before applying paint.
 - b. Apply two coats of MPI 36 (Knot Sealer) over large knots.
 5. After application of prime or first coat of stain, fill cracks, nail and screw holes, depressions and similar defects with wood filler paste. Sand the surface to make smooth and finish flush with adjacent surface.
 6. Before applying finish coat, reapply wood filler paste if required, and sand surface to remove surface blemishes. Finish flush with adjacent surfaces.
 7. Fill open grained wood such as oak, walnut, ash and mahogany with MPI 91 (Wood Filler Paste), colored to match wood color.
 - a. Thin filler in accordance with manufacturer's instructions for application.
 - b. Remove excess filler, wipe as clean as possible, dry, and sand as specified.
- C. Ferrous Metals:
1. Remove oil, grease, soil, drawing and cutting compounds, flux and other detrimental foreign matter in accordance with SSPC-SP 1 (Solvent Cleaning).
 2. Remove loose mill scale, rust, and paint, by hand or power tool cleaning, as defined in SSPC-SP 2 (Hand Tool Cleaning) and SSPC-SP 3 (Power Tool Cleaning).
 3. Fill dents, holes and similar voids and depressions in flat exposed surfaces of hollow steel doors and frames, access panels, roll-up steel doors and similar items specified to have semi-gloss or gloss finish with TT-F-322D (Filler, Two-Component Type, For Dents, Small Holes and Blow-Holes). Finish flush with adjacent surfaces.
 - a. Fill flat head countersunk screws used for permanent anchors.
 - b. Do not fill screws of item intended for removal such as glazing beads.
 4. Spot prime abraded and damaged areas in shop prime coat which expose bare metal with same type of paint used for prime coat. Feather edge of spot prime to produce smooth finish coat.
 5. Spot prime abraded and damaged areas which expose bare metal of factory finished items with paint as recommended by manufacturer of item.

D. Zinc-Coated (Galvanized) Metal, Aluminum, Copper and Copper Alloys

Surfaces Specified Painted:

1. Clean surfaces to remove grease, oil and other deterrents to paint adhesion in accordance with SSPC-SP 1 (Solvent Cleaning).
2. Spot coat abraded and damaged areas of zinc-coating which expose base metal on hot-dip zinc-coated items with MPI 18 (Organic Zinc Rich Coating). Prime or spot prime with MPI 134 (Waterborne Galvanized Primer) or MPI 135 (Non-Cementitious Galvanized Primer) depending on finish coat compatibility.

E. Masonry, Concrete, Cement Board, Cement Plaster and Stucco:

1. Clean and remove dust, dirt, oil, grease efflorescence, form release agents, laitance, and other deterrents to paint adhesion.
2. Use emulsion type cleaning agents to remove oil, grease, paint and similar products. Use of solvents, acid, or steam is not permitted.
3. Remove loose mortar in masonry work.
4. Replace mortar and fill open joints, holes, cracks and depressions with new mortar specified in Section 04 05 13, MASONRY MORTARING Section 04 05 16, MASONRY GROUTING. Do not fill weep holes. Finish to match adjacent surfaces.
5. Neutralize Concrete floors to be painted by washing with a solution of 1.4 Kg (3 pounds) of zinc sulfate crystals to 3.8 L (1 gallon) of water, allow to dry three (3) days and brush thoroughly free of crystals.
6. Repair broken and spalled concrete edges with concrete patching compound to match adjacent surfaces as specified in Division 03, CONCRETE Sections. Remove projections to level of adjacent surface by grinding or similar methods.

F. Gypsum Plaster and Gypsum Board:

1. Remove efflorescence, loose and chalking plaster or finishing materials.
2. Remove dust, dirt, and other deterrents to paint adhesion.
3. Fill holes, cracks, and other depressions with CID-A-A-1272A finished flush with adjacent surface, with texture to match texture of adjacent surface. Patch holes over 25 mm (1-inch) in diameter as specified in Section for plaster or gypsum board.

3.5 PAINT PREPARATION:

- A. Thoroughly mix painting materials to ensure uniformity of color, complete dispersion of pigment and uniform composition.
- B. Do not thin unless necessary for application and when finish paint is used for body and prime coats. Use materials and quantities for thinning as specified in manufacturer's printed instructions.
- C. Remove paint skins, then strain paint through commercial paint strainer to remove lumps and other particles.
- D. Mix two (2) component and two (2) part paint and those requiring additives in such a manner as to uniformly blend as specified in manufacturer's printed instructions unless specified otherwise.
- E. For tinting required to produce exact shades specified, use color pigment recommended by the paint manufacturer.

3.6 APPLICATION:

- A. Start of surface preparation or painting will be construed as acceptance of the surface as satisfactory for the application of materials.
- B. Unless otherwise specified, apply paint in three (3) coats; prime, body, and finish. When two (2) coats applied to prime coat are the same, first coat applied over primer is body coat and second coat is finish coat.
- C. Apply each coat evenly and cover substrate completely.
- D. Allow not less than 48 hours between application of succeeding coats, except as allowed by manufacturer's printed instructions, and approved by COR.
- E. Apply by brush or roller. Spray application for new or existing occupied spaces only upon approval by acceptance from COR in writing.
 - 1. Apply painting materials specifically required by manufacturer to be applied by spraying.
 - 2. In new construction and in existing occupied spaces, where paint is applied by spray, mask or enclose with polyethylene, or similar air tight material with edges and seams continuously sealed including items specified in "Building and Structural Work Field Painting"; "Work not Painted"; motors, controls, telephone, and electrical equipment, fronts of sterilizes and other recessed equipment and similar prefinished items.

- F. Do not paint in closed position operable items such as access doors and panels, window sashes, overhead doors, and similar items except overhead roll-up doors and shutters.

3.7 PRIME PAINTING:

- A. After surface preparation, prime surfaces before application of body and finish coats, except as otherwise specified.
- B. Spot prime and apply body coat to damaged and abraded painted surfaces before applying succeeding coats.
- C. Additional field applied prime coats over shop or factory applied prime coats are not required except for exterior exposed steel apply an additional prime coat.
- D. Prime rabbets for stop and face glazing of wood, and for face glazing of steel.
- E. Wood and Wood Particleboard:
 - 1. Use same kind of primer specified for exposed face surface.
 - a. Exterior wood: MPI 7 (Exterior Oil Wood Primer) for new construction and MPI 5 (Exterior Alkyd Wood Primer) for repainting bare wood primer except where MPI 90 (Interior Wood Stain, Semi-Transparent) is scheduled.
 - b. Interior wood except for transparent finish: MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat), thinned if recommended by manufacturer.
 - 2. Apply two (2) coats of primer MPI 7 (Exterior Oil Wood Primer) or MPI 5 (Exterior Alkyd Wood Primer) or sealer MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) to surfaces of wood doors, including top and bottom edges, which are cut for fitting or for other reason.
 - 3. Apply one (1) coat of primer MPI 7 (Exterior Oil Wood Primer) or MPI 5 (Exterior Alkyd Wood Primer) or sealer MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) as soon as delivered to site to surfaces of unfinished woodwork, except concealed surfaces of shop fabricated or assembled millwork and surfaces specified to have varnish, stain or natural finish.
 - 4. Back prime and seal ends of exterior woodwork, and edges of exterior plywood specified to be finished.
 - 5. Apply MPI 67 (Interior Latex Fire Retardant, Top-Coat (UL Approved) to wood for fire retardant finish.

F. Metals except boilers, incinerator stacks, and engine exhaust pipes:

1. Steel and iron: MPI 79 (Marine Alkyd Metal Primer); MPI 95 (Fast Drying Metal Primer). Use MPI 101 (Cold Curing Epoxy Primer) where MPI 77 (Epoxy Cold Cured, Gloss, MPI 98 (High Build Epoxy Coating), OR MPI 108 (High Build Epoxy Marine Coating) finish is specified.
2. Zinc-coated steel and iron: MPI 134 (Waterborne Galvanized Primer) or MPI 135 (Non-Cementitious Galvanized Primer) .
3. Aluminum scheduled to be painted: MPI 95 (Fast Drying Metal Primer).
4. Terne Metal: MPI 79 (Marine Alkyd Metal Primer) or MPI 95 (Fast Drying Metal Primer).
5. Copper and copper alloys scheduled to be painted: MPI 95 (Fast Drying Metal Primer).
6. Machinery not factory finished: MPI 9 (Exterior Alkyd Enamel).
7. Asphalt coated metal: MPI 1 (Aluminum Paint).
8. Metal over 94 degrees C (201 degrees F), Boilers, Incinerator Stacks, and Engine Exhaust Pipes: MPI 22 (High Heat Resistant Coating).

G. Gypsum Board:

1. Surfaces scheduled to have MPI 53 (Interior Latex, Flat) , MPI Gloss Level 1, MPI 52 (Interior Latex, MPI Gloss Level 3), MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5) MPI 114 (Interior Latex, Gloss) finish: Use MPI 53 (Interior Latex, MPI Gloss Level 3), MPI 52 (Interior Latex, MPI Gloss Level 3), MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5), MPI 114 (Interior Latex, Gloss) respectively .
2. Primer: MPI 50 (Interior Latex Primer Sealer) except use MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) in shower and bathrooms.
3. Not Used .
4. Use MPI 101 (Cold Curing Epoxy Primer) for surfaces scheduled to receive MPI 77 (Epoxy Cold Cured, Gloss), MPI 98 (High Build Epoxy Coating), or MPI 108 (High Build Epoxy Marine Coating) finish.

H. Not Used

I. Concrete Masonry Units except glazed or integrally colored and decorative units:

1. MPI 4 (Block Filler) on interior surfaces.
2. Prime exterior surface as specified for exterior finishes.

J. Cement Plaster, Concrete Masonry, and Interior Surfaces of Ceilings and Walls:

1. MPI 52 (Interior Latex, MPI Gloss Level 3) except use two (2) coats where substrate has aged less than six (6) months.
2. Use MPI 139 (Interior High Performance Latex, MPI Gloss level 3) as scheduled.

K. Not Used

3.8 EXTERIOR FINISHES:

A. Apply following finish coats where specified in Section 09 06 00, SCHEDULE FOR FINISHES.

B. Wood:

1. Do not apply finish coats on surfaces concealed after installation, top and bottom edges of wood doors and sash, or on edges of wood framed insect screens.
2. Two (2) coats of MPI 11 (Exterior Latex, Semi-Gloss) on exposed surfaces, except where transparent finish is specified.
3. Not Used

C. Steel and Ferrous Metal :

1. Two (2) coats of MPI 94 (Exterior Alkyd, Semi-Gloss) on exposed surfaces, except on surfaces over 94 degrees C (201 degrees F).
2. Not Used.

D. Machinery without factory finish except for primer: One (1) coat MPI 8 (Exterior Alkyd, Flat, gloss level 1)

E. Concrete Masonry Units, Cement Plaster, Concrete:

1. General:

- a. Where specified in Section 09 06 00, SCHEDULE FOR FINISHES or shown.
 - b. Mix as specified in manufacturer's printed directions.
 - c. Do not mix more paint than can be used within four (4) hours after mixing. Discard paint that has started to set.
 - d. Dampen warm surfaces above 24 degrees C (75 degrees F) with fine mist of water before application of paint. Do not leave free water on surface.
 - e. Cure paint with a fine mist of water as specified in manufacturer's printed instructions.
2. Use two (2) coats of TT-P-1411 (Paint, Co-polymer-Resin, Cementitious), unless specified otherwise.

3.9 INTERIOR FINISHES:

- A. Apply following finish coats over prime coats in spaces or on surfaces specified in Section 09 06 00, SCHEDULE FOR FINISHES.

- B. Metal Work:
 - 1. Apply to exposed surfaces.
 - 2. Omit body and finish coats on surfaces concealed after installation except electrical conduit containing conductors over 600 volts.
 - 3. Ferrous Metal, Galvanized Metal, and Other Metals Scheduled:
 - a. Apply two (2) coats of MPI 47 (Interior Alkyd, Semi-Gloss) unless specified otherwise.
 - b. Two (2) coats of MPI 51 (Interior Alkyd, Eggshell).
 - c. Not Used.
 - d. Not Used.
 - e. Machinery: One (1) coat MPI 9 (Exterior Alkyd Enamel).
 - f. Asphalt Coated Metal: One (1) coat MPI 1 (Aluminum Paint).
 - g. Ferrous Metal over 94 degrees K (290 degrees F): Boilers, Incinerator Stacks, and Engine Exhaust Pipes: One (1) coat MPI 22 (High Heat Resistant Coating).

- C. Gypsum Board:
 - 1. One (1) coat of MPI 45 (Interior Primer Sealer) plus one (1) coat of MPI 139 (Interior High Performance Latex, MPI Gloss level 3).
 - 2. Not Used.
 - 3. Not Used.
 - 4. Not Used .

- D. Plaster:
 - 1. One (1) coat of MPI 45 (Interior Primer Sealer) plus one (1) coat of MPI 139 (Interior High Performance Latex, MPI Gloss level 3).
 - 2. Not Used
 - 3. Not Used.
 - 4. Not Used.

- E. Masonry and Concrete Walls:
 - 1. Over MPI 4 (Interior/Exterior Latex Block Filler) on CMU surfaces.
 - 2. Two (2) coats of MPI 52 (Interior Latex, MPI Gloss Level 3).
 - 3. Not Used .

- F. Wood:
 - 1. Sanding:

- a. Use 220-grit sandpaper.
 - b. Sand sealers and varnish between coats.
 - c. Sand enough to scarify surface to assure good adhesion of subsequent coats, to level roughly applied sealer and varnish, and to knock off "whiskers" of any raised grain as well as dust particles.
2. Sealers:
- a. MPI 31 (gloss) or MPI 71 (flat) thinned as recommended by manufacturer at rate of one (1) part of thinner to four (4) parts of varnish.
 - b. Apply sealers specified except sealer may be omitted where pigmented, penetrating, or wiping stains containing resins are used.
 - c. Allow manufacturer's recommended drying time before sanding, but not less than 24 hours or 36 hours in damp or muggy weather.
 - d. Sand as specified.
3. Paint Finish:
- a. One (1) coat of MPI 45 (Interior Primer Sealer) plus one (1) coat of MPI 47 (Interior Alkyd, Semi-Gloss).
 - b. Not Used.
 - c. Not Used.
 - d. Not Used.
4. Transparent Finishes on Wood Except Floors.
- a. Not Used.
 - b. Stain Finish:
 - 1) One (1) coat of MPI 90 (Interior Wood Stain, Semi-Transparent).
 - 2) Use wood stain of type and color required to achieve finish specified. Do not use varnish type stains.
 - 3) One (1) coat of sealer MPI 71 (flat) thinned as recommended by manufacturer at rate of one (1) part of thinner to four (4) parts of varnish.
 - 4) Two (2) coats of MPI 71 MPI 31 (Polyurethane Moisture Cured, Clear Gloss).
 - c. Not Used.
 - d. Not Used.
- G. Cement Board: One (1) coat of and MPI 139 (Interior High Performance Latex, MPI Gloss Level 3) .
- H. Not Used.

I. Miscellaneous:

1. Apply where specified in Section 09 06 00, SCHEDULE FOR FINISHES.
2. MPI 1 (Aluminum Paint): Two (2) coats of aluminum paint.
3. Not Used.
4. Not Used.

3.10 REFINISHING EXISTING PAINTED SURFACES:

- A. Clean, patch and repair existing surfaces as specified under "Surface Preparation". No "telegraphing" of lines, ridges, flakes, etc., through new surfacing is permitted. Where this occurs, sand smooth and re-finish until surface meets with COR's approval.
- B. Remove and reinstall items as specified under "General Workmanship Requirements".
- C. Remove existing finishes or apply separation coats to prevent non compatible coatings from having contact.
- D. Patched or Replaced Areas in Surfaces and Components: Apply spot prime and body coats as specified for new work to repaired areas or replaced components.
- E. Except where scheduled for complete painting apply finish coat over plane surface to nearest break in plane, such as corner, reveal, or frame.
- F. In existing rooms and areas where alterations occur, clean existing stained and natural finished wood retouch abraded surfaces and then give entire surface one (1) coat of MPI 31 (Polyurethane, Moisture Cured, Clear Gloss) .
- G. Refinish areas as specified for new work to match adjoining work unless specified or scheduled otherwise.
- H. Coat knots and pitch streaks showing through old finish with MPI 36 (Knot Sealer) before refinishing.
- I. Sand or dull glossy surfaces prior to painting.
- J. Sand existing coatings to a feather edge so that transition between new and existing finish will not show in finished work.

3.11 PAINT COLOR:

- A. Color and gloss of finish coats is specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Not Used.
- C. Coat Colors:
 1. Color of priming coat: Lighter than body coat.
 2. Color of body coat: Lighter than finish coat.

3. Color prime and body coats to not show through the finish coat and to mask surface imperfections or contrasts.

D. Painting, Caulking, Closures, and Fillers Adjacent to Casework:

1. Paint to match color of casework where casework has a paint finish.

2. Paint to match color of wall where casework is stainless steel, plastic laminate, or varnished wood.

3.12 MECHANICAL AND ELECTRICAL WORK FIELD PAINTING SCHEDULE:

A. Field painting of mechanical and electrical consists of cleaning, touching-up abraded shop prime coats, and applying prime, body and finish coats to materials and equipment if not factory finished in space scheduled to be finished.

B. In spaces not scheduled to be finish painted in Section 09 06 00, SCHEDULE FOR FINISHES paint as specified below.

C. Paint various systems specified in Division 02 - EXISTING CONDITIONS, Division 21 - FIRE SUPPRESSION, Division 22 - PLUMBING, Division 23 - HEATING, VENTILATION AND AIR-CONDITIONING, Division 26 - ELECTRICAL, Division 27 - COMMUNICATIONS, and Division 28 - ELECTRONIC SAFETY AND SECURITY.

D. Paint after tests have been completed.

E. Omit prime coat from factory prime-coated items.

F. Finish painting of mechanical and electrical equipment is not required when located in interstitial spaces, above suspended ceilings, in concealed areas such as pipe and electric closets, pipe basements, pipe tunnels, trenches, attics, roof spaces, shafts and furred spaces except on electrical conduit containing feeders 600 volts or more.

G. Not Used.

H. Color:

1. Paint items having no color specified in Section 09 06 00, SCHEDULE FOR FINISHES to match surrounding surfaces.

2. Paint colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES except for following:

a. White: Exterior unfinished surfaces of enameled plumbing fixtures. Insulation coverings on breeching and uptake inside boiler house, drums and drum-heads, oil heaters, condensate tanks and condensate piping.

- b. Gray: Heating, ventilating, air conditioning and refrigeration equipment (except as required to match surrounding surfaces), and water and sewage treatment equipment and sewage ejection equipment.
 - c. Aluminum Color: Ferrous metal on outside of boilers and in connection with boiler settings including supporting doors and door frames and fuel oil burning equipment, and steam generation system (bare piping, fittings, hangers, supports, valves, traps and miscellaneous iron work in contact with pipe).
 - d. Federal Safety Red: Exposed fire protection piping hydrants, post indicators, electrical conduits containing fire alarm control wiring, and fire alarm equipment.
 - e. Federal Safety Orange: Entire lengths of electrical conduits containing feeders 600 volts or more.
 - f. Color to match brickwork sheet metal covering on breeching outside of exterior wall of boiler house.
- I. Apply paint systems on properly prepared and primed surface as follows:
- 1. Exterior Locations:
 - a. Apply two (2) coats of MPI 8 (Exterior Alkyd, Flat) to the following ferrous metal items:
Vent and exhaust pipes with temperatures under 94 degrees C (201 degrees F), roof drains, fire hydrants, post indicators, yard hydrants, exposed piping and similar items.
 - b. Apply two (2) coats of MPI 10 (Exterior Latex, Flat) to galvanized and zinc-copper alloy metal.
 - c. Apply one (1) coat of MPI 22 (High Heat Resistant Coating), 650 degrees C (1200 degrees F) to incinerator stacks, boiler stacks, and engine generator exhaust.
 - 2. Interior Locations:
 - a. Apply two (2) coats of MPI 47 (Interior Alkyd, Semi-Gloss) to following items:
 - 1) Metal under 94 degrees C (201 degrees F) of items such as bare piping, fittings, hangers and supports.
 - 2) Equipment and systems such as hinged covers and frames for control cabinets and boxes, cast-iron radiators, electric conduits and panel boards.
 - 3) Heating, ventilating, air conditioning, plumbing equipment, and machinery having shop prime coat and not factory finished.

- b. Not Used.
 - c. Not Used.
 - d. Apply two (2) coats of MPI 22 (High Heat Resistant Coating) to ferrous metal surface over 94 degrees K (290 degrees F) of following items:
 - 1) Garbage and trash incinerator.
 - 2) Medical waste incinerator.
 - 3) Exterior of boilers and ferrous metal in connection with boiler settings including supporting members, doors and door frames and fuel oil burning equipment.
 - 4) Steam line flanges, bare pipe, fittings, valves, hangers and supports over 94 degrees K (290 degrees F).
 - 5) Engine generator exhaust piping and muffler.
 - e. Paint electrical conduits containing cables rated 600 volts or more using two (2) coats of MPI 8 (Exterior Alkyd, Flat) in the Federal Safety Orange color in exposed and concealed spaces full length of conduit.
3. Other exposed locations:
- a. Metal surfaces, except aluminum, of cooling towers exposed to view, including connected pipes, rails, and ladders: Two (2) coats of MPI 1 (Aluminum Paint).
 - b. Cloth jackets of insulation of ducts and pipes in connection with plumbing, air conditioning, ventilating refrigeration and heating systems: One (1) coat of MPI 50 (Interior Latex Primer Sealer) and one (1) coat of MPI 10 (Exterior Latex, Flat) .

3.13 BUILDING AND STRUCTURAL WORK FIELD PAINTING:

- A. Painting and finishing of interior and exterior work except as specified here-in-after.
 - 1. Painting and finishing of new and existing work including colors and gloss of finish selected is specified in Finish Schedule, Section 09 06 00, SCHEDULE FOR FINISHES.
 - 2. Painting of disturbed, damaged and repaired or patched surfaces when entire space is not scheduled for complete repainting or refinishing.
 - 3. Painting of ferrous metal and galvanized metal.
 - 4. Painting of wood with fire retardant paint exposed in attics, when used as mechanical equipment space (except shingles).
 - 5. Identity painting and safety painting.

B. Building and Structural Work not Painted:

1. Prefinished items:
 - a. Casework, doors, elevator entrances and cabs, metal panels, wall covering, and similar items specified factory finished under other sections.
 - b. Factory finished equipment and pre-engineered metal building components such as metal roof and wall panels.
2. Finished surfaces:
 - a. Hardware except ferrous metal.
 - b. Anodized aluminum, stainless steel, chromium plating, copper, and brass, except as otherwise specified.
 - c. Signs, fixtures, and other similar items integrally finished.
3. Concealed surfaces:
 - a. Inside dumbwaiter, elevator and duct shafts, interstitial spaces, pipe basements, crawl spaces, pipe tunnels, above ceilings, attics, except as otherwise specified.
 - b. Inside walls or other spaces behind access doors or panels.
 - c. Surfaces concealed behind permanently installed casework and equipment.
4. Moving and operating parts:
 - a. Shafts, chains, gears, mechanical and electrical operators, linkages, and sprinkler heads, and sensing devices.
 - b. Tracks for overhead or coiling doors, shutters, and grilles.
5. Labels:
 - a. Code required label, such as Underwriters Laboratories Inc., Intertek Testing Service or Factory Mutual Research Corporation.
 - b. Identification plates, instruction plates, performance rating, and nomenclature.
6. Galvanized metal:
 - a. Exterior chain link fence and gates, corrugated metal areaways, and gratings.
 - b. Gas Storage Racks.
 - c. Except where specifically specified to be painted.
7. Metal safety treads and nosings.
8. Gaskets.

9. Concrete curbs, gutters, pavements, retaining walls, exterior exposed foundations walls and interior walls in pipe basements.
10. Face brick.
11. Structural steel encased in concrete, masonry, or other enclosure.
12. Structural steel to receive sprayed-on fire proofing.
13. Ceilings, walls, columns in interstitial spaces.
14. Ceilings, walls, and columns in pipe basements.
15. Wood Shingles.

3.14 IDENTITY PAINTING SCHEDULE:

- A. Identify designated service in new buildings or projects with extensive remodeling in accordance with ASME A13.1, unless specified otherwise, on exposed piping, piping above removable ceilings, piping in accessible pipe spaces, interstitial spaces, and piping behind access panels. For existing spaces where work is minor match existing.
 1. Legend may be identified using snap-on coil plastic markers or by paint stencil applications.
 2. Apply legends adjacent to changes in direction, on branches, where pipes pass through walls or floors, adjacent to operating accessories such as valves, regulators, strainers and cleanouts a minimum of 12.2 M (40 feet) apart on straight runs of piping. Identification next to plumbing fixtures is not required.
 3. Locate Legends clearly visible from operating position.
 4. Use arrow to indicate direction of flow using black stencil paint.
 5. Identify pipe contents with sufficient additional details such as temperature, pressure, and contents to identify possible hazard. Insert working pressure shown on construction documents where asterisk appears for High, Medium, and Low Pressure designations as follows:
 - a. High Pressure - 414 kPa (60 psig) and above.
 - b. Medium Pressure - 104 to 413 kPa (15 to 59 psig).
 - c. Low Pressure - 103 kPa (14 psig) and below.
 - d. Add Fuel oil grade numbers.
 6. Legend name in full or in abbreviated form as follows:

	COLOR OF	COLOR OF	COLOR OF	LEGEND
PIPING	EXPOSED PIPING	BACKGROUND	LETTERS	ABBREVIATIONS

Blow-off	Green	White	Blow-off
Boiler Feedwater	Green	White	Blr Feed
A/C Condenser Water Supply	Green	White	A/C Cond Wtr Sup
A/C Condenser Water Return	Green	White	A/C Cond Wtr Ret
Chilled Water Supply	Green	White	Ch. Wtr Sup
Chilled Water Return	Green	White	Ch. Wtr Ret
Shop Compressed Air	Blue	White	Shop Air
Air-Instrument Controls	Green	White	Air-Inst Cont
Drain Line	Green	White	Drain
Emergency Shower	Green	White	Emg Shower
High Pressure Steam	Green	White	H.P. _____*
High Pressure Condensate Return	Green	White	H.P. Ret _____*
Medium Pressure Steam	Green	White	M. P. Stm _____*
Medium Pressure Condensate Return	Green	White	M.P. Ret _____*
Low Pressure Steam	Green	White	L.P. Stm _____*
Low Pressure Condensate Return	Green	White	L.P. Ret _____*
High Temperature Water Supply	Green	White	H. Temp Wtr Sup
High Temperature Water Return	Green	White	H. Temp Wtr Ret
Hot Water Heating Supply	Green	White	H. W. Htg Sup
Hot Water Heating Return	Green	White	H. W. Htg Ret
Gravity Condensate Return	Green	White	Gravity Cond Ret
Pumped Condensate Return	Green	White	Pumped Cond Ret
Vacuum Condensate Return	Green	White	Vac Cond Ret
Fuel Oil - Grade // //	Brown	White	Fuel Oil-Grade // //
(Diesel Fuel included under Fuel Oil)			
Boiler Water Sampling	Green	White	Sample
Chemical Feed	Green	White	Chem Feed
Continuous Blow-Down	Green	White	Cont. B D
Pumped Condensate	Green	White	Pump Cond
Pump Recirculating	Green	White	Pump-Recirc.
Vent Line	Green	White	Vent
Alkali	Orange	Black	Alk
Bleach	Orange	Black	Bleach
Detergent	Yellow	Black	Det
Liquid Supply	Yellow	Black	Liq Sup
Reuse Water	Yellow	Black	Reuse Wtr

Cold Water (Domestic)	White	Green	White	C.W. Dom
Hot Water (Domestic)				
Supply	White	Yellow	Black	H.W. Dom
Return	White	Yellow	Black	H.W. Dom Ret
Tempered Water	White	Yellow	Black	Temp. Wtr
Ice Water				
Supply	White	Green	White	Ice Wtr
Return	White	Green	White	Ice Wtr Ret
Reagent Grade Water		Green	White	RG
Reverse Osmosis		Green	White	RO
Sanitary Waste		Green	White	San Waste
Sanitary Vent		Green	White	San Vent
Storm Drainage		Green	White	St Drain
Pump Drainage		Green	White	Pump Disch
Chemical Resistant Pipe				
Waste		Orange	Black	Acid Waste
Vent		Orange	Black	Acid Vent
Atmospheric Vent		Green	White	ATV
Silver Recovery		Green	White	Silver Rec
Oral Evacuation		Green	White	Oral Evac
Fuel Gas		Yellow	Black	Gas
Fire Protection Water				
Sprinkler	Red	Red	White	Auto Spr
Standpipe	Red	Red	White	Stand
Sprinkler	Red	Red	White	Drain

7. Electrical Conduits containing feeders over 600 volts, paint legends using 50 mm (2 inch) high black numbers and letters, showing the voltage class rating. Provide legends where conduits pass through walls and floors and at maximum 6096 mm (20 foot) intervals in between. Use labels with yellow background with black border and words Danger High Voltage Class, 5000 or 15000 or 25000 as applies.

8. See Sections for methods of identification, legends, and abbreviations of the following:

f. Conduits containing high voltage feeders over 600 volts:

- Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS /
- Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS /
- Section 28 05 33, RACEWAYS AND BOXES FOR ELECTRONIC SAFETY AND SECURITY.

B. Fire and Smoke Partitions:

1. Identify partitions above ceilings on both sides of partitions except within shafts in letters not less than 64 mm (2 1/2 inches) high.
 2. Stenciled message: "SMOKE BARRIER" or, "FIRE BARRIER" as applicable.
 3. Locate not more than 6096 mm (20 feet) on center on corridor sides of partitions, and with a least one (1) message per room on room side of partition.
 4. Use semi-gloss paint of color that contrasts with color of substrate.
- C. Identify columns in pipe basements and interstitial space:
1. Apply stenciled number and letters to correspond with grid numbering and lettering indicated on construction documents.
 2. Paint numbers and letters 101 mm (4 inches) high, locate 45 mm (18 inches) below overhead structural slab.
 3. Apply on four (4) sides of interior columns and on inside face only of exterior wall columns.
 4. Color:
 - a. Use black on concrete columns.
 - b. Use white or contrasting color on steel columns.

3.15 PROTECTION CLEAN UP, AND TOUCH-UP:

- A. Protect work from paint droppings and spattering by use of masking, drop cloths, removal of items or by other approved methods.
- B. Upon completion, clean paint from hardware, glass and other surfaces and items not required to be painted of paint drops or smears.
- C. Before final inspection, touch-up or refinished in a manner to produce solid even color and finish texture, free from defects in work which was damaged or discolored.

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SECTION 10 14 00
SIGNAGE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies interior signage for room numbers, directional signs exterior signage, code required signs and temporary signs.
- B. This section specifies exterior signage.

1.2 RELATED WORK

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Electrical Work: Division 26, ELECTRICAL.
- C. Lighted EXIT signs for egress purposes are specified under Division 26, ELECTRICAL.
- D. Not Used.
- E. Color and Finish of Interior Signs: Section 09 06 00, SCHEDULE FOR FINISHES.
- F. Not Used.
- G. Not Used.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Provide signage that is the product of one manufacturer, who has provided signage as specified for a minimum of three (3) years. Submit manufacturer's qualifications.
- B. Installer's Qualifications: Minimum three (3) years' experience in the installation of signage of the type as specified in this Section. Submit installer's qualifications.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 00, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Interior Sign Samples: Sign panels and frames, with letters and symbols, for each sign type.
 - 1. Sign Panel, 203 x 254 mm (8 x 10 inches), with letters.
 - 2. Color samples of each color, 152 x 152 mm (6 x 6 inches. Show anticipated range of color and texture.
 - 3. Sample of typeface, arrow and symbols in a typical full size layout.

- D. Exterior Sign Samples: 152 x 152 mm (6 x 6 inches) samples of each color and material.
- E. Manufacturer's Literature:
 - 1. Showing the methods and procedures proposed for the anchorage of the signage system to each surface type.
 - 2. Manufacturer's printed specifications and maintenance instructions.
- F. Sign Location Plan, showing location, type and total number of signs required.
- G. Shop Drawings: Scaled for manufacture and fabrication of sign types. Identify materials, show joints, welds, anchorage, accessory items, mounting and finishes.
- H. Manufacturer's qualifications.
- I. Installer's qualifications.

1.5 DELIVERY AND STORAGE

- A. Deliver materials to job in manufacturer's original sealed containers with brand name marked thereon. Protect materials from damage.
- B. Package to prevent damage or deterioration during shipment, handling, storage and installation. Maintain protective covering in place and in good repair until removal is necessary.
- C. Deliver signs only when the site and mounting services are ready for installation work to proceed.
- D. Store products in dry condition inside enclosed facilities.

1.6 WARRANTY

- A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".

1.7 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Architectural Manufacturers Association (AAMA):
 - 611-14Anodized Architectural Aluminum
 - 2603-13Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels
- C. American National Standards Institute (ANSI):
 - A117.1-09Accessible and Usable Buildings and Facilities

D. ASTM International (ASTM):

A36/A36M-14Carbon Structural Steel
A240/A240M-15Chromium and Chromium-Nickel Stainless Steel
Plate, Sheet, and Strip for Pressure Vessels
and for General Applications
A666-10Annealed or Cold-Worked Austenitic Stainless
Steel Sheet, Strip, Plate and Flat Bar
A1011/A1011M-14Steel, Sheet and Strip, Hot-Rolled, Carbon,
Structural, High-Strength Low-Alloy, High-
Strength Low-Alloy with Improved Formability,
and Ultra-High Strength
B36/B36M-13Brass Plate, Sheet, Strip, and Rolled Bar
B152/B152M-13Copper Sheet, Strip, Plate, and Rolled Bar
B209-14Aluminum and Aluminum-Alloy Sheet and Plate
B209M-14Aluminum and Aluminum-Alloy Sheet and Plate
(Metric)
B221-14Aluminum and Aluminum-Alloy Extruded Bars,
Rods, Wire, Shapes, and Tubes
B221M-13Aluminum and Aluminum-Alloy Extruded Bars,
Rods, Wire, Shapes, and Tubes (Metric)
C1036-11 (R2012)Flat Glass
C1048-12Heat-Treated Flat Glass-Kind HS, Kind FT Coated
and Uncoated Glass
C1349-10Architectural Flat Glass Clad Polycarbonate
D1003-13Test Method for Haze and Luminous Transmittance
of Transparent Plastics
D4802-10Poly(Methyl Methacrylate) Acrylic Plastic Sheet

D. Code of Federal Regulation (CFR):

40 CFR 59Determination of Volatile Matter Content, Water
Content, Density Volume Solids, and Weight
Solids of Surface Coating

E. Federal Specifications (Fed Spec):

MIL-PRF-8184FPlastic Sheet, Acrylic, Modified.
MIL-P-46144CPlastic Sheet, Polycarbonate

F. National Fire Protection Association (NFPA):

70-14National Electrical Code

PART 2 - PRODUCTS

2.1 SIGNAGE GENERAL

- A. Provide signs of type, size and design shown on the construction documents.
- B. Provide signs complete with lettering, framing and related components for a complete installation.
- C. Provide graphics items as completed units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.
- D. Do not scale construction documents for dimensions. Verify dimensions and coordinate with field conditions. Notify Contracting Officer Representative (COR) of discrepancies or changes needed to satisfy the requirements of the construction documents.

2.2 EXTERIOR SIGNAGE PERFORMANCE REQUIREMENTS

- A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes 67 degrees C (120 degrees F) ambient and 100 degrees C (180 degrees F) material surfaces.

2.3 INTERIOR SIGN MATERIALS

- A. Aluminum:
 - 1. Sheet and Plate: ASTM B209M (B209).
 - 2. Extrusions and Tubing: ASTM B221M (B221).
- B. Cast Acrylic Sheet: MIL-PRF-8184F; Type II, class 1, Water white non-glare optically clear. Matt finish water white clear acrylic shall not be acceptable.
- C. Polycarbonate: MIL-P-46144C; Type I, class 1.
- D. Vinyl: Premium grade 0.1 mm (0.004 inch) thick machine cut, having a pressure sensitive adhesive and integral colors.
- E. Adhesives:
 - 1. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by signage manufacturer.
 - 2. Adhesives to have VOC content of 50 g/L or less when calculated according to 40 CFR 59, (EPA Method 24).

- F. Typography: Comply with VA Signage Design Guide.
1. Type Style: Helvetica Medium and Helvetica Medium Condensed. Initial caps or all caps, as indicated .
 2. Arrow: Comply with graphic standards in construction documents.
 3. Letter spacing: Comply with graphic standards in construction documents.
 4. Letter spacing: Comply with graphic standards in construction documents.
 5. Provide text, arrows, and symbols in size, colors, typefaces and letter spacing shown in construction documents. Text shall be a true, clean, accurate reproduction of typeface(s). Text shown in construction documents is for layout purposes only; final text for signs is listed.

2.4 EXTERIOR SIGN MATERIALS

- A. Aluminum Sheet and Plate: ASTM B209M (B209).
- B. Aluminum Extrusions: ASTM B221M (B221).
- C. Brass Sheet (Yellow Brass): ASTM B36/B36M.
- D. Bronze Plate: ASTM B36/B36M.
- E. Copper Sheet: ASTM B152/B152M.
- F. Steel Products: Structural steel products that conform to ASTM A36/A36M. Sheet and strip steel products that conform to ASTM A1011/A1011M.
- G. Stainless Steel Sheet: ASTM A240/A240M, stretcher leveled standard of flatness.
- H. Acrylic Sheet: ASTM D4802; category as standard with manufacturer for each sign. Provide type UVF.
- I. Fiberglass Sheet: Multiple laminations of glass fiber reinforced polyester resin with UV light stabilized, colorfast, nonfading, weather and stain resistant, colored polyester gel coat with manufacturer's standard finish.
- J. Polycarbonate Sheet: ASTM C1349, Appendix X1, Type II (coated, mar resistant, UV stabilized polycarbonate) with coating on both sides.
- K. Finish:
 1. Aluminum Finishes:
 - a. Not Used.
 - b. Color Anodic Finish: AAMA 611.

- c. Baked Enamel or Powder Coat Finish: AAMA 2603 with a minimum dry film thickness of 0.04 mm (1.5 mils).
- 2. Not Used.

2.5 INTERIOR SIGN TYPES

- A. Conform to the VA Signage Design Guide.
- B. Provide sliding rail frame component system.
- C. Component System Signs:
 - 1. Provide interior sign system as follows:
 - a. Interchangeable system that allows for changes of graphic components of the installed sign, without changing sign in its entirety.
 - b. Provide sign system comprised of following primary components:
 - 1) Rail Back: Horizontal rails, spaced to allow for uniform, modular sizing of sign types.
 - 2) Rail Insert: Mount to back of Copy Panels to allow for attachment to Rail Back.
 - 3) Copy Panels: Fabricate of ABS, phopolymer, acrylic or aluminum materials to allow for different graphic needs.
 - 4) End Caps: Interlock to Rail Back to enclose and secure changeable Copy Panels.
 - 5) Joiners and Accent Joiners: To connect separate Rail Backs together.
 - 6) Top Accent Bars: To provide decorative trim cap that encloses the top of sign.
 - c. Provide rail back, rail insert and end caps in anodized extruded aluminum.
 - d. Provide signs in system that are convertible in the field to allow for enlargement from one (1) size to another in height and width through use of joiners or accent joiners, which connect rail back panels together blindly, providing a butt joint between copy panels. Connect accent joiners to rail backs with a visible 3 mm (1/8") horizontal rib, flush to the adjacent copy insert surfaces.
 - e. Provide sign configurations as indicated on construction documents that vary in width from 228 mm (9 inches) to 2032 mm (80 inches), and have height dimensions of 50 mm (2 inches), 76

- mm (3 inches), 152 mm (6 inches), 228 mm (9 inches) and 305 mm (12 inches). Height that can be increased beyond 305 mm (12 inches), by repeating height module in full or in part.
2. Provide rail back functions as internal structural member of sign. Fabricate of 6063T5-extruded aluminum, anodized black.
 - a. Fabricate to accept an extruded aluminum or plastic insert on either side, depending upon sign type.
 - b. Provide components that are convertible in field to allow for connection to other rail back panels.
 - c. Provide mounting devices including wall mounting for screw-on applications, wall mounting with pressure sensitive tape, freestanding mount, ceiling mount and other mounting devices as needed.
 3. Provide rail insert functions as mounting device for copy panels on to the rail back. The rail insert mounts to the back of the copy panel with adhesive suitable for attaching particular copy insert material.
 - a. Provide copy panels that slide or snap into the horizontal rail back.
 4. Provide copy panels that accept various forms of copy and graphics, and attach to the rail back with the rail insert. Provide copy panels fabricated of ABS plastic with integral color or an acrylic lacquer finish, photopolymer or acrylic.
 - a. Provide copy panels that are interchangeable by sliding horizontally from either side of sign, and to other signs in system of equal or greater width or height.
 - b. Provide materials that are cleanable without use of special chemicals or cleaning solutions.
 - c. Copy Panel Materials.
 - 1) ABS Inserts: 2.3 mm (.090 inches) extruded ABS plastic core with .07 mm (.003 inches) acrylic cap bonded during extrusion/texturing process.
 - a) Pressure bonded to extruded rail insert with adhesive.
 - b) Background Color: Integral or painted in acrylic lacquer.
 - c) Finished: Texture pattern.
 - 2) Photopolymer Inserts: 3.2 mm (.125 inches) phenolic photo polymer with raised copy etched to 2.3 mm (.0937 inches),

bonded to an ABS plastic or extruded aluminum insert with adhesive.

- a) Background Color: Painted, acrylic enamel.
- 3) Changeable Paper/ Insert Holder: Extruded insert holder with integral rail insert for connection with structural back panel in 6063T5 aluminum with a black anodized finish.
 - a) Inserts into holder are paper with a clear 0.76 mm (.030 inches) textured cover.
 - b) Background Color: Painted, acrylic lacquer.
- 4) Acrylic - 2 mm (.080 inches) non-glare acrylic.
 - a) Pressure bonded to extruded rail insert using adhesive.
 - b) Background Color: Painted in acrylic lacquer or acrylic enamel.
- 5) Extruded 6063T5 aluminum with a black anodized finish insert holder with integral rail insert for connection with structural back panel to hold 0.76 mm (.030 inches) textured polycarbonate insert and a sliding tile which mounts in the inset holder and slides horizontally.
5. End Caps: Extruded using 6063T5 aluminum with a black anodized finish. End caps interlock with rail back with clips to form an integral unit, enclosing and securing the changeable copy panels, without requiring tools for assembly.
 - a. Interchangeable to each end of sign and to other signs in signage system of equal height.
 - b. Provide mechanical fasteners that can be added to the end caps that will secure it to rail back to make sign tamper resistant.
6. Joiners: Extruded using 6063T5 aluminum with a black anodized finish. Rail joiners connect rail backs together blindly, providing a butt joint between copy inserts.
7. Accent Joiners: Extruded using 6063T5 aluminum with a mirror polished finish. Connect joiner and rail backs together with a visible 3 mm (.125 inches) horizontal rib, flush to the adjacent copy panel surfaces.
8. Top Accent Rail: Extruded rail using 6063T5 aluminum with a mirror polished finish that provides a 3.2 mm (.125 inches) high decorative trim cap. Cap butts flush to adjacent copy panel and encloses top of rail back and copy panel.

9. Typography:

- a. Vinyl First Surface Copy (non-tactile): Applied vinyl copy.
- b. Subsurface Copy Inserts: Textured 1 mm (.030 inches) clear polycarbonate face with subsurface applied vinyl copy.
 - 1) Spray face back with paint and laminated to extruded aluminum carrier insert.
- c. Integral Tactile Copy Inserts: Phenolic photopolymer etched with 2.3 mm (.0937 inches) raised copy.
- d. Silk-screened First Surface Copy (non-tactile): Injection molded or extruded ABS plastic, or Aluminum insert with first surface applied enamel silk-screened copy.

D. Tactile Sign:

1. Tactile sign made from a material that provides for letters, numbers and Braille to be integral with sign. Photopolymer etched metal, sandblasted phenolic or embossed material. Do not apply letters, numbers and Braille with adhesive.
2. Numbers, letters and Braille to be raised 0.8 mm (1/32 inches) from the background surface. The draft of the letters, numbers and Braille to be tapered, vertical and clean.
3. Braille Dots: Conform with ANSI A117.1 for Braille position and layout; (a) Dot base diameter: 1.5 mm (.059 inches) (b) Inter-dot spacing: 2.3 mm (.090 inches) (c) Horizontal separation between cells: 6.0 mm (.241 inches) (d) Vertical separation between cells: 10.0 mm (.395 inches)
4. Paint assembly specified color. After painting, apply white or other specified color to surface of the numbers and letters. Apply protective clear coat sealant to entire sign.
5. Finish: Eggshell, 11 to 19 degree on a 60 degree glossmeter.

E. Provide cork or felt on bottom or mounting bracket when sign is mounted on counter or desk.

F. For ceiling mounted signs, provide mounting hardware on the sign that allows for sign disconnection, removal, reinstallation, and reconnection.

G. Glass Door and Side Light Graphics:

1. Provide text and graphics as first surface applied stylus cut vinyl.
2. Provide typeface, color, and spacing, with each message or message group on a single quick release backing sheet.

H. Dimensional Letters:

1. Provide dimensional letters that are mill or laser cut acrylic in size and thickness indicated in construction documents.
2. Provide draft of letters perpendicular to letters face.
3. Fabricate letters with square corners, such as where a letter stem and bar intersect.
4. Paint letters with acrylic polyurethane.

I. Specialty Signs:

1. Card or Paper Holder: Extruded aluminum clip anodized black containing rollers to pinch and release paper.
 - a. End caps are black plastic.

J. Temporary Interior Signs:

1. Fabricated from 50 kg (110 pound) matte finished white paper cut to 101 mm (4 inch) wide by 305 mm (12 inch) long.
 - a. Punched 3.2 mm (.125 inch) hole with edge of hole spaced 13 mm (.5 inch) in from edge and centered on 101 mm (4 inch) side.
 - b. Reinforce hole on both sides with suitable material that prevents tie from pulling through hole.
 - c. Ties: Steel wire 0.3 mm (0.120 inch) thick attached to tag with twist leaving 152 mm (6 inch) long free ends.
2. Mark architectural room number on sign, with broad felt marker in clearly legible numbers or letters that identify room, corridor or space as shown on construction documents.
3. Install temporary signs to rooms that have a room, corridor or space number. Attach to door frame, door knob or door pull.
 - a. Doors that do not require signs are: corridor doors in corridor with same number, folding doors or partitions, toilet doors, bathroom doors within and between rooms, closet doors within rooms, communicating doors in partitions between rooms with corridor entrance doors.
 - b. Replace and missing, damaged or illegible signs.

2.6 EXTERIOR SIGN TYPES

A. General:

1. Fabricate signs that comply with VA Signage Design Guide.

B. Text and Graphics:

1. Illuminated Signs: Form graphics with router and backed with 3 mm (0.0125 inch) thick minimum translucent white acrylic diffuser. Mechanically fasten diffuser and letter voids to sign face.
 2. Non-illuminated Signs: Provide surface applied reflective white opaque vinyl graphics.
- C. Non-illuminated Wall Panel Sign:
1. Provide sign constructed of an aluminum extrusion system including:
 - a. Internal flanges for attachment of additional structural supports and mounting to wall.
 - b. Frame retainer maximum 25 mm (1 inch) face dimension to allow for sign face removal.
 2. Weld sign cabinet at mitered corners and provide internal bracing to ensure structural rigidity. Shop weld and grind smooth exposed welds so that surface is consistent with surrounding surface, and accepts paint finish in a like manner.
 3. Sign Faces: 2.3 mm (0.090 inch) thick aluminum with surface applied reflective white vinyl graphics.
 - a. Mount aluminum face in extruded cabinet frame to allow for removal from top or side, so that faces can be changed without affecting extruded sign structure.
- D. Non-illuminated Wall Panel Sign:
1. Constructed of flat sheet of aluminum for wall mounting.
 2. Sign Face: 3.2 mm (0.125 inch) thick aluminum with surface applied reflective white vinyl graphics.
 3. Installed with mechanical fasteners into wall surface. Exposed support brackets are not acceptable.

2.7 FABRICATION

- A. Design interior signage components to allow for expansion and contraction for a minimum material temperature range of 38 degrees C (100 degrees F), without causing buckling, excessive opening of joints or over stressing of adhesives, welds and fasteners.
- B. Form work to required shapes and sizes, with true curve lines and angles. Provide necessary rebates, lugs and brackets for assembly of units. Provide concealed fasteners wherever possible.
- C. Shop fabricate so far as practicable. Fasten joints flush to conceal reinforcement, or weld joints, where thickness or section permits.

- D. Level and assemble contract surfaces of connected members so joints will be tight and practically unnoticeable, without applying filling compound.
- E. Signs: Fabricate with fine, even texture to be flat and sound.
 - 1. Maintain lines and miters sharp, arises unbroken, profiles accurate and ornament true to pattern.
 - 2. Plane surfaces to be smooth, flat and without oil-canning, free of rack and twist.
 - 3. Maximum variation from plane of surface plus or minus 0.3 mm (0.015 inches). Restore texture to filed or cut areas.
- F. Finish extruded members to be free from extrusion marks. Fabricate square turns, sharp corners, and true curves.
- G. Finish hollow signs with matching material on all faces, tops, bottoms and ends. Mitere edge joints to give appearance of solid material.
- H. Do not manufacture signs until final sign message schedule and location review has been completed by the COR and forwarded to contractor.
- I. Drill holes for bolts and screws. Mill smooth exposed ends and edges with corners slightly rounded.
- J. Form joints exposed to weather to exclude water.
- K. Movable Parts, Including Hardware: Cleaned and adjusted to operate as designed without binding or deformation of members. Center doors and covers in opening or frame.
 - 1. Align contact surfaces fit tight and even without forcing or warping components.
- L. Pre-assemble items in shop to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.
- M. Prime painted surfaces as required. Apply finish coating of paint for complete coverage with no light or thin applications allowing substrate or primer to show.
 - 1. Finish surface smooth, free of scratches, gouges, drips, bubbles, thickness variations, foreign matter and other imperfections.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Locate signs as shown on the construction documents Sign Location Plans.

- B. Conform to the VA Signage Design Guide for installation requirements.
- C. At each sign location there are no utility lines behind each sign location that will be affected by installation of signs.
 - 1. Correct and repair damage done to utilities during installation of signs at no additional cost to Government.
- D. Provide inserts and anchoring devices which must be set in concrete or other material for installation of signs. Submit setting drawings, templates, instructions and directions for installation of anchorage devices, which may involve other trades.
- E. Refer to Sign Message Schedule for mounting method. Mount signs in proper alignment, level and plumb according to the Sign Location Plan and the dimensions given on elevation and Sign Location Plans. When exact position, angle, height or location is not clear, contact COR for resolution.
- F. When signs are installed on glass, provide blank glass back up to be placed on opposite side of glass exactly behind sign being installed. Provide blank glass back that is the same size as sign being installed.
- G. Touch up exposed fasteners and connecting hardware to match color and finish of surrounding surface.
- H. At completion of sign installation, clean exposed sign surfaces. Clean and repair adjoining or adjacent surfaces that became soiled or damaged as a result of installation of signs.

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10-01-15
Renovate Tower of Building 1
VAMC, Sioux Falls, SD
VA Project #438-18-102

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**SECTION 10 26 00
WALL AND DOOR PROTECTION**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies wall guards and corner guards and door protection.

1.2 RELATED WORK

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Section 08 14 00 INTERIOR WOOD DOORS. .
- C. Armor plates and kick plates not specified in this section: Section 08 71 00, DOOR HARDWARE.
- D. Color and texture of aluminum, stainless steel and resilient material: Section 09 06 00, SCHEDULE FOR FINISHES and Color Schedule in Construction Drawings.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Manufacturer with a minimum of three (3) years' experience in providing items of type specified.
 - 1. Obtain wall and door protection from single manufacturer.
- B. Installer's Qualifications: Installers are to have a minimum of three (3) years' experience in the installation of units required for this project.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
 - 2. For composite wood products, submit documentation indicating product contains no added urea formaldehyde.
- C. Shop Drawings: Show design and installation details.
- D. Manufacturer's Literature and Data:
 - 1. Not Used.
 - 2. Wall Guards.
 - 3. Corner Guards.
 - 4. Door Protection.

- E. Test Report: Showing that resilient material complies with specified fire and safety code requirements.
- F. Manufacturer's qualifications.
- G. Installer's qualifications.
- H. Manufacturer's warranty.

1.5 DELIVERY AND STORAGE

- A. Deliver materials to the site in original sealed packages or containers marked with the name and brand, or trademark of the manufacturer.
- B. Protect from damage from handling and construction operations before, during and after installation.
- C. Store in a dry environment of approximately 21 degrees C (70 degrees F) for at least 48 hours prior to installation.

1.6 WARRANTY

- A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".
- B. Manufacturer Warranty: Manufacturer shall warranty their wall and door protection for a minimum of five (5) years from date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. ASTM International (ASTM):
 - A240/A240M-14Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and For General Applications
 - B221-14Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 - B221M-13Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)
 - D256-10Impact Resistance of Plastics
 - D635-10Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
 - E84-14Surface Burning Characteristics of Building Materials

- C. Aluminum Association (AA):
DAF 45-09Designation System for Aluminum Finishes
- D. American Architectural Manufacturers Association (AAMA):
611-14Anodized Architectural Aluminum
- E. Code of Federal Regulation (CFR):
40 CFR 59Determination of Volatile Matter Content, Water
Content, Density Volume Solids, and Weight
Solids of Surface Coating
- F. The National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06Metal Finishes Manual
- G. National Fire Protection Association (NFPA):
80-13Standard for Fire Doors and Windows
- H. SAE International (SAE):
J 1545-05(R2014)Instrumental Color Difference Measurement for
Exterior Finishes.
- I. Underwriters Laboratories Inc. (UL):
Annual IssueBuilding Materials Directory

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: A240/A240M, Type 304.
- B. Aluminum Extruded: ASTM B221M (B221), Alloy 6063, Temper T5 or T6.
Provide aluminum alloy used for colored anodizing coating as required
to produce specified color.
- C. Resilient Material:
 - 1. Provide resilient material consisting of high impact resistant
extruded acrylic vinyl, polyvinyl chloride, or injection molded
thermal plastic conforming to the following:
 - a. Minimum impact resistance of 960.8 N-m/m (18 ft.-lbs./sq. inch)
when tested in accordance with ASTM D256 (Izod impact, ft.-lbs.
per inch notched).
 - b. Class 1 fire rating when tested in accordance with ASTM E84,
having a maximum flame spread of 25 and a smoke developed rating
of 450 or less.
 - c. Rated self-extinguishing when tested in accordance with
ASTM D635.

- d. Provide material labeled and tested by Underwriters Laboratories or other approved independent testing laboratory.
- e. Provide resilient material for protection on fire rated doors and frames assemblies that is listed by the testing laboratory performing the tests.
- f. Provide resilient material installed on fire rated wood/steel door and frame assemblies that have been tested on similar type assemblies. Test results of material tested on any other combination of door and frame assembly are not acceptable.
- g. Provide integral color with colored components matched in accordance with SAE J 1545 to within plus or minus 1.0 on the CIE-LCH scales.

2.2 CORNER GUARDS

- A. Not Used
- B. Fabricate stainless steel corner guards of 1.3 mm (.059 inch) thick material conforming to ASTM A240/A240M, 2" x 2" wide, Type 302. Install corner guards as indicated on construction documents. Form corner guard to dimensions shown on construction documents. Corner guard to be installed above the continuous resilient wall base.

2.3 WALL GUARDS

- A. Resilient Wall Guards:
 - 1. Not Used:
 - 2. Wall Guards:
 - a. Snap-on covers of resilient material, minimum 2.54 mm (0.100-inch) thick. Free-floating over 51 mm (2 inch) wide aluminum retainer clips, minimum 2.28 mm (0.090-inch) thick, anchored to wall at maximum 610 mm (24 inches) on center, supporting a continuous aluminum retainer, minimum 1.57 mm (0.062-inch) thick.
 - 3. Provide wall guards with prefabricated end closure caps, inside and outside corners, concealed splices, cushions, mounting hardware and other accessories as required. End caps and corners to be field adjustable to assure close alignment with handrails and wall guards. Screw or bolt closure caps to aluminum retainer in a concealed manner.
- B. Not Used
- C. Not Used.

2.4 DOOR PROTECTION

- A. Fabricate door and door frame protection items from vinyl acrylic or polyvinyl chloride resilient material, minimum 1.52 mm (0.060-inch) thick, for doors.
- B. Provide adhesive as recommended by resilient material manufacturer.
- C. Basis of Design: Acrovyn impact resistant doors.
- D. All corridor doors: Ground Floor and First Floor, as indicated on door schedule. At existing doors, match size to current frame, reuse existing hardware.

2.5 NOT USED

2.6 FASTENERS AND ANCHORS

- A. Provide fasteners and anchors as required for each specific type of installation.
- B. Where type, size, spacing or method of fastening is not shown or specified in construction documents, submit shop drawings showing proposed installation details.

2.7 FINISH

- B. Aluminum: In accordance with AA DAF-45.
 - 1. Exposed aluminum: AAMA 611 AA-M12C22A32 chemically etched medium matte with integrally colored anodic coating, Class II Architectural .01 mm (0.4 mil) thick.
 - 2. Concealed aluminum: Mill finish as fabricated, uniform in color and free from surface blemishes.
- C. Stainless Steel: In accordance with NAAMM AMP 500 finish Number 4.
- D. Resilient Material: Embossed textures and color in accordance with SAE J1545.

PART 3 - INSTALLATION

3.1 NOT USED

3.2 STAINLESS STEEL CORNER GUARDS

- A. Mount guards on external corners of interior walls, partitions and columns as shown on construction documents.
- B. Where corner guards are installed on walls, partitions or columns finished with plaster or ceramic tile, anchor corner guards as shown on construction documents. C. Where corner guards are installed on

exposed structural glazed facing tile units or masonry wall, partitions or columns, anchor corner guards as shown on the construction documents.

- D. Where corner guards are installed on gypsum board, clean surface and anchor guards with a neoprene solvent-type contact adhesive specifically manufactured for use on gypsum board construction. Remove excess adhesive from around edge of guard and allow curing undisturbed for 24 hours.

3.3 RESILIENT WALL GUARDS AND TRIM

- A. Secure guards to walls with mounting cushions or brackets and fasteners in accordance with manufacturer's details and instructions.

3.4 NOT USED

3.5 NOT USED

3.6 DOOR PROTECTION

- A. Surfaces to receive protection to be clean, smooth and free of obstructions.
- B. Install protectors after frames are in place but preceding installation of doors in accordance with approved shop drawings and manufacturer's specific instructions.
- C. Apply with adhesive in controlled environment according to manufacturer's recommendations.
- D. Protection installed on fire rated doors and frames to be installed according to NFPA 80 and installation procedures listed in UL Building Materials Directory; or, equal listing by other approved independent testing laboratory establishing the procedures.

- - - E N D - - -

SECTION 10 44 13
FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 DESCRIPTION

This section covers recessed fire extinguisher cabinets.

1.2 RELATED WORK

- A. Acrylic glazing: Section 08 80 00, GLAZING.
- B. Field Painting: Section 09 91 00, PAINTING.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data: Fire extinguisher cabinet including installation instruction and rough opening required.

1.4 APPLICATION PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Testing and Materials (ASTM):
 - D4802-15Poly (Methyl Methacrylate) Acrylic Plastic Sheet

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHER CABINET

Recessed type with flat trim of size and design shown.

2.2 FABRICATION

- A. Form body of cabinet from 0.9 mm (0.0359 inch) thick sheet steel.
- B. Fabricate door and trim from 1.2 mm (0.0478 inch) thick sheet steel with all face joints fully welded and ground smooth.
 - 1. Glaze doors with 6 mm (1/4 inch) thick ASTM D4802, clear acrylic sheet, Category B-1, Finish 1.
 - 2. Design doors to open 180 degrees.
 - 3. Provide continuous hinge, pull handle, and adjustable roller catch.

2.3 FINISH

- A. Finish interior of cabinet body with baked-on semigloss white enamel.
- B. Finish door, frame with manufacturer's standard baked-on prime coat suitable for field painting.

PART 3 - EXECUTION

- A. Install fire extinguisher cabinets in prepared openings and secure in accordance with manufacturer's instructions.
- B. Install cabinet so that the extinguisher height within meets the requirements of NFPA 10

- - - E N D - - -

SECTION 12 24 00
WINDOW SHADES

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section includes solar screen (fiberglass / vinyl) shades. Provide window shades complete, including brackets, fittings and hardware.

1.2 RELATED WORK:

- A. Color of shade material and fascia: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Lightproof Shades: Section 12 24 21, LIGHTPROOF SHADES.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualification: Submit evidence that the manufacture has a minimum of three (3) years' experience in providing item of type specified, and that the blinds have performed satisfactorily on similar installations. Submit qualifications.
- B. Submit qualifications for installers who are trained and approved by manufacturer for installation of units provided.
- C. Electrical Requirements:
 - 1. NFPA 70 Article 100.
 - 2. Listed and labeled in accordance with UL 325.
 - 3. Marked for intended use, and tested as a system.
 - 4. Individual testing of components is not acceptable in lieu of system testing.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
 - 1. Shade material, each type, 610 mm (24 inch) square, including cord and ring, showing color, finish and texture.
 - 2. Fascia Material, 305 mm (12 inches) long, including supporting channels.
- C. Manufacturer's literature and data; showing details of construction and hardware for:
 - 1. Cloth and window shades

D. Shop Drawings: Provide fabrication and installation details for cloth shades, including shade cloth materials, their orientation to rollers, and their seam and batten locations.

1. Not Used.

E. Fire Testing: Submit report of flame spread and smoke developed during product material tests by independent testing laboratory.

F. Manufacturer's warranty.

1.5 WARRANTY:

A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".

B. Manufacturer Warranty: Manufacturer shall warranty their window shades for a minimum of five (5) years from date of installation and final acceptance by the Government. Submit manufacturer's warranty.

1.6 APPLICABLE PUBLICATIONS:

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced to in the text by the basic designation only.

B. Federal Specifications (Fed. Spec.):

AA-V-00200BVenetian Blinds, Shade, Roller, Window, Roller, Slat, Cord, and Accessories

C. ASTM International (ASTM):

A240/A240M-14Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

B221-14Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

B221M-13Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)

G21-13Determining Resistance of Synthetic Polymeric Materials to Fungi

D. National Electric Manufacturer's Association (NEMA):

ICS 6-93(R2006)Industrial Control and Systems Closures

E. National Fire Protection Association (NFPA):

70-14National Electrical Code (NEC)

701-15Fire Tests for Flame Propagation of Textiles and Films

F. Underwriters Laboratories Inc. (UL):

325-06(R2013)Door, Drapery, Gate, Louver, and Window
Operators and Systems

PART 2 - PRODUCTS

SPEC WRITER NOTE: Update material requirements to space with applicable requirements (types, grades, classes, and other related items) specified in the referenced Applicable Publications.

2.1 CLOTH SHADES:

- A. Light-Filtering Solar Shade Cloth: Woven fabric, stain and fade resistant.
1. Type: Clutch shade with bead loop.
 - a. Including Bronze Fascia
 - b. Basis of Design: Insolroll or approved equal.
 2. Weave: Solar Screen Fabric: 37% Fiberglass, 63% Vinyl on Fiberglass.
 3. Thickness: Manufacturers standard.
 4. Weight: 3% density.
 5. Not Used
 6. Not Used
 7. Fire-Test-Response Characteristics: Passes NFPA 701 small and large-scale vertical burn. Submit report for testing of shade cloth materials identical to products provided.
 8. Drive-End Location: As indicated on construction documents.
 9. Shade Cloth Anti-Microbial Characteristics: 'No Growth' per ASTM G21 results for fungi ATCC9642, ATCC9677, and ATCC9645.
 10. Cordless Shades: Provide roller containing spring operating mechanism sized to accommodate shade size indicated in construction documents. Provide with positive locking mechanism that can stop shade movement at each half-turn of roller and with manufacturer's standard pull.
 - a. Pole: Manufacturer's standard type in length required to make operation convenient from floor level and with hook for engaging pull.
 11. Not Used

2.2 NOT USED

2.3 NOT USED

2.4 NOT USED

2.5 MATERIALS:

- A. Stainless Steel: ASTM A240/A240M.
- B. Extruded Aluminum: ASTM B221M (B221).
- C. Not Used.

2.6 FASTENINGS:

- A. Zinc-coated or cadmium plated steel or stainless steel fastenings of length and type recommended by manufacturer. Except as otherwise specified, provide fastenings for installation with various structural materials as follows:

Type of Fastening	Structural Material
Wood screw	Wood
Tap screw	Metal
Case-hardened, self-tapping screw in pre-drilled hole	Solid masonry, concrete
Screw or bolt in expansion shields	Solid masonry, concrete
Toggle bolts	Hollow blocks, gypsum wallboard, plaster

2.7 FABRICATION:

- A. Fabricate solar screen fabric shades to fit measurements of finished openings obtained at site.
- B. Solar screen fabric shades: Rolling type, constructed of shade cloth mounted on rollers. Provide shade cloth with plain sides, and with hem at bottom to accommodate weight bar.
 - 1. Provide separate shades for each individual sash within opening. Provide shade length that exceeds height of window by 305 mm (12 inches) measured from head to sill, in addition to material required to make-up hem:
 - a. Provide rollers with spindles, nylon bearings, tempered steel springs, and other related accessories required for positive action.
 - b. Provide rollers of diameter and wall thicknesses required to accommodate operating mechanisms, weights, and widths of shadebands indicated without deflection.

- c. Provide rollers with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
- d. Secure solar screen fabric shades to rollers to prevent wrinkling or folding, and on line parallel to axis of rollers so that shade hangs plumb.
- e. Secure solar screen fabric shades with zinc-coated steel or stainless steel machine screws spaced not over 228 mm (9 inches) on centers.
- f. Do not attach shade cloth to rollers with tacks.
- g. Provide hem bar of extruded aluminum for entire width of shade band. Heat seal hem bar on all sides to prevent removal.
- h. Provide eyelets with clear openings large enough to accommodate cords, without cutting into cloth when set.
- i. Provide cords of sufficient length to permit shades to be drawn to bottom of opening with ends looped and held with cord rings. Attach cords to hems through metal eyelets in center of slats in bottom hems.

C. Not Used

D. Not Used

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Measure openings before fabrication. Do not scale construction documents.
- B. Solar screen fabric shades: Mount window shades on end of face brackets, set on metal gussets, or casing of windows as required. Provide extension face brackets where necessary at mullions. In existing buildings, provide brackets similar to those on existing windows.
 - 1. Locate rollers in level position as high as practicable at heads of windows.
 - 2. Install shades to prevent infiltration of light over rollers.
 - 3. Where extension brackets are necessary for alignment of shades, provide metal lugs, and rigidly anchor lugs and brackets.
 - 4. Place brackets and rollers so that shades do not interfere with window and screen hardware.
- 5. Not Used

6. Not Used
7. Mount shade to allow clearances for window operation hardware.
8. Not Used
9. Shade installation methods not specifically described, are subject to approval of Contracting Officer Representative (COR).

B. Not Used

C. Not Used

3.2 ADJUSTING:

- A. Adjust and shades to operate smoothly, free from binding or malfunction throughout entire operational range.

3.3 CLEANING AND PROTECTION:

- A. Clean shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions that ensure that shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged shades that cannot be repaired, in a manner approved by COR before time of Substantial Completion.

3.4 NOT USED

- - - E N D - - -

**SECTION 12 24 21
LIGHTPROOF SHADES**

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section includes lightproof shades. Provide lightproof shades complete including brackets, light traps, fittings, and hardware.

1.2 RELATED WORK:

- A. Section 12 24 00, WINDOW SHADES.
- B. Shade Cloth and Color of Light Track Trim Finish: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualification: Submit evidence that the manufacture has a minimum of three (3) years' experience in providing item of type specified, and that the shades have performed satisfactorily on similar installations. Submit manufacturer qualifications.
- B. Submit qualifications for installers who are trained and approved by manufacturer for installation of units provided.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data: Showing details of construction and hardware for Lightproof Shades.
- C. Samples:
 - 1. Shade cloth, each type, 600 mm (24 inch) square, including cord and ring, showing color, finish and texture.
- D. Shop Drawings: Provide fabrication and installation details for lightproof shades.
- E. Fire Testing: Submit report of flame spread and smoke development during product material tests by independent testing laboratory.
- F. Manufacturer's warranty.

1.5 WARRANTY:

- A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".
- B. Manufacturer Warranty: Manufacturer shall warranty their lightproof shades for a minimum of five (5) years from date of installation and final acceptance by the Government. Submit manufacturer's warranty.

1.6 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. ASTM International (ASTM):
 - G21-13Determining Resistance of Synthetic Polymeric Materials to Fungi
- C. National Fire Protection Association (NFPA):
 - 701-15Fire Tests for Flame Propagation of Textiles and Films

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Room Darkening, PVC Free Shade Cloth with Opaque Acrylic Backing: Not less than 0.19 mm (.008 inches) thick blackout material and weighing 580 grams per square meter (17.1 ounces per square yard), plus or minus 5 percent comprised of fiberglass, acrylic, polyester finish materials.
 - 1. Material: 42% Fiberglass, 51% acrylic, 7% cotton flocked backing (PVC-free, fire-rated)
 - 2. Type Clutch shade with bead loop.
 - a. Include bronze fascia
 - 3. Color: Selected from manufacturer's standard colors or as indicated in Section 09 06 00, SCHEDULE FOR FINISHES.
 - 4. Fire-Test-Response Characteristics: Passes NFPA 701 small and large-scale vertical burn. Submit report for testing of shade cloth materials identical to products provide.
 - 5. Shade Cloth Anti-Microbial Characteristics: 'No Growth' in accordance with ASTM G21 results for fungi ATCC9642, ATCC9644, and ATCC9645.
- B. Not Used.
- C. Cordless Shades: Provide roller containing spring operating mechanism sized to accommodate shade size. Provide with positive locking mechanism that can stop shade movement at each half-turn of roller and with manufacturer's standard pull.

1. Pole: Manufacturer's standard type in length required to make operation convenient from floor level and with hook for engaging pull.

D. Fastenings: Zinc-coated or cadmium plated steel or stainless steel fastenings of proper length and type. Except as otherwise specified, fastenings for use with various structural materials are to be as follows:

Type of Fastening	Structural Material
Wood screw	Wood
Tap Screw	Metal
Case-hardened, self-tapping screw in pre-drilled hole	Sheet metal or solid masonry or concrete
Screw or bolt-in expansion shield	Solid masonry or concrete
Toggle bolts	Hollow blocks, gypsum wallboard, plaster

E. Not Used

2.2 NOT USED

2.3 FABRICATION:

- A. Measure openings before fabrication. Do not scale construction documents.
- B. Fabricate lightproof shades with metal head housing, deep side guides, sill light lock members, continuous metal jamb and head anchor section, operating bars, and complete with roller assembly, one (1) piece lightproof shade cloth, and two (2) metal disappearing type horizontal braces for each shade.
- C. Shop fabricate light traps consisting of head box to house shade roller, and steel channels U-shape in cross section to serve as guides for shade along sides, and to receive bottom edge of shade along sill.
 - 1. Fabricate light trap of sheet steel having a minimum thickness of 0.38 mm (0.015 inches). Provide legs of the U-shaped channels not less than 45 mm (1-3/4 inches) long and separated by minimum distance that will permit free operation of the shade.
 - 2. Round or bead edges of light trap coming into contact with shade cloth.

3. Provide hinged or removable exposed face of head box for access to shade roller.
 4. Fabricate entire assembly to prevent light from entering the room when the shade is drawn.
 5. Finish interior or concealed surfaces of light trap with coat of flat black enamel.
 6. Not Used
- D. Fabricate rollers of aluminum or stainless steel of sufficient diameter and thickness to support the shade, and provided with spindles, bearings and coil springs.
- E. Provide rollers with groove and metal spline with steel, or stainless steel machine screws spaced not over 228 mm (9 inches) on centers, for attaching the shade cloth.
- F. For shades not finished with a selvage, bind or hem vertical edges.
1. Sewn Edges: Double or triple stitched, using a heavy-duty thread. Make needle holes lightproof by applying a suitable filler.
 2. Sealed Edges: Continuously hot seal without curling or raveling.
- G. Stiffen shade by transverse steel bars of size and weight sufficient to hold shade in channel guides.
1. Space bars approximately 457 mm (18 inches) on centers and conceal in pockets in the shade.
 2. Fit bottom edge of shade with steel operating bar designed to engage sill channel of light trap.
 3. Paint bars with flat black enamel.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install lightproof shades level at a height that will permit proper operation of the shades, and prevent outside light from infiltrating into the room.
- B. Fit light traps to adjacent construction, with rigid and light-tight connections.
- C. Locate so shade is no closer than 51 mm (2 inches) to interior face of glass.
- D. Allow clearance for hardware at operable windows.
- E. not Used

- F. Do not install shades until after room painting and finishing operations are complete.

3.2 ADJUSTING:

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.3 CLEANING AND PROTECTION:

- A. Clean lightproof surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, that ensure that lightproof shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged lightproof shades that cannot be repaired, in a manner approved by Contracting Officer Representative (COR) before time of Substantial Completion.

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VAMC, Sioux Falls, SD
VA Project #438-18-102

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SECTION 12 32 00
MANUFACTURED WOOD CASEWORK

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies plastic laminate casework as detailed on the construction documents, including related components and accessories required to form integral units. Wood casework items shown on the construction documents, but not specified below are to be included as part of the work under this section, and applicable portions of the specification are to apply to these items.

1.2 RELATED WORK:

- A. Not Used.
- B. Sealants: Section 07 92 00, JOINT SEALANTS.
- C. Color of Casework Finish: Section 09 06 00, SCHEDULE OF FINISHES.
- D. Resilient Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
- E. Backing Plates for Wall Mounted Casework: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- F. Not Used.
- G. Not Used.
- H. Countertop Construction and Materials and Items Installed in Countertops: Section 12 36 00, COUNTERTOPS.
- I. Plumbing Requirements Related to Casework: Division 22, PLUMBING.
- J. Electrical Lighting and Power Requirements Related to Casework: Division 26, ELECTRICAL.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Locks for doors and drawers.
 - 2. Adhesive cements.
 - 3. Casework hardware.
- C. Samples:
 - 1. Wood Face Veneer or Hardwood Plywood.
 - 2. Plastic laminate.
- D. Shop Drawings (1/2 full size):

1. Each casework type, showing details of construction, including materials, hardware and accessories.
2. Fastenings and method of installation.

E. Certification:

1. Manufacturer's qualifications specified.
2. Installer's qualifications specified.

1.4 QUALITY ASSURANCE:

A. Approval by COR is required of manufacturer and installer based upon certification of qualifications specified.

B. Manufacturer's qualifications:

1. Manufacturer is regularly engaged in design and manufacture of plastic laminate casework, casework components and accessories of scope and type similar to indicated requirements for a period of not less than five (5) years.
2. Manufacturer has successfully completed at least three (3) projects of scope and type similar to indicated requirements.
3. Submit manufacturer's qualifications and list of projects, including owner contact information.

C. Installer Qualifications:

1. Installer has completed at least three (3) projects in last five (5) years in which these products were installed.
2. Submit installer qualifications.

1.5 WARRANTY:

A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".

B. Manufacturer Warranty: Manufacturer shall warranty their wood casework for a minimum of five (5) years from date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.6 APPLICABLE PUBLICATIONS:

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.

B. ASTM International (ASTM):

A240/A240M-14Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

- A1008/A1008M-13Steel, Sheet, Cold-Rolled, Carbon, Structural,
High Strength Low Alloy
- C1036-11E1 (R2012)Flat Glass
- C. Builders Hardware Manufacturers Association (BHMA):
- A156.1-13Butts and Hinges
- A156.9-10Cabinet Hardware
- A156.5-14Auxiliary Locks and Associated Products
- A156.11-14Cabinet Locks
- D. Composite Panel Association (CPA):
- A208.1-09Particleboard
- A208.2-09Medium Density Fiberboard (MDF) for Interior
Applications
- E. U.S. Department of Commerce Product Standards (Prod. Std):
- PS 1-09Construction and Industrial Plywood
- F. Hardwood, Plywood and Veneer Association (HPVA):
- HP-1-09Hardwood and Decorative Plywood
- G. Architectural Woodwork Institute (AWI):
- Architectural Woodwork Standards, Edition 2 Certification Program -
2014
- H. American Society of Mechanical Engineers (ASME):
- A112.18.1-12Plumbing Fixture Fittings
- I. National Electrical Manufacturers Association (NEMA):
- LD 3-05High Pressure Decorative Laminates
- J. Underwriters Laboratories Inc. (UL):
- 437-08 (R2013)Key Locks
- K. Scientific Equipment and Furniture Association (SEFA):
- 2.3-10Installation of Scientific Laboratory Furniture
and Equipment

PART 2 - PRODUCTS

2.1 NOT USED

2.2 PLASTIC LAMINATE:

- A. NEMA LD 3.
- B. Exposed decorative surfaces, both sides of cabinet doors, and for items having plastic laminate finish. General purpose Type HGL.
- C. Cabinet Interiors Including Shelving: Both of following options to comply with NEMA LD 3 as a minimum.

1. Plastic laminate clad plywood or particleboard, MDF (excluding shelves).
2. Not Used
3. Not Used
- D. Backing sheet on bottom of plastic laminate covered wood tops. Backer Type BKL.
- E. Post Forming Fabrication, Decorative Surface: Post forming Type HGP.

2.3 PLYWOOD, SOFTWOOD:

- A. Prod. Std. PS1, five (5) ply construction from 13 mm to 28 mm (1/2 inch to 1-1/8 inch) thickness, and seven (7) ply for 31 mm (1 1/4 inch) thickness.

2.4 PARTICLEBOARD:

- A. CPA A208.1, Type 1, Grade M or medium density.

2.5 MEDIUM DENSITY FIBERBOARD (MDF):

- A. Fully waterproof bond conforming to CPA A208.1 and CPA A208.2.

2.7 HARDWARE:

- A. Cabinet Locks:
 1. Provide where locks are indicated on construction documents.
 2. Locked pair of hinged door over 915 mm (36 inches) high:
 - a. ANSI/BHMA A156.5, key one side.
 - b. On active leaf use three (3) point locking device, consisting of two (2) steel rods and lever controlled cam at lock, to operate by lever having lock cylinder housed therein.
 - c. On inactive leaf provide dummy lever of same design.
 - d. Provide keeper holes for locking device rods and cam.
 3. Door and Drawer: ANSI/BHMA A156.11 cam locks. Provide one (1) type for each condition as follows:
 - a. Drawer and Hinged Door up to 915 mm (36 inches) high: E07261.
 - b. Drawer and Hinged Door: Pin-tumbler, cylinder type lock with not less than four (4) pins or a UL 437 rated wafer lock with brass working parts and case.
 4. Key locks differently for each type casework and master key for each service, such as Administrative.
 - b. Furnish two (2) keys per lock.
 - c. Furnish six (6) master keys per service or Nursing Unit.
 5. Marking of Locks and Keys:

- a. Name of manufacturer, or trademark which can readily be identified legibly marked on each lock and key change number marked on exposed face of lock.
 - b. Key change numbers stamped on keys.
 - c. Key change numbers to provide sufficient information for manufacturer to replace key.
- B. Hinged Doors:
1. Provide doors 915 mm (36 inches) and more in height with three (3) hinges and doors less than 915 mm (36 inches) in height is to have two (2) hinges. Each door is to close against two (2) rubber bumpers.
 2. Hinges: Fabricate hinges with minimum 1.8 mm (0.072 inch) thick chromium plated steel leaves, and with minimum 3.5 mm (0.139 inch) diameter stainless steel pin. Hinges to be five (5) knuckle design with 63 mm (2-1/2 inch) high leaves and hospital type tips.
 4. Fasteners: Provide full thread wood screws to fasten hinge leaves to door and cabinet frame. Finish screws to match finish of hinges.
- C. Door Catches:
1. Friction or Magnetic type, fabricated with metal housing.
 2. Provide one (1) catch for cabinet doors 1220 mm (48 inches) high and under, and two (2) for doors over 1220 mm (48 inches) high.
- D. Drawer and Door Pulls:
1. Doors and drawers to have flush pulls, fabricated of either chromium-plated brass, chromium plated steel, stainless steel, or anodized aluminum. Drawer and door pulls to be of a design that can be operated with a force of 22.2 N (5 pounds) or less, with one (1) hand and not require tight grasping, pinching or twisting of the wrist.
- E. Drawer Slides:
1. Full extension steel slides with nylon ball-bearing rollers.
 2. Slides to have positive stop.
 3. Equip drawers with rubber bumpers.
- G. Shelf Standards (Except For Fixed Shelves):
1. Bright zinc-plated steel for recessed mounting with screws, 16 mm (5/8 inch) wide by 5 mm (3/16 inch) high providing 13 mm (1/2 inch) adjustment, complete with shelf supports.

2.8 MANUFACTURED PRODUCTS:

- A. When two (2) or more units are required, use products of one (1) manufacturer.
- B. Manufacturer of casework assemblies is to assume complete responsibility for the final assembled unit.
- C. Provide products of a single manufacturer for parts which are alike.

2.9 FABRICATION:

- A. Casework to be of the flush overlay design and, except as otherwise specified, be of Premium Grade construction and of component thickness in conformance with AWI Quality Standards.
- B. Fabricate casework of plastic laminated covered plywood or particleboard as follows:
 - 1. Where shown, doors, drawers, shelves, all semi-concealed surfaces to be plastic laminated.
- C. Provide 1.2 mm (18 gage) sheet steel sloping tops for casework where shown on construction drawings. Fasten sloping tops with oval-head screws inserted from interior. Exposed ends of sloping tops to have flush closures fastened as recommended by manufacturer.
- D. Support Members for Tops of Tables and Countertops:
 - 1. Construct as detailed on construction documents.
 - 2. Provide miscellaneous steel members and anchor as shown on construction drawings.
- E. Legs For Counters:
 - 1. Fabricate legs for counters of 1.6 mm (0.0635 inch) thick, 38 mm (1-1/2 inch) square tubular steel.
 - 2. Secure legs to counter tops and provide legs at bottom with shoes not less than 25 mm (1 inch) in height.
 - 3. Fabricate shoes of stainless steel, aluminum or chromium plated brass.
- F. Cantilever Countertop Supports:
 - 1. Wall mounted steel supports to carry (25 inch) wide countertop and supported load of (200 lbs / lin ft.).

2.10 PRODUCTS OF OTHER COMPONENTS DIRECTLY RELATED TO CASEWORK:

- A. Refer to Section 07 92 00, JOINT SEALANTS for work related to sealants used in conjunction with joints of countertops, casework systems, and adjacent materials.

- B. Refer to Section 09 65 13, RESILIENT BASE AND ACCESSORIES for work related to rubber base adhered to casework systems.
- C. Refer to Section 09 22 16, NON-STRUCTURAL METAL FRAMING for backing plates used in conjunction with wall assemblies for the attachment of casework systems.
- D. Refer to Section 12 36 11, COUNTERTOPS for work related to plastic laminate, acid-resistant plastic laminate, metal, molded resin, wood, and methyl methacrylic polymer countertops and/or shelving used in conjunction with casework systems. When countertop materials are provided by the casework manufacturer, they are to include the following features:
 - 1. Capable of being suspended from vertical support rails or horizontal wall strips or service modules.
 - 2. Provided with rounded corners and impact resistant material on exposed edges.
 - 3. Capable of being easily relocated and installed without tools.
 - 4. Capable of being suspended and easily changed under counter mounted storage units.
 - 5. Provide leveling adjustment capability so units can be brought into a level position.
 - 6. Secured using fasteners. Show detail on shop drawings.
- E. Refer to Section 12 36 11, COUNTERTOPS for work related to and integral with countertop systems such as pegboards, funnel and graduate racks.
- F. Refer to Division 22, PLUMBING for the following work related to casework systems:
 - 1. Sinks, faucets and other plumbing service fixtures, venting, and piping systems.
- G. Refer to Division 26, ELECTRICAL for the following work related to casework systems:
 - 1. Connections and wiring devices.
 - 2. Connections and lighting fixtures except when factory installed by the manufacturer.

PART 3 - EXECUTION

3.1 COORDINATION:

- A. Begin only after work of other trades is complete, including wall and floor finish completed, ceilings installed, light fixtures and diffusers installed and connected and area free of trash and debris.

- B. Verify location and size of mechanical and electrical services as required and perform cutting of components of work installed by other trades.
- C. Verify reinforcement of walls and partitions for support and anchorage of casework.
- D. Coordinate with other Divisions and Sections of the specification for work related to installation of casework systems to avoid interference and completion of service connections.

3.2 INSTALLATION:

- A. Install casework in accordance with manufacturer's written instructions and per SEFA 2.3 recommendations .
 - 1. Install in available space; arranged for safe and convenient operation and maintenance.
 - 2. Align cabinets for flush joints except where shown otherwise.
 - 3. Install with bottom of wall cabinets in alignment and tops of base cabinets aligned level, plumb, true, and straight to a tolerance of 3.2 mm in 2438 mm (1/8 inch in 96 inches).
 - 4. Install corner cabinets with hinges on corner side with filler or spacers sufficient to allow opening of drawers.
- B. Support Rails:
 - 1. Install true to horizontal at heights shown on construction documents; maximum tolerance for uneven floors is plus or minus 13 mm (1/2 inch).
 - 2. Shim as necessary to accommodate variations in wall surface not exceeding 5 mm (3/16 inch) at fastener.
- C. Wall Strips:
 - 1. Install true to vertical and spaced as shown on construction documents.
 - 2. Align slots to assure that hanging units will be level.
- D. Plug Buttons:
 - 1. Install plug buttons in predrilled or prepunched perforations not used.
 - 2. Use chromium plate plug buttons or buttons finish to match adjacent surfaces.
- E. Seal junctures of casework systems with mildew-resistant silicone sealants as specified in Section 07 92 00, JOINT SEALANTS.

3.3. CLOSURES AND FILLER PLATES:

- A. Close openings larger than 6 mm (1/4 inch) wide between cabinets and adjacent walls with flat, steel closure strips, scribed to required contours, or machined formed steel fillers with returns, and secured with sheet metal screws to tubular or channel members of units, or bolts where exposed on inside.
- B. Where ceilings interfere with installation of sloping tops, omit sloping tops and provide flat steel filler plates.
- C. Secure filler plates to casework top members, unless shown otherwise on construction documents.
- D. Secure filler plates more than 152 mm (6 inches) in width top edge to a continuous 25 x 25 mm (1 x 1 inch) 0.889 mm (1/16 inch) thick steel formed steel angle with screws.
- E. Anchor angle to ceiling with toggle bolts.
- F. Install closure strips at exposed ends of pipe space and offset opening into concealed space.
- G. Finish closure strips and fillers with same finishes as cabinets.

3.4 FASTENINGS AND ANCHORAGE:

- A. Do not anchor to wood ground strips.
- B. Provide hat shape metal spacers where fasteners span gaps or spaces.
- C. Use 6 mm (1/4 inch) diameter toggle or expansion bolts, or other appropriate size and type fastening device for securing casework to walls or floor. Use expansion bolts shields having holding power beyond tensile and shear strength of bolt and breaking strength of bolt head.
- D. Use 6 mm (1/4 inch) diameter hex bolts for securing cabinets together.
- E. Use 6 mm (1/4 inch) by minimum 38 mm (1-1/2 inch) length lag bolt anchorage to wood blocking for concealed fasteners.
- F. Use not less than No. 12 or 14 wood screws with not less than 38 mm (1-1/2 inch) penetration into wood blocking.
- G. Space fastening devices 305 mm (12 inches) on center with minimum of three (3) fasteners in 915 or 1220 mm (3 or 4 foot) unit width.
- H. Anchor floor mounted cabinets with a minimum of four (4) bolts through corner gussets. Anchor bolts may be combined with or separate from leveling device.
- I. Secure cabinets in alignment with hex bolts or other internal fastener devices removable from interior of cabinets without special tools. Do not use fastener devices which require removal of tops for access.

- J. Where units abut end to end, anchor together at top and bottom of sides at front and back. Where units are back to back, anchor backs together at corners with hex bolts placed inconspicuously inside casework.
- K. Where type, size, or spacing of fastenings is not shown on construction documents or specified, show on shop drawings proposed fastenings and method of installation.

3.5 ADJUSTMENTS:

- A. Adjust equipment to insure proper alignment and operation.
- B. Replace or repair damaged or improperly operating materials, components or equipment.

3.6 CLEANING:

- A. Immediately following installation, clean each item, removing finger marks, soil and foreign matter.
- B. Remove from job site trash, debris and packing materials.
- C. Leave installed areas clean of dust and debris.

3.7 INSTRUCTIONS:

- A. Provide operational and cleaning manuals and verbal instructions in accordance with Article INSTRUCTIONS, SECTION 01 00 00, GENERAL REQUIREMENTS.
- B. Provide in service training both prior to and after facility opening. Coordinate in service activities with COR.
- C. Commencing at least seven (7) days prior to opening of facility, provide one (1) four (4) hour day of on-site orientation and technical instruction on use and cleaning procedures application to products and systems specified herein.

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**SECTION 12 36 00
COUNTERTOPS, WINDOW STOOLS**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies casework (solid surface) countertops and window stools.

1.2 RELATED WORK

- A. Color and patterns of solid surface: SECTION 09 06 00, SCHEDULE FOR FINISHES and Color Schedule in Construction Drawings.
- B. DIVISION 22, PLUMBING.
- C. DIVISION 26, ELECTRICAL.
- D. Not Used.

1.3 SUBMITTALS

- A. Submit in accordance with SECTION 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings
 - 1. Show dimensions of section and method of assembly.
 - 2. Show details of construction at a scale of ½ inch to a foot.
- C. Samples:
 - 1. 150 mm (6 inch) square samples each top.
 - 2. Front edge, back splash, end splash and core with surface material and booking.

1.4 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Hardboard Association (AHA):
 - A135.4-95Basic Hardboard
- C. Composite Panel Association (CPA):
 - A208.1-09Particleboard
- D. American Society of Mechanical Engineers (ASME):
 - A112.18.1-12Plumbing Supply Fittings
 - A112.1.2-12Air Gaps in Plumbing System
 - A112.19.3-08(R2004)Stainless Steel Plumbing Fixtures (Designed for Residential Use)
- E. American Society for Testing and Materials (ASTM):

- A167-99 (R2009)Stainless and Heat-Resisting Chromium-Nickel
Steel Plate, Sheet and Strip
- A1008-10Steel, Sheet, Cold-Rolled, Carbon, Structural,
High Strength, Low Alloy
- D256-10Pendulum Impact Resistance of Plastic
- D570-98 (R2005)Water Absorption of Plastics
- D638-10Tensile Properties of Plastics
- D785-08Rockwell Hardness of Plastics and Electrical
Insulating Materials
- D790-10Flexural Properties of Unreinforced and
Reinforced Plastics and Electrical Insulating
Materials
- D4690-99 (2005)Urea-Formaldehyde Resin Adhesives
- F. Federal Specifications (FS):
- A-A-1936Adhesive, Contact, Neoprene Rubber
- G. U.S. Department of Commerce, Product Standards (PS):
- PS 1-95Construction and Industrial Plywood
- H. National Electrical Manufacturers Association (NEMA):
- LD 3-05High Pressure Decorative Laminates

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Not Used. B. Not Used.
- C. Stainless Steel: ASTM A167, Type 304.
- D. Sheet Steel: ASTM A1008, cold rolled, Class 1 finish, stretcher leveled.
- E. Particleboard: CPA A208.1, Grade 2-M-2.
- F. Plywood: PS 1, Exterior type, veneer grade AC not less than five ply construction.
- G. Not Used.
- H. Hardboard: ANSI/AHA A135.4, Type I, tempered, fire retardant treated, smooth surface one side.
- I. Adhesive
1. For plastic laminate FS A-A-1936.
 2. For wood products: ASTM D4690, unextended urea resin or unextended melamine resin, phenol resin, or resorcinol resin.
 3. For Field Joints:

- a. Epoxy type, resistant to chemicals as specified for plastic laminate laboratory surfaces.
- b. Fungi resistant: ASTM G-21, rating of 0.

J. Fasteners:

- 1. Metals used for welding same metal as materials joined.
- 2. Use studs, bolts, spaces, threaded rods with nuts or screws suitable for materials being joined with metal splice plates, channels or other supporting shape.

K. Solid Polymer Material (Solid Surface):

- 1. Filled Methyl Methacrylic Polymer.
- 2. Performance properties required:

Property	Result	Test
Elongation	0.3% min.	ASTM D638
Hardness	90 Rockwell M	ASTM D785
Gloss (60° Gordon)	5-20	NEMA LD3.1
Color stability	No change	NEMA LD3 except 200 hour
Abrasion resistance	No loss of pattern Max wear depth 0.0762 mm (0.003 in) - 10000 cycles	NEMA LD3
Water absorption weight (5 max)	24 hours 0.9	ASTM D-570
Izod impact	14 N·m/m (0.25 ft-lb/in)	ASTM D256 (Method A)
Impact resistance	No fracture	NEMA LD-3 900 mm (36") drop 1 kg (2 lb.) ball
Boiling water surface resistance	No visible change	NEMA LD3
High temperature resistance	Slight surface dulling	NEMA LD3

- 3. Cast into sheet form.
- 4. Color throughout with subtle veining through thickness.
- 5. Joint adhesive and sealer: Manufacturers silicone adhesive and sealant for joining methyl methacrylic polymer sheet.
- 6. Bio-based products will be preferred.

L. Not Used.

2.2 NOT USED

2.3 NOT USED

2.4 NOT USED

2.5 NOT USED

2.6 NOT USED

2.7 NOT USED

2.8 NOT USED

2.9 NOT USED

2.10 COUNTERTOPS AND WINDOW STOOLS

- A. Fabricate in largest sections practicable.
- B. Fabricate with joints flush on top surface.
- C. Fabricate countertops to overhang front of cabinets and end of assemblies 25 mm (one inch) except where against walls or cabinets.
- D. Provide 1 mm (0.039 inch) thick metal plate connectors or fastening devices (except epoxy resin tops).
- E. Join edges in a chemical resistant waterproof cement or epoxy cement, except weld metal tops.
- F. Fabricate with end splashes where against walls or cabinets.
- G. Splash Backs and End Splashes:
 - 1. Not less than 19 mm (3/4 inch) thick.
 - 2. Height 100 mm (4 inches) unless noted otherwise.
 - 3. Not Used.
 - 4. Fabricate epoxy splash back in maximum lengths practical of the same material.
- H. Not Used.
- I. Not Used.
- J. Not Used.
- K. Not Used.
- L. Not Used.
- M. Not Used.
- N. Not Used.
- O. Not Used.
- P. Not Used.

- Q. Methyl Methacrylic Polymer Tops and Window Stools:

1. Fabricate countertop of methyl methacrylic polymer cast sheet, 13 mm (1/2 inch) thick.
 2. Fabricate back splash and end splash to height shown.
 3. Fabricate skirt to depth shown.
 4. Fabricate with marine edge where sinks occur.
 5. Fabricate in one piece for full length from corner to corner up to 3600 mm (12 feet).
 6. Join pieces with adhesive sealant.
 7. Cut out countertop for lavatories, plumbing trim.
 8. Provide concealed fasteners and epoxy cement for anchorage of sinks to countertop.
- R. Not Used.
- S. Not Used.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Before installing countertops verify that wall surfaces have been finished as specified and that mechanical and electrical service locations are as required.
- B. Secure countertops to supporting rails of cabinets with metal fastening devices, or screws through pierced slots in rails.
 1. Where type, size or spacing of fastenings is not shown or specified, submit shop drawings showing proposed fastenings and method of installation.
 2. Use round head bolts or screws.
 3. Use epoxy or silicone to fasten the epoxy resin countertops to the cabinets.
 4. Use wood or sheet metal screws for wood or plastic laminate tops; minimum penetration into top 16 mm (5/8 inch), screw size No 8, or 10.

3.2 PROTECTION AND CLEANING

- A. Tightly cover and protect against dirt, water, and chemical or mechanical injury.
- B. Clean at completion of work.

- - - E N D - - -

12-01-18
Renovate Tower of Building 1
VAMC, Sioux Falls, SD
VA Project #438-18-102

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SECTION 14 21 00
TRACTION ELEVATORS

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section specifies the engineering, furnishing and installation of the complete electric traction elevator system as described herein and as indicated on the Contract drawings.
- B. Items listed in the singular apply to each elevator in this specification except where noted.
- C. Passenger Elevators A, B & C shall be machine-room-less electric traction patient-service elevators with Integrated Control System (ICS) located adjacent to top-landing entrance, machine located inside the hoistway mounted on car guide rail, microprocessor control system, power operated two-speed side opening horizontal sliding car and hoistway doors with Class "A" load rated.
 - 1. Basis of Design: Kone MonoSpace 500 Elevator System with KCM831 Equipment Control: KONE, One Kone Court, Moline, IL; 1-800-956-5683; www.KONE.com, or approved equal.
- D. Elevator Manufacturer to verify, coordinate and allow the VA's autonomous mobile robots to access and use elevators to distribute supplies. VA's current Manufacturer for robot system is Aethon.
- E. Not Used.
- F. Not Used.

ELEVATOR SCHEDULE: ELEVATOR "A"	
Elevator Number	ELEVATOR "A"
Overall Platform Size	Per manufacturer
Clear Inside Car Dimensions	(W x D): 5'-7" x 7'-8"
Cab Height:	8'-0"
Clear Height under Suspended Ceiling:	7'-6"
Rated Load -(lb)	4000 lbs.
Contract Speed - (fpm)	200 fpm
Total Travel - (ft)	42'-7"
Floors Served	5 Landings

ELEVATOR SCHEDULE: ELEVATOR "A"	
Number of Openings	5 Front Openings, 0 Back Openings
Entrance Type & Size	Front opening, two-speed side opening horizontal sliding (left sliding, see plan), 4'-0" wide x 7'-0" high opening
Type of Roping	Machine-room-less electric traction in-shaftway hoisting system with Integrated Control System (ICS) located adjacent to top-landing entrance.
Drive:	Regenerative
Main Power Supply	208 volts + 5%, three phase
Operation	Simplex

ELEVATOR SCHEDULE: ELEVATORS "B" & "C"	
Elevator Number	ELEVATORS "B" & "C"
Overall Platform Size	Per manufacturer
Clear Inside Car Dimensions	(W x D): 5'-10" x 9'-1"
Cab Height:	8'-0"
Clear Height under Suspended Ceiling:	7'-6"
Rated Load -(lb)	5000 lbs.
Contract Speed -(fpm)	200 fpm
Total Travel -(ft)	30'-1"
Floors Served	4 Landings
Number of Openings	4 Front Openings, 0 Back Openings
Entrance Type & Size	Front opening, two-speed side opening horizontal sliding (Right/left sliding, see plan), 4'-6" wide x 7'-0" high opening
Type of Roping	Machine-room-less electric traction in-shaftway hoisting system with Integrated Control System (ICS) located adjacent to top-landing entrance.
Drive:	Regenerative
Main Power Supply	208 volts + 5%, three phase
Operation	Duplex

1.2 RELATED WORK

- A. Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire-rated construction.
- C. SECTION 09 06 00, SCHEDULE FOR FINISHES: As a master format for construction projects, to identify interior and exterior material finishes for type, texture, patterns, color and placement.
- D. Not Used.
- E. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section.
- F. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low Voltage power and lighting wiring.
- G. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- H. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for cables and wiring.
- I. Section 26 05 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY: Requirements for installing the over-current protective devices to ensure proper equipment and personnel protection.
- J. Section 26 22 00, LOW-VOLTAGE TRANSFORMERS: Low voltage transformers.
- K. Section 26 24 16, PANELBOARDS: Low voltage panelboards.
- L. Section 26 43 13, TRANSIENT-VOLTAGE SURGE SUPPRESSION: Surge suppressors installed in panelboards.
- M. Section 26 51 00, INTERIOR LIGHTING: Fixture and ballast type for interior lighting.

1.3 QUALIFICATIONS

- A. Approval by the Contracting Officer's Representative (COR) is required for products and services of proposed manufacturers, suppliers and installers and shall be contingent upon submission of certificates by the Contractor stating the following:
 - 1. Elevator contractor is currently and regularly engaged in the installation of elevator equipment as one of his principal products.
 - 2. Elevator contractor shall have five (15) fifteen years of successful experience, trained supervisory personnel, facilities to install

elevator equipment specified herein and a documented quality assurance program.

3. Elevator Mechanic (Installer) shall have passed a Mechanic Examination approved by the U.S. Department of Labor and have technical qualifications of at least (15) fifteen years of experience in the elevator industry or 10,000 hours of field experience working in the elevator industry with technical update training. Apprentices shall be actively pursuing Certified Elevator Mechanic status. Certification shall be submitted for all workers employed in this capacity.
- B. Welding at the project site shall be made by welders and welding operators who have previously qualified by test as prescribed in American Welding Society Publications AWS D1.1 to perform the type of work required. Certificates shall be submitted for all workers employed in this capacity. A welding or hot work permit is required for each day and shall be obtained from the VAMC safety department. Request permit one day in advance.
- C. Electrical work shall be performed by a Licensed Master Electrician and Licensed Journeymen Electricians as requirements by NEC. Certificates shall be submitted for all workers employed in this capacity.
- D. Approval will not be given to elevator contractors and manufacturers who have established on prior projects, either government, municipal, or commercial, a record for unsatisfactory elevator installations, have failed to complete awarded contracts within the contract period, and do not have the requisite record of satisfactory performing elevator installations of similar type and magnitude.
- E. Approval of Elevator Contractor's equipment will be contingent upon their providing factory training, engineering and technical support, including all manuals, wiring diagrams, and tools necessary for adjusting, maintenance, repair, and testing of equipment to the VA for use by the VA's designated Elevator Maintenance Service Provider. Identifying an elevator maintenance service provider that shall render services within one hour of receipt of notification, together with certification that the quantity and quality of replacement parts stock is sufficient to warranty continued operation of the elevator installation.

- F. Equipment relating to all 3 of electric traction elevators within this project shall be the product of the same manufacturer.
- G. The Contractor shall provide and install safety devices that have been subjected to tests witnessed and certified by an independent professional testing laboratory that is not a subsidiary of the firm that manufactures supplies or installs the equipment.

1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification. Elevator installation shall meet the requirements of the latest editions published and adopted by the United States Department of Veterans Affairs on the date contract is signed.
- B. Federal Specifications (Fed. Spec.):
 - J-C-30B.....Cable and Wire, Electrical (Power, Fixed Installation)
 - J-C-580.....Cord, Flexible, and Wire, Fixture
 - W-S-610.....Splice Connectors
 - W-C-596F.....Connector, Plug, Electrical; Connector, Receptacle, Electrical
 - W-F-406E.....Fittings for Cable, Power, Electrical and Conduit, Metal, Flexible
 - HH-I-558C.....Insulation, Blankets, Thermal (Mineral Fiber, Industrial Type)
 - W-F-408E.....Fittings for Conduit, Metal, Rigid (Thick-Wall and Thin-wall Type)
 - RR-W-410.....Wire Rope and Strand
 - TT-E-489J.....Enamel, Alkyd, Gloss, Low VOC Content
 - QQ-S-766.....Steel, Stainless and Heat Resisting, Alloys, Plate, Sheet and Strip
- C. American Society of Mechanical Engineers (ASME):
 - A17.1.....Safety Code for Elevators and Escalators
 - A17.2.....Inspectors Manual for Electric Elevators and Escalators
- D. National Fire Protection Association:
 - NFPA 13.....Standard for the Installation of Sprinkler Systems
 - NFPA 70.....National Electrical Code (NEC)
 - NFPA 72.....National Fire Alarm and Signaling Code

- NFPA 101.....Life Safety Code
- NFPA 252.....Fire Test of Door Assemblies
- E. International Building Code (IBC).
- F. American Society for Testing and Materials (ASTM):
 - A1008/A1008M-09.....Steel, Sheet, Cold Rolled, Carbon, Structural,
High-Strength Low-Alloy and High Strength Low-
Alloy with Improved Formability
 - E1042-02.....Acoustically Absorptive Materials Applied by
Trowel or Spray
- G. Manufacturer's Standardization Society of the Valve and Fittings
Industry (MSS):
 - SP-58.....Pipe Hangers and Supports
- H. Society of Automotive Engineers, Inc. (SAE):
 - J517-91.....Hydraulic Hose, Standard
- I. Gauges:
 - Sheet and Plate: U.S. Standard (USS)
 - Wire: American Wire Gauge (AWG)
- J. American Welding Society (AWS):
 - D1.1.....Structured Welding Code Steel
- K. National Electrical Manufacturers Association (NEMA):
 - LD-3.....High-Pressure Decorative Laminates
- L. Underwriter's Laboratories (UL):
 - 486A.....Safety Wire Connectors for Copper Conductors
 - 797.....Safety Electrical Metallic Tubing
- M. Institute of Electrical and Electronic Engineers (IEEE)
- N. Regulatory Standards:
 - VA Barrier Free Design Handbook H-18-13
 - VA Seismic Design Manual H-18-8
- O. Other Industry and government standards:
 - 1. ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities
 - 2. ADAAG - Accessibility Guidelines for Buildings and Facilities
 - 3. ANSI/NFPA 80, Standard for Fire Doors and Fire Windows
 - 4. ASME/ANSI A17.1, Safety Code for Elevators and Escalators

1.5 SUBMITTALS

- A. Submit in accordance with Specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Before execution of work, furnish information to evidence full compliance with contract requirements for proposed items. Such information shall include, as required: Manufacturer's Name, Trade Names, Model or Catalog Number, Nameplate Data (size, capacity, and rating) and corresponding specification reference (Federal or project specification number and paragraph). All submitted drawings and related elevator material shall be forwarded to the Contracting Officer.
- C. Shop Drawings:
 - 1. Complete scaled and dimensioned layout in plan and section view showing the arrangement of equipment and all details of each elevator unit specified including:
 - a. Hoisting machines, controllers, power conversion devices, governors, and all other components located in machine room.
 - b. Car, counterweight, sheaves, supporting beams, guide rails, brackets, buffers, and size of car platform, car frame members, and other components located in hoistway.
 - c. Rail bracket spacing and maximum vertical forces on guide rails in accordance with H 18-8 for Non-Seismic Risk Zone.
 - d. Reaction at points of support and buffer impact loads.
 - e. Weight of principal parts.
 - f. Top and bottom clearances and over travel of car and counterweight.
 - g. Location of main line switch/shunt trip circuit breaker, switchboard panel, light switch, and feeder extension points in the machine room.
 - 2. Drawings of hoistway entrances and doors showing details of construction and method of fastening to the structural members of the building.
 - a. If drywall construction is used to enclose hoistway, submit details of interface fastenings between entrance frames and drywall.
 - b. Sill details including sill support.
- D. Samples:
 - 1. One each of stainless steel, 75 mm x 125 mm (3 in. x 5 in.).

2. One each of baked enamel, 75 mm x 125 mm (3 in. x 5 in.).
 3. One each of color floor covering.
 4. One each of protection pads, 75 mm x 125 mm (3 in. x 5 in.) if used.
 5. One each car and hoistway Braille plate sample.
 6. One each car and hall button sample.
 7. One each car and hall lantern/position indicator sample.
 8. One each wall and ceiling material finish sample.
 9. One each car lighting sample.
- E. Name of manufacturer, type or style designation, and applicable data of the following equipment shall be shown on the elevator layouts:
1. Hoisting Machine.
 2. Hoisting Machine Motor, HP and RPM ratings, Voltage, Starting and Full Load Ampere, and Number of Phases.
 3. Controller.
 4. Starters and Overload Current Protection Devices.
 5. Car Safety Device; Type "B" safeties and Governor.
 6. Electric Door Operator; HP, RPM, Voltage, and Ampere rating of motor.
 7. Hoistway Door Interlocks.
 8. Car and Counterweight Buffers; maximum and minimum rated loads, maximum rated striking speed and stroke.
 9. Cab Ventilation Unit; HP rating and CFM rating.
 10. Hoist and Compensation Ropes; breaking strength, allowable working load, and actual working load.
- F. Complete construction drawings of elevator car enclosure showing dimensioned details, fastenings to platform, car lighting, ventilation, ceiling framing, top exits, and location of car equipment.
- G. Complete dimensioned detail of vibration isolating foundations for traction hoisting machines.
- H. Dimensioned drawings showing details of:
1. All signal and operating fixtures.
 2. Car and counterweight roller guides.
 3. Hoistway door tracks, hangers, and sills.
 4. Door operator, infrared curtain units.
- I. Cut sheets and drawings showing details of controllers and supervisory panels.
- J. Furnish certificates as required under: Paragraph "QUALIFICATIONS".

K. Color selection charts for cab and entrances.

L. Operation and maintenance data:

1. Provide manufacturer's standard maintenance and operation manual.

M. Diagnostic Tools

1. Prior to seeking final acceptance for the completed project as specified by the Contract Documents, the Elevator Contractor shall deliver to the Owner any specialized tool(s) that may be required to perform diagnostic evaluations, adjustments, and/or parametric software changes and/or test and inspections on any piece of control or monitoring equipment installed. This shall include any specialized tool(s) required for monitoring, inspection and/or maintenance where the means of suspension other than conventional wire ropes are furnished and installed by the Elevator Contractor. Any and all such tool(s) shall become property of the Owner. Any diagnostic tool provided to the Owner by the Elevator Contractor shall be configured to perform all levels of diagnostics, systems adjustment and parametric software changes which are available to the Elevator Contractor. In those cases where diagnostic tools provided to the Owner require periodic recalibration/or re-initiation, the Elevator Contractor shall perform such tasks at no additional cost to the Owner for a period equal to the term of the maintenance agreement from the date of final acceptance of the completed project. During those intervals in which the Owner might find it necessary to surrender a diagnostic tool for re-calibration, re-initiation, or repair, the Elevator Contractor shall provide a temporary replacement for the tool at no additional cost to the Owner. The Elevator Contractor shall deliver to the Owner, printed instructions for the proper use of any tool that may be necessary to perform diagnostic evaluations, system adjustment, and/or parametric software changes on any unit of microprocessor-based elevator control equipment and means of suspension other than standard elevator steel cables furnished and install by the Elevator Contractor. Accompanying the printed instructions shall be any and all access codes, password, or other proprietary information that is necessary to interface with the microprocessor-control equipment.

1.6 WIRING DIAGRAMS

- A. Provide three complete sets of paper and one electronic set field wiring and straight-line wiring diagrams showing all electrical circuits in the hoistway, machine room and fixtures. Install one set coated with an approved plastic sealer and mounted in the elevator machine room as directed by the COR.
- B. In the event field modifications are necessary during installation, diagrams shall be revised to include all corrections made prior to and during the final inspection. Corrected diagrams shall be delivered to the COR within thirty (30) days of final acceptance.
- C. Provide the following information relating to the specific type of microprocessor controls installed:
 - 1. Owner's information manual, containing job specific data on major components, maintenance, and adjustment.
 - 2. System logic description.
 - 3. Complete wiring diagrams needed for field troubleshooting, adjustment, repair and replacement of components. Diagrams shall be base diagrams, containing all changes and additions made to the equipment during the design and construction period.
 - 4. Changes made during the warranty period shall be noted on the drawings in adequate time to have the finalized drawings reproduced for mounting in the machine room no later than six months prior to the expiration of the warranty period.

1.7 ADDITIONAL EQUIPMENT

- A. Additional equipment required to operate the specified equipment manufactured and supplied for this installation shall be furnished and installed by the contractor. The cost of the equipment shall be included in the base bid.

1.8 TOOL CABINET

- A. Provide a metal parts/tool cabinet, having two shelves and hinged doors. Cabinet size shall be 1200 mm (48 in.) high, 750 mm (30 in.) wide, and 450 mm (18 in.) deep.

1.9 PERFORMANCE STANDARDS

- A. The elevators shall meet the highest standards of the industry and specifically the following:
 - 1. Contract speed is high speed in either direction of travel with rated capacity load in the elevator. Speed variation under all load

- conditions, regardless of direction of travel, shall not vary more than three (3) percent.
2. The controlled rate of change of acceleration and retardation of the car shall not exceed 0.1G per ft/s/s and the maximum acceleration and retardation shall not exceed 0.2G per ft/s/s.
 3. Starting, stopping, and leveling shall be smooth and comfortable without appreciable steps of acceleration and deceleration.
- B. Passenger/ Service door operator shall open the car door and hoistway door at 75 cm (2.5 ft) per second and close at 30 cm (1 ft) per second. Freight door operators shall open and close at 30 cm (1 ft) per second.
- C. Floor level stopping accuracy shall be within 3 mm (.125 in.) above or below the floor, regardless of load condition.
- D. Noise and Vibration Isolation: All elevator equipment including their supports and fastenings to the building, shall be mechanically and electrically isolated from the building structure to minimize objectionable noise and vibration transmission to car, building structure, or adjacent occupied areas of building.
- E. Sound Isolation: Noise level relating to elevator equipment operation in the machine room shall not exceed 80 decibels. All db readings shall be taken 90 cm (3 ft) off the floor and 90 cm (3 ft) from equipment.
- F. Airborne Noise: Measured noise level of elevator equipment during operation shall not exceed 50 decibels in elevator lobbies and 60 decibels inside car under any condition including door operation and car ventilation exhaust blower on its highest speed.

1.10 WARRANTY

- A. Submit all labor and materials furnished regarding elevator system and installation to terms of "Warranty of Construction" articles of FAR clause 52.246-21. The one-year Warranty shall commence after final inspection, completion of performance test, and upon full acceptance of the installation and run concurrent with the guarantee period of service.
- B. During warranty period if a device is not functioning properly in accordance with specification requirements, more maintenance than the contract requires keeping device operational, device shall be removed and a new device meeting all requirements shall be installed as part of work until satisfactory operation of installation is obtained. Period of warranty shall start anew for such parts from date of completion of

each new installation performed, in accordance with foregoing requirements.

1.11 POWER SUPPLY

- A. For power supply, see Specification 26 05 19, Electrical specifications, and Electrical drawings.
- B. Main Line Fused Disconnect Switch/Shunt Trip Circuit Breaker for each controller shall be located inside the machine room at the strike jamb side of the machine room door and lockable in the "Off" position.
- C. Surge Suppressors to protect the elevator equipment.

1.12 EMERGENCY POWER SUPPLY

- A. Emergency power supply, its starting means, transfer switch for transfer of elevator supply from normal to emergency power, two pair of conductors in a conduit from an auxiliary contact on the transfer switch (open or close contacts as required by Controller Manufacturer) to terminals in the group elevator controller and other related work shall be provided by the Electrical Contractor.
- B. Upon loss of normal power supply (to any or all of Elevators "A", "B" or "C"), there shall be a momentary delay before transferring to emergency power of 10 seconds minimum to 45 seconds maximum, the delay shall be accomplished through an adjustable timing device.
- C. Prior to the return of normal power an adjustable timed circuit shall be activated that will cause all elevators to remain at a floor if already there or stop and remain at the next floor if in flight. Actual transfer of power from emergency power to normal building power shall take place after all elevators are stopped at a floor with doors open.
- D. Car lighting circuits shall be connected to the emergency power panel.

1.13 ELEVATOR CONTROL AND MACHINE SPACE

- A. Provide a machine-room-less electric traction patient-service elevators with Integrated Control System (ICS) located adjacent to top-landing entrance, machine located inside the hoistway mounted on car guide rail.
- B. Not Used.
- C. Not Used.
- D. Locate sprinkler pipes to provide seven 210 cm (7 ft) head clearance. Do not locate sprinkler heads, heat detectors, and smoke detectors directly over elevator equipment.

1.14 HOISTWAY LIGHTING

- A. Provide lighting with 3-way switches at the top and bottom of the hoistway accessible from elevator hoistway entrance prior to entering the pit or stepping onto the car top.
- B. Lighting shall illuminate top of elevator cab when it is at the top floor and the pit when at the bottom floor.

1.15 MAINTENANCE SERVICE

- A. The elevator manufacturer shall provide maintenance service consisting of regular examinations and adjustments of the elevator equipment for a period of 12 months after date of final completion. Replacement parts shall be produced by the original equipment manufacturer.
- B. Maintenance service be performed during regular working hours of regular working days and shall include emergency 24-hour call back service.
- C. Maintenance service shall not include adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Where stainless steel is specified, it shall be corrosion resisting steel complying with Fed. Spec. QQ-S-766, Class 302 or 304, Condition A with Number 4 finish on exposed surfaces. Stainless steel shall have the grain of belting in the direction of the longest dimension and surfaces shall be smooth and without waves. During installation stainless-steel surfaces shall be protected with suitable material.
- B. Where cold rolled steel is specified it shall be low-carbon steel rolled to stretcher level standard flatness, complying with ASTM A109.

2.2 MANUFACTURED PRODUCTS

- A. Materials, devices, and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items. The elevator equipment, including controllers, door operators, and supervisory system shall be the product of manufacturers of established reputation, provided such items are capably engineered and produced under coordinated specifications to ensure compatibility with the total operating system.
- B. Manufacturers of equipment assemblies which include components made by others shall assume complete responsibility for the final assembled

unit. Components shall be compatible with each other and with the total assembly for the intended service.

- C. Mixing of manufactures related to a single system or group of components shall be identified in the submittals.
- D. If key operated switches are furnished in conjunction with component of this elevator installation, furnish four (4) keys for each individual switch or lock. Provide different key tumblers for different switch and lock functions. Each key shall have a tag bearing a stamped or etched legend identifying its purpose.

2.3 CONDUIT AND WIREWAY

- A. Install electrical conductors, except traveling cable, in rigid zinc-coated steel or aluminum conduit, electrical metallic tubing or metal wireways. Rigid conduit smaller than 18.75 mm (.75 in.) or electrical metallic tubing smaller than 12.5 mm (.50 in.) electrical trade size shall not be used. All raceways completely embedded in concrete slabs, walls, or floor fill shall be rigid steel conduit. Wireway (duct) shall be installed in the hoistway and to the controller and between similar apparatus in the elevator machine room. Fully protect self-supporting connections, where approved, from abrasion or other mechanical injury. Flexible metal conduit not less than 9.375 mm (.375 in.) electrical trade size may be used, not exceeding 45 cm (18 in.) in length unsupported, for short connections between risers and limit switches, interlocks, and for other applications permitted by NEC.
- B. All conduit terminating in steel cabinets, junction boxes, wireways, switch boxes, outlet boxes and similar locations shall have approved insulation bushings. Install a steel lock nut under the bushings if they are constructed completely of insulating materials. Protect the conductors at ends of conduits not terminating in steel cabinets or boxes by terminal fittings having an insulated opening for the conductors.
- C. Rigid conduit and EMT fittings using set screws or indentations as a means of attachment shall not be used.
- D. Connect motor or other items subject to movement, vibration or removal to the conduit or EMT systems with flexible, steel conduits.

2.4 CONDUCTORS

- A. Conductors shall be stranded or solid coated annealed copper in accordance with Federal Specification J-C-30B for Type RHW or THW.

Where 16 and 18 AWG are permitted by NEC, single conductors or multiple conductor cables in accordance with Federal Specification J-C-580 for Type TF may be used provided the insulation of single conductor cable and outer jacket of multiple conductor cable is flame retardant and moisture resistant. Multiple conductor cable shall have color or number coding for each conductor. Conductors for control boards shall be in accordance with NEC. Joints or splices are not permitted in wiring except at outlets. Tap connectors may be used in wireways provided they meet all UL requirements.

- B. Provide all conduit and wiring between controller, hoistway and fixtures.
- C. All wiring must test free from short circuits or ground faults. Insulation resistance between individual external conductors and between conductors and ground shall be a minimum of one megohm.
- D. Where size of conductor is not given, voltage and amperes shall not exceed limits set by NEC.
- E. Provide equipment grounding. Ground the conduits, supports, controller enclosure, motor, platform and car frame, and all other non-current conducting metal enclosures for electrical equipment in accordance with NEC. The ground wires shall be copper, green insulated and sized as required by NEC. Bond the grounding wires to all junction boxes, cabinets, and wire raceways.
- F. Terminal connections for all conductors used for external wiring between various items of elevator equipment shall be solderless pressure wire connectors in accordance with Federal Specification W-S-610. The Elevator Contractor may, at his option, make these terminal connections on #10 gauge or smaller conductors with approved terminal eyelets set on the conductor with a special setting tool, or with an approved pressure type terminal block. Terminal blocks using pierce-through serrated washers are not acceptable.

2.5 TRAVELING CABLES

- A. All conductors to the car shall consist of flexible traveling cables conforming to the requirements of NEC. Traveling cables shall run from the junction box on the car directly to the controller. Junction boxes on the car shall be equipped with terminal blocks. Terminal blocks having pressure wire connectors of the clamp type that meet UL 486A requirements for stranded wire may be used in lieu of terminal eyelet

connections. Terminal blocks shall have permanent indelible identifying numbers for each connection. Cables shall be securely anchored to avoid strain on individual terminal connections. Flame and moisture resistant outer covering must remain intact between junction boxes. Abrupt bending, twisting and distortion of the cables shall not be permitted.

- B. Provide spare conductors equal to 10 percent of the total number of conductors furnished, but not less than 5 spare conductors in each traveling cable.
- C. Provide shielded wires for the auto dial telephone system within the traveling cable, five (5) pair shielded wires for card reader, one (1) theRG-6 Ethernet cable for Wi-Fi, two (2) pair 14-gauge wires for 110 Volt power supply, and wire for video display monitor if specified.
- D. If traveling cables contact the hoistway or elevator due to sway or change in position, provide shields or pads to the elevator and hoistway to prevent damage to the traveling cables.
- E. Hardware cloth may be installed from the hoistway suspension point to the elevator pit to prevent traveling cables from rubbing or chafing and securely fastened and tensioned to prevent buckling. Hardware cloth is not required when traveling cable is hung against a flat wall.

2.6 CONTROLLER AND SUPERVISORY PANEL

- A. UL/CSA Labeled Controller: Mount all assemblies, power supplies, chassis switches, and relays on a steel frame in a NEMA Type 1 General Purpose Enclosure. Cabinet shall be securely attached to the building structure.
- B. Properly identify each device on all panels by name, letter, or standard symbol which shall be neatly stencil painted or decaled in an indelible and legible manner. Identification markings shall be coordinated with identical markings used on wiring diagrams. The ampere rating shall be marked adjacent to all fuse holders. All spare conductors to controller and supervisory panel shall be neatly formed, laced, and identified.
- C. Not Used.
- D. Controller: Provide microcomputer based control system to perform all of the functions.
 - 1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.

2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed and physically segregated from the rest of the controller.
 3. Provide a serial cardrack and main CPU board containing a non-erasable EPROM and operating system firmware.
 4. Variable field parameters and adjustments shall be contained in a non-volatile memory module.
- E. Drive: Provide Variable Voltage Variable Frequency AC drive system to develop high starting torque with low starting current.
- F. Controller Location: Locate controller{s} in the front wall integrated with the top landing entrance frame, machine side of the elevator. One non-fused three phase permanent power in hoist way at top landing. A separate control space should not be required.
- G. The elevator control panel shall be marked by the manufacturer with its short circuit current rating (SCCR) in accordance with NFPA 70, 2017 Article 620.16. The elevator control panel SCCR shall be greater than the available short circuit current as calculated in accordance with specification section 26 05 73. As a minimum the elevator control panel SCCR shall be no less than 6,000 amps.

2.7 MICROPROCESSOR CONTROL SYSTEM

- A. Provide a microprocessor control system with absolute position/speed feedback to control dispatching, signal functions, door operation, and VVVF Drive for hoist motor control. Complete details of the components and printed circuit boards, together with a complete operational description, shall be submitted for approval. Add Regenerative Drive when economically advantages to the VA.
- B. Controller manufacturer shall provide factory training, engineering and technical support, including all manuals, wiring diagrams, and tools necessary for adjusting, maintenance, repair, and testing of equipment to the VA for use by the VA's designated Elevator Maintenance Service Provider.

2.8 EMERGENCY POWER OPERATION

- A. The control system for Elevator(s) shall provide for the operation of all cars per elevator group on emergency power upon failure of the normal power supply.
- B. Auxiliary equipment on elevator controllers, wiring between associated elevator controllers and wiring between elevator controllers and remote

selector panel as required to permit the elevators to operate as detailed, shall be provided by the Elevator Contractor.

- C. Upon loss of normal power supply (to any or all of Elevators "A", "B" or "C"), there shall be a momentary delay before transferring to emergency power of 10 seconds minimum to 45 seconds maximum,, the delay shall be accomplished through an adjustable timing device.
- D. Prior to the return of normal power an adjustable timer circuit shall activate that will cause all cars to remain at a floor if already there or stop and remain at the next floor if in flight. Actual transfer of power from emergency power to normal building power shall take place after all cars are stopped at a floor with their doors open.
- E. Emergency Rescue Operation:
Provide a power source to send the elevator(s) to the nearest landing. After the elevator(s) has leveled at the nearest landing, provide power to open the car and hoistway doors automatically. After a predetermined time, the doors shall close. Power shall stay applied to the door open button to reopen the doors from the inside of the elevator. The elevator shall remain shut down at the landing until normal power is restored. Install a sign on the controller indicating that power is applied to emergency rescue operator and door operator during loss of normal power.

2.9 ELEVATOR MONITOR

- A. Provide separate monitors for each passenger elevator group, and each service elevator group. Provide a separate keyboard for each monitor. Room / location of the monitors as directed by the COR.
- B. The monitor shall contain indicators to provide the following information:
 - 1. The floor where each elevator is currently located.
 - 2. The direction that each elevator is currently traveling or is scheduled to travel.
 - 3. The location and direction of currently registered hall calls.
 - 4. Elevators that are currently out of service.
 - 5. Elevators that are currently bypassing hall calls.
 - 6. Elevators that are currently engaged in passenger transfers.
 - 7. Operations program under which entire group is currently operating.

8. Zone divisions of the entire group.
 9. Door positions.
 10. Status indication for elevators on independent service, car top inspection, fire service, earthquake protection, and activated stop switch and alarm bell.
- C. The maintenance terminal shall be suitable for all troubleshooting procedures related to the specific type microprocessor installed on this project.

2.10 FIREFIGHTER'S SERVICE

- A. Provide Firefighter's Service.
1. Main Floor
 2. Alternate Floor
 3. Verify main and alternate floors with Contract Officer's Representative.

2.11 INDEPENDENT SERVICE

- A. Provide a legibly and indelibly labeled "INDEPENDENT SERVICE", two-position key operated switch that shall have its positions marked "ON" and "OFF". When the switch is in the "ON" position, the car shall respond only to calls registered on its car dispatch buttons and shall bypass all calls registered on landing push buttons. The car shall start when a car call is registered, car call button or door close button is pressed, car and hoistway doors are closed, and interlock circuits are made. When switch is returned to "OFF" position, normal service shall be resumed.

2.12 MEDICAL EMERGENCY SERVICE - PATIENT CARE FACILITIES ONLY

- A. Provisions shall be made for calling elevator(s) to any floor served by the elevator on an emergency basis, operating independently from the dispatch signals and landing call signals.
- B. Install card reader/key switch in the floor landing push button fixture above the push buttons.
- C. Provide a call registered light indicator adjacent to card reader/key switch. The card reader/key switch at the landings and in the car, shall only be operable by authorized personnel with a valid VA ID badge/key.
- D. When card reader/key switch is activated at any floor, the call register light indicator shall illuminate at the call floor and inside the elevator only. The elevator control system shall instantly select

an elevator to respond to the medical emergency call. Immediately upon selection, all car calls shall be cancelled. If car is traveling away from the medical emergency call, it shall slow down and stop at the nearest floor, maintain closed doors, reverse direction and proceed nonstop to the medical emergency call floor. If the car is traveling toward the medical emergency call floor, it shall proceed to that floor nonstop. If at the time of selection, it is slowing down for a stop, the car shall stop, maintain doors closed, and start immediately toward the medical emergency floor.

- E. Arriving at the medical emergency floor, the car shall remain with doors open for 30 seconds. After this interval has expired and the car has not been placed on medical emergency operation inside the car, the car shall automatically return to normal service.
- F. Provide an LED illuminated indicator light next to the Medical Emergency card reader/key switch the same size as the Fire Service indicator.
 - 1. Locate a "Medical Emergency" card reader/key switch above call buttons in the main car operating panel for selecting medical emergency service. Activation of the card reader will allow the car to accept a car call for any floor, close doors, and proceed nonstop to the floor desired.
 - 2. After medical emergency call has been completed the elevator shall return to normal operation after an adjustable time of 30 to 90 seconds has expired.
- G. In the center of the rear cab panel provide a back lighted "MEDICAL EMERGENCY" LED illuminated display that shall flash on and off continuously when the car is assigned to this operation and until it is restored to normal service. "MEDICAL EMERGENCY" indicator shall be a photographic negative type 1800 mm (72 in.) to center above the floor, 150 mm (6 in.) wide X 75 mm (3 in.) high, with 12.5 mm (.50 in.) high letters legible only when illuminated.
- H. If the car being operated on "Independent Service", the medical emergency service indicator lights in the car operating panel and rear wall shall be illuminated, buzzer shall sound, and the "Audio Voice" system shall direct the attendant to return the car to automatic operation.

- I. If the car is out of service and unable to answer medical emergency calls, the call register light shall not illuminate.
- J. Each card reader/key switch shall have its identity legible and indelible engraved in faceplates. All lettering shall be 6 mm (.25 in.) high, filled with black paint.
- K. When Phase I firefighter's recall is activated it shall over-ride elevators on medical emergency service and return them to the main or alternate fire service recall floor. When the fire emergency floor has been identified the attendants may complete their medical emergency run on Phase II firefighter's operation if life safety is not affected.

2.13 LOAD WEIGHING

- A. Provide means for weighing car load for each elevator. When load in a car reaches an adjustable predetermined level of the rated capacity, that car shall bypass registered landing calls until the load in the car drops below the predetermined level. Calls bypassed in this manner shall remain registered for the next car. The initial adjustment of the load weighting bypass setting shall be 60 to 100 percent.

2.14 ANTI-NUISANCE FEATURE

- A. If weight in the car is not commensurate with the number of registered car calls, cancel car calls. Systems that employ either load weighing or door protective device for activation of this feature are acceptable.

2.15 SEISMIC REQUIREMENTS

- A. Elevator Equipment shall conform to the requirements of seismic zone: non-seismic.

2.16 ELEVATOR MACHINE BEAMS

- A. Overhead beams shall support machines and machinery in place to prevent movement under any conditions imposed in service.

2.17 TRACTION HOIST MACHINE

- A. Provide gearless traction machine with an AC permanent magnet synchronous motor, direct current electro-mechanical disc brakes, integral traction drive sheave, and deflector sheave mounted in proper alignment on an isolated bedplate, mounted to the car guide rail at the top of the hoistway.
- B. Provide hoist machine mounted direct drive, digital, closed-loop velocity encoder.

- C. Drive sheaves shall be free from cracks, sand holes, and other imperfections that would tend to injure the hoist ropes. Sheave shall be turned smooth and true with rope grooves of proper design to insure maximum traction and maximum life of the hoist ropes.
- D. Hoisting machine brake shall be drum or disc type and shall stop and hold the elevator with 125 percent of rated load.

2.18 SHEAVES

- A. Provide deflector sheaves with a metal basket type guard mounted below the sheave and a guard to prevent ropes from jumping out of grooves. Securely fasten guard to sheave support beams.
- B. Two-to-one idler sheaves on car and counterweight, if used, shall be provided with metal guards that prevent foreign objects from falling between ropes and sheave grooves and to prevent ropes from jumping out of grooves.
- C. Securely mount overhead sheaves on overhead beams in proper alignment with basement traction sheave, car and counterweight rope hitches or sheaves. Provide blocking beams where sheaves are installed on two or more levels.

2.19 HOIST ROPES

- A. Provide elevator with the required number and size of ropes to insure adequate traction and required safety factor. Hoisting ropes shall be pre-formed 8 x 19 or 8 x 25 traction steel, conforming to Federal Specification RR-W-410 with minimum nominal diameter of 12.5 mm (.50 in.).
- B. Securely attach a corrosion resistant metal data tag to one hoisting rope fastening on top of the elevator.

2.20 HOIST ROPE COMPENSATION

- A. Provide compensation when required by controller manufacturer. Compensation shall consist of a necessary number and size of encapsulated chains attached to the underside of car and counterweight frames.
 - 1. Provide guide(s) in pit to minimize chain sway.
 - 2. Provide take-up adjustment to compensate for hoist rope stretch.
 - 3. Pad areas where compensation may strike car or hoistway items.

2.21 GOVERNOR ROPE

- A. Governor Rope shall be 6 x 19 or 8 x 19 wire rope, preformed traction steel, uncoated, fiber core, conforming to Federal Specification RR-W-410 with minimum nominal diameter of 9.375 mm (.375 in.) having a minimum safety factor of 5. Tiller rope construction is not acceptable.
- B. Under normal operation rope shall run free and clear of governor jaws, rope guards, and other stationary parts.
- C. Securely attach governor rope tag to governor rope releasing carrier.

2.22 SPEED GOVERNOR

- A. Provide Centrifugal car driven governor to operate the car safety device and counterweight governor to operate the counterweight safety device. Governor shall be complete with weighted pit tension sheave, governor release carrier and mounting base with protected cable sleeves.
- B. Furnish overspeed switch and speed reducing switches when required.
- C. The governor rope clamping device shall be designed to prevent appreciable damage to or deformation of the governor rope that results from the stopping action of the device operating the safety.
- D. Provide metal guard over top of governor rope and sheaves.
- E. Where the elevator travel does not exceed 100 feet, the weight tension sheave may be mounted on a pivoted steel arm in lieu of operating in steel guides.

2.23 CAR AND COUNTERWEIGHT SAFETY DEVICE

- A. Provide "Type B Safeties" on the elevator and counterweight.

2.24 ASCENDING CAR OVERSPEED PROTECTION

- A. Provide a device to prevent ascending over speed and unintended motion away from the landing in either direction when the doors are not locked.

2.25 CAR AND COUNTERWEIGHT BUFFERS

- A. Provide polyurethane buffer(s) for each car and each counterweight. Securely fasten buffers and supports to the pit channels and in the alignment with striker plates on car and counterweight. Each installed buffer shall have a permanently attached metal plate indicating its stroke and load rating. Buffer anchorage shall not puncture pit waterproofing.

2.26 COUNTERWEIGHTS

- A. Elevator shall be counterweighted with the weight of the car plus 40-50 percent of the rated capacity load as required by the controller manufacturer.
- B. Furnish two (2) tie rods with cotter pins and double nuts at top and bottom. Install counterweight retainer plates or other approved means on tie rods to prevent counterweight sub-weights from jumping and/or rattling. Both ends of tie-rods shall be visible and accessible.

2.27 GUIDE RAILS, SUPPORTS, AND FASTENINGS

- A. Guide rails for car shall be planed steel T-sections and weigh 27.5 kg/m (18.5 lb/ft). Guide rails for counterweight shall be planed steel T-sections and weigh 22.5 kg/m (15 lb/ft).
- B. Securely fasten guide rails to the brackets or other supports by heavy duty steel rail clips.
- C. Provide car and counterweight rail brackets and counterweight spreader brackets of sufficient size and design to secure substantial rigidity to prevent spreading or distortion of rails under any condition.
- D. Guide rails shall extend from channels on pit floor to within 75 mm (3 in.) of the underside of the concrete slab or grating at top of hoistway with a maximum deviation of 3.2 mm (.125 in.) from plumb in all directions. Provide a minimum of 18.5 mm (.75 in.) clearance between bottom of rails and top of pit channels.
- E. Guide rail anchorages in pit shall be made in a manner that will not reduce effectiveness of the pit waterproofing.
- F. In the event inserts or bond blocks are required for the attachment of guide rails, the Contractor shall furnish such inserts or bond blocks and shall install them in the forms before the concrete is poured. Use inserts or bond blocks only in concrete or block work where steel framing is not available for support of guide rails. Expansion-type bolting for guide rail brackets will not be permitted.
- G. Guide rails shall be clean and free of any signs of rust, grease, or abrasion before final inspection. Paint the shank and base of the T-section with one field coat of manufacturer's standard enamel.

2.28 NORMAL AND FINAL TERMINAL STOPPING DEVICES

- A. Mount terminal slowdown switches and direction limit switches on the elevator or in hoistway to reduce speed and bring car to an automatic stop at the terminal landings.

1. Switches shall function with any load up to and including 125 percent of rated elevator capacity at any speed obtained in normal operation.
 2. Switches, when opened, shall permit operation of elevator in reverse direction of travel.
- B. Mount final terminal stopping switches in the hoistway.
1. Switches shall be positively opened should the car travel beyond the terminal direction limit switches.
 2. Switches shall be independent of other stopping devices.
 3. Switches, when opened, shall remove power from hoist motor, apply hoist machine brake, and prevent operation of car in either direction.

2.29 CROSSHEAD DATA PLATE AND CODE DATA PLATE

- A. Permanently attach a non-corrosive metal Data Plate to car crosshead.
- B. Permanently attach a non-corrosive Code Data Plate to the controller.

2.30 WORKMAN'S LIGHTS AND OUTLETS

- A. Provide duplex GFCI protected type receptacles and lamps with guards on top of each elevator car and beneath the platform. The receptacles shall be in accordance with Fed. Spec. W-C-596 for Type D7, 2-pole, 3-wire grounded type, rated for 15 amperes and 125 volts.

2.31 CARTOP OPERATING DEVICE

- A. Provide a cartop operating device.
- B. The device shall be activated by a toggle switch mounted in the device. The switch shall be clearly marked "INSPECTION" and "NORMAL" on the faceplate, with 6 mm (.25 in.) letters.
- C. Movement of the elevator shall be accomplished by the continuous pressure on a direction button and a safety button.
- D. Provide an emergency stop switch, push to stop/pull to run.
- E. Provide permanent identification for the operation of all components in the device.
- F. The device shall be permanently attached to the elevator crosshead on the side of the elevator nearest to the hoistway doors used for accessing the top of the car.

2.32 CAR LEVELING DEVICE

- A. Car shall be equipped with a two-way leveling device to automatically bring the car to within 3 mm (.125 in.) of exact level with the landing for which a stop is initiated regardless of load in car or direction.

- B. If the car stops short or travels beyond the floor, the leveling device, within its zone shall automatically correct this condition and maintain the car within 3 mm (.125 in.) of level with the floor landing regardless of the load carried.

2.33 EMERGENCY STOP SWITCHES

- A. Provide an emergency stop switch, push to stop/pull to run, for each cartop device, pit, on the machine, service panel and firefighter's control panel inside the elevator. Mount stop switches in the pit adjacent to pit access door, at top of the pit ladder 1200 mm (48 in.) above the bottom landing sill and 1200 mm (48 in.) above the pit floor adjacent to the pit ladder.
- B. Each stop switch shall be red in color and shall have "STOP" and "RUN" positions legibly and indelibly identified.

2.34 MAIN CAR OPERATING PANEL

- A. Locate the main car operating panel in the car enclosure on the front return panel for passenger/service elevators and the front of the side wall for freight elevators. The top floor car call push button shall not be more than 1200 mm (48 in.) above the finished floor. Car call push buttons and indicator lights shall be LED illuminated, round with a minimum diameter of 25 mm (1 in.). Each button shall contain an integral registration LED white light which shall illuminate upon registration of a call and shall extinguish when that call is answered.
 - 1. Illuminated buttons marked to correspond to landings served, emergency call button, door open button, door close button, and key switches for lights, inspection, and exhaust fan.
 - 2. All buttons to have raised text and Braille marking on left hand side.
 - 3. The car operating display panel shall be White DOT-matrix. All texts, when illuminated, shall be White.
 - 4. The car operating panel shall have a Brushed Stainless Steel finish.
 - 5. Additional features of car operating panel shall include:
 - a. Car Position Indicator within operating panel (White).
 - b. Elevator Data Plate marked with elevator capacity and car number on car top.
 - c. Help buttons with raised markings.
 - d. In car stop switch per local code.

- e. Call Cancel Button
- B. One-piece front faceplate with edges beveled 15 degrees hinged, swing return panel, or tilt shall have the firefighter's service panel recessed into the upper section and the service operation panel recessed into the lower section fitted with hinged doors. Doors shall have concealed hinges, be in the same front plane as the faceplate and fitted with key operated locks. Secure the faceplate with stainless steel tamperproof screws.
- C. All terminology and tactile symbols on the faceplate shall be on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. Use 6 mm (.25 in.) letters to identify all devices in the faceplate. The tactile symbols with contrasting background shall be 12.5 mm (0.5 in.) high raised .075 mm (.030 in.) on the plate. Surface mounted plates are not acceptable.
- D. The upper section shall contain the following items in order listed from top to bottom:
 1. Elevator number, 12.5 mm (.50 in.) high with black paint for contrast.
 2. Capacity plate information with black paint for contrast with freight loading class and number of passengers allowed.
 3. LED illuminated digital car position indicator with direction arrows.
 4. Emergency car lighting system consisting of a rechargeable battery, charger, controls, and LED illuminated light fixture. The system shall automatically provide emergency light in the car upon failure or interruption of the normal car lighting service, and function irrespective of the position of the light control switch in the car. The system shall maintain a minimum illumination of 1.0 foot-candle when measured 1200 mm (48 in.) above the car floor and approximately 300 mm (12 in.) in front of the car operating panel, for not less than four (4) hours.
 5. Firefighter's Emergency Operation Panel shall be 1650 mm (66 in.) minimum to 1800 mm (72 in.) maximum to the top of the panel above finished floor.
 6. Firefighter's Emergency Indicator Light shall be round with a minimum diameter of 25 mm (1 in.).

7. Medical Emergency card reader/key switch marked "MEDICAL EMERGENCY" with two positions labeled "ON" and "OFF" and Medical Emergency Indicator Light located next to the card reader/key switch shall be round with a minimum diameter of 25 mm (1 in.). Instruction for Medical Emergency operation shall be engraved below the card reader/key switch and light.
 8. Key operated Independent Service Switch or switch inside service panel.
 9. Provide a Door Hold Button on the faceplate next to the Independent Service Key Switch. It shall have "DOOR HOLD" indelibly marked on the button. Button shall light when activated. When activated, the door shall stay open for a maximum of one minute. To override hold timer, push a car call button or door close button.
 10. Complete set of round car call push buttons, minimum diameter of 25 mm (1 in.), and LED white light illuminated, corresponding to the floors served. Car call buttons shall be legibly and indelibly identified by a floor number and/or letter not less than 12.5 mm (.50 in.) high in the face of the call button.
 11. Door Open and Door Close buttons shall be located below the car call buttons. They shall have "OPEN" and "CLOSE" legibly and indelibly identified by letters in the face of the respective button. The Door Open button shall be located closest to the door jamb.
 12. Red Emergency Alarm button that shall be located below the car operating buttons. Mount the emergency alarm button not lower than 875 mm (35 in.) above the finished floor. It shall be connected to audible signaling devices. Provide audible signaling devices including the necessary wiring.
 13. Emergency Help push button shall activate two-way communications by Auto Dial telephone system that is compatible with the VAMC's telephone system. Help button shall be LED white light illuminated and flash when call is acknowledged. Legibly and indelibly label the button "HELP" in the face of the button with 12.5 mm (.50 in.) high letters.
- E. The service operation panel, in the lower section shall contain the following items:
1. Light switch labeled "LIGHTS" for controlling interior car lighting with its two positions marked "ON" and "OFF".

2. Inspection switch that will disconnect normal operation and activate hoistway access switches at terminal landings. Switch shall be labeled "ACCESS ENABLE" with its two positions marked "ON" and "OFF".
3. Three-position switch labeled "FAN" with its positions marked "HIGH", "LOW" and "OFF" for controlling car ventilating blower.
4. Two-position, spring return, toggle switch or push button to test the emergency light and alarm device. It shall be labeled "TEST EMERGENCY LIGHT AND ALARM".
5. Two-position emergency stop switch, when operated, shall interrupt power supply and stop the elevator independently of regular operating devices. Emergency stop switch shall be marked "PUSH TO STOP" and "PULL TO RUN".

2.35 AUXILIARY CAR OPERATING PANEL

- A. Provide an auxiliary car operating panel in the front return panel opposite the main car operating panel. The auxiliary car operating panel shall contain only those controls essential to passenger (public) operation. The auxiliary car operating panel faceplate shall match the main car operating panel faceplate in material and general design. Secure the faceplate with stainless steel tamperproof screws.
 1. Complete set of round car call push buttons, minimum diameter 25 mm (1 in.), and LED white light illuminated, corresponding to the floors served. Car call button shall be legibly and indelibly identified by a floor number and/or letter not less than 12.5 mm (.50 in.) high in the face of the call button corresponding to the numbers of the main car operating buttons.
 2. Mount door "OPEN" and door "CLOSE" buttons closest to the door jamb and mount the alarm button no lower than 875 mm (35 in.) above the finished floor. The Door Open button shall be located closest to the door.
 3. Cross-connect all buttons in the auxiliary car operating panels to their corresponding buttons in the main car operating panel. Registration of a car call shall cause the corresponding button to illuminate in the main and auxiliary car operating panel.
 4. Emergency Help push button shall activate two-way communications by auto dial telephone that is compatible with the VAMC's telephone system. Help button shall be LED white light illuminated and flash

when call is acknowledged. Legibly and indelibly label the button "HELP" in the face of the button with 12.5 mm (.50 in.) high letters.

- B. All terminology and tactile symbols on the faceplate shall be on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. Use 6 mm (.25 in.) letters to identify all devices in the faceplate. The tactile symbols with contrasting background shall be 12.5 mm (0.5 in.) high raised .075 mm (.030 in.) on the plate. Surface mounted plates are not acceptable.

2.36 CAR POSITION INDICATOR

- A. Provide an alpha-numeric digital car position indicator in the main car operating panel, consisting of numerals and arrows not less than 63 mm (2.5 in.) high, to indicate position of car and direction of car travel. Locate position indicator at the top of the main car operating panel, illuminated by light emitting diodes.

2.37 AUDIO VOICE SYSTEM

- A. Provide digitized audio voice system. Audio voice shall announce floor designations, direction of travel, and special announcements. The voice announcement system shall be a natural sounding human voice that receives messages and shall comply with ADA requirements for audible car position indicators. The voice announcer shall have two separate volume controls, one for the floor designations and direction of travel, and another for special announcements. The voice announcer shall have a full range loud speaker, located on top of the cab. The audio voice unit shall contain the number of ports necessary to accommodate the number of floors, direction messages, and special announcements. Install voice announcer per manufacturer's recommendations and instructions. The voice system shall be the product of a manufacturer of established reputation. Provide manufacturer literature and list of voice messages.

2.38 AUTO DIAL TELEPHONE SYSTEM

- A. Furnish and install a complete ADA compliant auto dial telephone that is compatible with the VAMC's telephone system.
- B. Provide a two-way communication device in the car with automatic dialing, tracking and recall features with shielded wiring to car controller in machine room. Provide dialer with automatic rollover capability with two numbers.

- C. "HELP" button shall illuminate and flash when call is acknowledged.
Button shall match floor push button design.
- D. Provide "HELP" button tactile symbol signage and Braille adjacent to button mounted integral with car operating panels.
- E. The auto dial system may be in the main or auxiliary car operating panel. The speaker and unit shall be mounted on the backside of the perforated stainless-steel plate cover.
- F. Each elevator shall have individual phone numbers.
- G. If the operator ends the call, the passenger shall be able to redial the telephone immediately.

2.39 CORRIDOR OPERATING DEVICES

- A. Fabricate faceplates for elevator operating and signal devices from not less than 3 mm (.125 in.) thick flat stainless steel with all edges beveled 15 degrees.
- B. Corridor push button faceplates shall be sized to accommodate corridor pictograph on faceplate. The centerline of the landing push buttons shall be 105 cm (42 in.) above the corridor floor.
- C. Elevator Corridor Call Station Pictograph shall be engraved in the faceplate.
- D. Fasten all car and corridor operating device and signal device faceplates with stainless steel tamperproof screws.
- E. All terminology and tactile symbols on the faceplate shall be raised .030 inch with contrasting background, on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. The handicapped markings with contrasting background shall be 12.5 mm (0.5 in.) high raised .075 mm (.030 in.) on the plate, square or rectangular. Use 6 mm (.25 in.) letters to identify all other devices in the faceplate. Surface mounted plates are not acceptable.
- F. Provide oneriser of landing call buttons for each elevator or group of elevators as shown on contract drawings.
- G. Each button shall contain an integral registration LED white light which shall illuminate upon registration of a call and shall extinguish when that call is answered.
- H. The direction of each button shall be legibly and indelibly identified by arrows not less than 12.5 mm (.50 in.) high in the face of each button.

- I. Landing push buttons shall not re-open the doors while the car and hoistway doors are closing at that floor, the call shall be registered for the next available elevator. Calls registered shall be canceled if closing doors are re-opened by means of "DOOR OPEN" button or infrared curtain unit.
- J. Provide emergency power indicator light, medical emergency card reader/key switch and indicator light, fire service recall key switch and indicator light, fire recall instruction, communication failure light, audible enunciator, and reset key switch in a separate fixture at the designated main floor.
- K. Submit design of hall pushbutton fixtures for approval.

2.40 DIGITAL CORRIDOR ARRIVAL LANTERN/POSITION INDICATOR

- A. Provide elevator with combination corridor lantern/position indicator digital display mounted over the hoistway entrances at each floor in healthcare facilities. Provide each terminal landing with "UP" or "DOWN", minimum 63 mm (2.5 in.) high digital arrow lanterns and each intermediate landing with "UP" and "DOWN" digital arrow lanterns. Each lens shall be LED illuminated of proper intensity, so shielded to illuminate individual lens only. The lenses in each lantern shall be illuminated green to indicate "UP" travel and red to indicate "DOWN" travel. Lanterns shall signal in advance of car arrival at the landing indicating the direction of travel. Corridor lanterns shall not be illuminated when a car passes a floor without stopping. Each lantern shall be equipped with an audible electronic chime which shall sound once for "UPWARD" bound car and twice for "DOWNWARD" bound car. Audible signal shall not sound when a car passes the floor without stopping. Provide adjustable sound level on audible signal. Car riding lanterns are not acceptable.
- B. Install alpha-numeric digital position indicator between the arrival lanterns. Indicator faceplate shall be stainless steel. Numerals shall be not less than 63 mm (2.5 in.) high with direction arrows. Cover plates shall be readily removable for re-lamping. The appropriate direction arrow shall be illuminated during entire travel of car in corresponding direction.

2.41 HOISTWAY ACCESS

- A. Provide hoistway access switches for elevator at top terminal landing to permit access to top of car, and at bottom terminal landing to

permit access to pit. Elevators with side slide doors, mount the access key switch 180 cm (6 ft) above the corridor floor in the wall next to the strike jamb.

- B. Exposed portion of each access switch or its faceplate shall have legible, indelible legends to indicate "UP", "DOWN", and "OFF" positions.
- C. Each access switch shall be a constant pressure cylinder type lock having not less than five pins or five stainless steel disc combination with key removable only when switch is in the "OFF" position.
- D. Lock shall not be operable by any other key which will operate any other lock or device used for any other purpose at the VA Medical Center.
- E. Arrange the hoistway switch to initiate and maintain movement of the car. When the elevator is operated in the down direction from the top terminal landing, limit the zone of travel to a distance not greater than the top of the car crosshead level with the top floor. Submit design and location of access switches for approval.
- F. Provide emergency access for all hoistway entrances, keyways for passenger and service elevators.

2.42 HOISTWAY ENTRANCES: PASSENGER/SERVICE ELEVATORS

- A. Provide complete entrances with sills, sill supports, hangers, hanger supports, tracks, angle struts, unit frames, door panels, fascia plates, toe guards, hardware, bumpers, sight guards, and wall anchors.
- B. Provide one piece extruded stainless steel sills grooved for door guides and recessed for fascia plates. Sills shall have overall height of not less than 19 mm (.75 in.) set true, straight, and level, with hoistway edges plumb over each other, and top surfaces flush with finished floor. Hoistway entrance frames and sills shall be grouted solid full length after installation.
- C. Construct hanger supports of not less than 9.375 mm (.375 in.) thick steel plate, and bolted to strut angles.
- D. Structural steel angles 75 mm x 75 mm x 9.375 mm (3 in. x 3 in. x .375 in.) shall extend from top of sill to bottom of floor beam above, and shall be securely fastened at maximum 45 cm (18 in.) on center and at each end with two bolts.
- E. Provide jambs and head soffits, of not less than 14-gauge stainless steel. Jambs and head soffits shall be bolted/welded construction and

provided with three anchors each side. Side jambs shall be curved. Radius of curvature shall be 88 mm (3.5 in.). Head jamb shall be square, and shall overhang corridor face of side jambs by 6 mm (.25 in.). Rigidly fasten jambs and head soffits to building structure and grouted solid. After installation, protect jambs and head soffits to prevent damage to finish during construction.

- F. Provide raised numerals or letters on cast, rear mounted plates for all openings. Numerals shall be a minimum of 50 mm (2 in.) high, located on each side of entrance frame, with centerline of 150 cm (5 ft) above the landing sill. The number plates shall contain Braille.
- G. Provide unique car number on every elevator entrance at designated main fire service floor level, minimum 75 mm (3 in.) in height.
- H. Provide passenger entrances with two speed side opening horizontal sliding doors.
 - 1. Door panels shall be flush hollow metal construction, not less than 32 mm (1.25 in.) thick, consisting of one continuous piece 16-gauge stainless steel on corridor side wrapped around the leading edge. Separate two plates by a sound-deadening material, and reinforce by steel shapes welded to the plates at frequent intervals. Reinforce panels as required for installation of hangers, power-operating and door-opening devices. Top and bottom of door panels shall have continuous stiffener channels welded in place. Reinforcement of the door panels shall be a minimum of 1.0 mm (0.04 in.) in thickness and of the hat section type.
 - a. Fire Rating: Entrance and doors shall be UL fire-rated for 1-1/2 hour.
 - b. Entrance Finish: Brushed Stainless Steel at doors and frames
 - 2. Hang doors on two-point suspension hangers having sealed ball bearing sheaves not less than 75 mm (3 in.) in diameter, made of non-metallic sound-reducing material. Equip hangers with adjustable ball-bearing rollers to take upward thrust of panels. Up thrust rollers shall be capable of being locked in position after adjustment to a maximum of .38 mm (.015625 in.) clearance. Provide the hanger sheaves with steel fire stops to prevent disengagement from tracks. Do not use hangers that are constructed integrally with the door panels.

3. Provide two removable non-metallic door gibs or other approved material guides and a separate fire gib at the bottom of each door panel.
 4. Reinforce each door panel for interlock mechanism, drive assembly, and closer. Provide relating devices to transmit motion from one door panel to the other.
 5. One door panel for each entrance shall bear a BOCA label, Underwriters' label or labels from other accredited test laboratories may be furnished provided they are based on fire test reports and factory inspection procedures acceptable to the COR.
 6. Fasten sight guard of 14-gauge stainless steel, extending full height of panel, to leading edge of fast speed panel of two-speed doors.
- I. Provide 14-gauge sheet steel fascia plates in hoistway to extend vertically from head of hanger support housing to sill above. Plates shall be 75 mm (3 in.) wider than door opening of elevator and reinforced to prevent waves and buckles. Below bottom terminal landing and over upper terminal landing provide shear guards beveled back to and fastened to the wall.
 - J. Equip each hoistway door with an electrical/mechanical interlock, functioning as hoistway unit system, to prevent operation of car until doors are locked in the closed position unless car is operating in leveling zone or hoistway access switch is used.
 - K. Wiring installed from the hoistway riser to each door interlock shall be NEC type SF-2 or equivalent.

2.43 CAR AND COUNTERWEIGHT GUIDES: PASSENGER/SERVICE ELEVATORS

- A. Install on car frame four adjustable roller guides each assembled on a substantial metal base, to permit individual alignment to the guide rails.
- B. Each guide shall consist of not less than three (3) wheels, each with a durable, resilient oil-resistant material tire rotating on ball bearings having sealed-in lubrication. Assemble rollers on a substantial metal base and mount to provide continuous spring pressure contact of all wheels with the corresponding rail surfaces under all conditions of loading and operation. Secure the roller guides at top and bottom on each side of car frame and counterweight frame. All

mounting bolts shall be fitted with nuts, flat washers, split lock washers, and if required, beveled washers.

- C. Provide sheet metal guards to protect rollers on top of car and counterweight.
- D. Minimum diameter of car rollers shall be 150 mm (6 in.). The entire elevator car shall be properly balanced to equalize pressure on all guide rollers. Cars shall be balanced in post-wise and front-to-back directions. Test for this balanced condition shall be witnessed at time of final inspection.
- E. Minimum diameter of counterweight rollers shall not be less than 100 mm (4 in.). Properly balance counterweight frame to equalize pressure on all guide rollers. The Contractor shall have the option of furnishing, for counterweight only, mechanically adjusted roller guide in lieu of spring-loaded roller guides as specified.
- F. Equip car and counterweight with an auxiliary guiding device for each guide shoe which shall prevent the car or counterweight from leaving the rails if the normal guides fail. These auxiliary guides shall not, during normal operation, touch the guiding surfaces of the rails. Fabricate the auxiliary guides from hot rolled steel plate and mount between the normal guide shoes and the car and counterweight frames. The auxiliary guides may be an extension of the normal guide shoe mounting plate if that plate is fabricated from hot rolled steel. The portion of the auxiliary guide which contacts the rail surfaces in the event of loss of the normal guides shall be lined with an approved bearing material to minimize damage to the rail guiding surfaces.

2.44 CAR FRAME: PASSENGER/SERVICE ELEVATORS

- A. Car frame shall be constructed of steel channel stiles, crosshead, gussets, braces, and cable hitch plate securely bolted and/or welded. The entire assembly shall be constructed to withstand unequal loading of platform. Car frame members shall be constructed to relieve the car enclosure of all strains.

2.45 CAR PLATFORM: PASSENGER/SERVICE ELEVATORS

- A. Construct the car platform to meet the requirements of class loading specified. The platform shall be designed to withstand the forces developed under the loading conditions specified. Provide car entrances with extruded stainless steel sill or better with machined or extruded guide grooves. Cover underside and all exposed edges of wood filled

platform with sheet metal of not less than 26-gauge, with all exposed joints and edges folded under. Fire resistant paint is not acceptable. Platform shall have flexible composition flooring not less than 3 mm (.125 in.) thick. For color, see Section 09 06 00, SCHEDULE FOR FINISHES and Color Schedule on the Construction Drawings. Adhesive material shall be type recommended by manufacturer of flooring. Lay flooring flush with threshold plate and base.

1. Flooring material to be F-1: Resilient (Rubber) Flooring Tile Flooring as described in the Color Schedule on the Construction Documents.

- B. Provide a platform guard (toe guard) of not less than 12-gauge sheet-steel on the entrance side, extend 75 mm (3 in.) beyond each side of entrance jamb. Securely brace platform guard to car platform, and bevel bottom edge at a 60-75-degree angle from horizontal. Install platform in the hoistway, so that the clearance between front edge and landing threshold shall not exceed 32 mm (1.25 in.).
- C. Isolate the platform from the car frame by approved rubber pads or other equally effective means.
- D. Provide adjustable diagonal brace rods to hold platform firmly within car suspension frame.
- E. Balance car front to back and side to side. Provide balancing frame and weights, properly located, to achieve the required true balance.
- F. Provide a bonding wire between frame and platform.

2.46 CAR ENCLOSURE: PASSENGER/SERVICE ELEVATORS

- A. Car enclosure shall have a dome height inside the cab of 2400 mm (8 ft).
- B. Securely fasten car enclosure to platform by through bolts located at intervals of not more than 450 mm (18 in.) running through an angle at the base of panels to underside of platform.
- C. Front return wall panel, entrance columns, entrance head-jamb and transom shall be 14-gauge brushed stainless steel. Transom shall be full width of cab. Side and rear walls shall be constructed of 14-gauge cold rolled steel. Coat exterior of walls with mastic sound insulation material approximately 2.5 mm (.10 in.) thick followed by a prime coat of paint.
- D. Finish of side and rear walls of passenger / service elevators shall be as follows:

1. Rear Wall: Non-removable vertical panels Brushed Stainless Steel.
 2. Side Walls: Non-removable vertical panels Brushed Stainless Steel.
 3. Car Skirting Finish: Brushed Stainless Steel.
 4. Car Front and Door Finish: Brushed Stainless Steel.
 5. Ceiling: Round, LED spotlights, Brushed Stainless Steel.
 6. Handrail: Round, bent ends, Brushed Stainless Steel:
 - a. Rails to be located on Back Wall and Side Walls of car enclosure.
 7. Threshold: stainless steel.
- E. Not Used.
- F. Construct canopy of not less than 12-gauge steel.
- G. Provide car top railings.
- H. Provide a hinged top emergency exit cover. Exit shall be unobstructed when open and shall have mechanical stops on the cover. Provide an exit switch to prevent operation of the elevator when the emergency exit is open.
- I. Provide duplex, GFCI protected receptacle in car. Locate flush-mounted receptacle on the centerline of the main car operating panel, 150 mm (6 in.) above the car floor.
- J. Lighting for passenger/service elevators:
 1. Provide stainless steel hanging ceiling frame. Construct frame of 3.125 mm (.125 in.) thick x 37.5 mm (1.50 in.) wide x 37.5 mm (1.50 in.) high "T" and "L" sections, divide ceiling into six panels.
 2. Provide LED illuminated car light fixtures above the ceiling panels. Maintain a minimum light level of 50-foot candles at 90 cm (36 in.) above the finished floor.
- K. Not Used.
- L. Provide a blower unit arranged to exhaust through an opening in the canopy. Provide a stainless or chrome plated fan grill on the interior side of the opening. Provide screening over intake and exhaust end of blower. Provide 2-speed fan, with rated air displacement of 250 cfm and 400 cfm at respective speeds. Mount fan on top of car with rubber isolation to prevent transmission of vibration to car structure. Provide a 3-position switch to control the unit in the service panel.
- M. Provide car enclosure with two sets of handrails with centerlines 75 cm and 105 cm (30 in. and 42 in.) above the car floor.

1. Locate handrails 37.5 mm (1.50 in.) from cab wall. Install handrails on side and rear walls. Conceal all handrail fastenings. Handrails shall be removable from inside the car enclosure..
- N. Provide passenger car with two-speed side opening horizontal sliding doors constructed the same as hoistway doors.
- O. Provide one set of protective pads for service elevator of sufficient length to completely cover two sides, rear walls and front return of cab interior. Pads shall consist of a minimum of 6 mm (.25 in.) thick glass fiber insulation securely sewn between flame resistant vinyl coated coverings. Color of the covering shall be approved by the COR. Provide stainless steel pad buttons or hooks, spaced at intervals of not more than 150 mm (18 in.) to adequately support pads.

2.47 POWER DOOR OPERATORS: PASSENGER/SERVICE ELEVATORS

- A. Provide a high-speed heavy-duty door operator to automatically open the car and hoistway doors simultaneously when the car is level with the floor, and automatically close the doors simultaneously at the expiration of the door-open time. Provide microprocessor door control with circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current. Motor shall be of the high-internal resistance type, capable of withstanding high currents resulting from stall without damage to door operator/motor. The door operator shall open the car door and hoistway door simultaneously, at a speed of 75 cm (2.5 ft) per second. Closing speed of the doors shall be 30 cm (1 ft) per second. Reversal of direction of the doors from the closing to opening operation, whether initiated by obstruction of the infrared curtain or the door "OPEN" button, shall be accomplished within 37.5 mm (1.50 in.) maximum of door movement. Emphasis is placed on obtaining quiet interlock and door operation; smooth, fast, dynamic braking for door reversals, and stopping of the doors at extremes of travel.
- B. Equip car doors with electric contact that prevents operation of car until doors are closed unless car is operating in leveling zone or hoistway access switch is used. Locate door contact to prevent its being tampered with from inside of car.
- C. Car and hoistway doors shall be manually operable in an emergency without disconnecting the power door operating equipment unless the car is outside the unlocking zone.

1. It shall not be possible for the doors to open by power unless the elevator is within the leveling zone.
 2. Provide infrared curtain unit. The device shall cause the car and hoistway doors to reverse automatically to the fully-open position should the unit be actuated while the doors are closing. Unit shall function when the doors are not closed, except during firefighter's operation.
- D. Should the doors be prevented from closing for more than a predetermined adjustable interval of 15 to 30 seconds by operation of the curtain unit, the doors shall stay open, the audio voice message and a buzzer located on the car shall sound only on automatic operation. Do not provide door nudging.
1. If an obstruction of the doors should not activate the photo-electric door control device and prevent the doors from closing for more than a predetermined adjustable interval of 15 to 30 seconds, the doors shall reverse to the fully open position and remain open until the "Door Close" button re-establishes the closing cycle.
- E. Provide door "OPEN" and "CLOSE" buttons. When the door "OPEN" button is pressed and held, the doors, if in the open position, shall remain open and if the doors are closing, they shall stop, reverse and re-open. Momentary pressure of the door "CLOSE" button shall initiate the closing of the doors prior to the expiration of the normal door open time.
- F. Door Operator: A closed loop permanent magnet VVVF high-performance door operator shall be provided to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlock shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.
- G. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Emergency devices and keys for opening doors from the landing shall be provided as required by local code.

- H. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.
- I. Door hangers and tracks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.
- J. Electronic Door Safety Device. The elevator car shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine work of other trades on which the work of this Specification depends. Report defects to the Contracting Officers Representative in writing that may affect the work of elevator contractor.
- B. Examine elevator hoistway openings for plumb, level, in line, and that elevator pit is proper size, waterproofed and drained with necessary access door, and ladder.
- C. Examine machine room for proper illumination, heating, ventilation, electrical equipment, and beams are correctly located complete with access stairs and door.
- D. If the Elevator Contractor requires changes in size or location of trolley beams or their supports and trap doors, etc., to accomplish their work, he must justify the changes, subject to approval of the Contracting officer, and include additional cost in their bid.
- E. Work required prior to the completion of the elevator installation:
 - 1. Supply of electric feeder wires to the terminals of the elevator control panel, including circuit breaker.

2. Provide light and GFCI outlets in the elevator pit and machine room.
 3. Furnish electric power for testing and adjusting elevator equipment.
 4. Furnish circuit breaker panel in machine room for car and hoistway lights and receptacles.
 5. Supply power for cab lighting and ventilation from an emergency power panel specified in Division 26, ELECTRICAL.
 6. Machine room enclosed and protected from moisture, with self-closing, self-locking door and access stairs.
 7. Provide fire extinguisher in machine room.
- F. Provide to General Contractor for installation; inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.

3.2 ARRANGEMENT OF EQUIPMENT

- A. Arrange equipment in machine room so that major equipment components can be removed for repair or replacement without dismantling or removing other equipment in the same machine room. Locate controller near and visible to its respective hoisting machine.

3.3 WORKMANSHIP, INSTALLATION, AND PROTECTION

- A. Installations shall be performed by Certified Elevator Mechanics and Apprentices to best possible industry standards. Details of the installation shall be mechanically and electrically correct. Materials and equipment shall be new and without imperfections.
- B. Recesses, cutouts, slots, holes, patching, grouting, refinishing to accommodate installation of equipment shall be included in the Contractor's work. All new holes in concrete shall be core drilled.
- C. Structural members shall not be cut or altered. Work in place that is damaged or defaced shall be restored equal to original new condition.
- D. Finished work shall be straight, plumb, level, and square with smooth surfaces and lines. All machinery and equipment shall be protected against dirt, water, or mechanical injury. At completion, all work shall be thoroughly cleaned and delivered in perfect unblemished condition.
- E. Sleeves for conduit and other small holes shall project 50 mm (2 in.) above concrete slabs.
- F. Hoist cables that are exposed to accidental contact in the machine room and pit shall be completely enclosed with 16-gauge sheet metal or expanded metal guards.

- G. Exposed gears, sprockets, and sheaves shall be guarded from accidental contact.

3.4 CLEANING

- A. Upon completion of installation and prior to final inspection, all equipment shall be thoroughly cleaned of grease, oil, cement, plaster, dust, and other debris.
- B. Clean machine room and equipment.
- C. Perform hoistway clean down.
- D. Prior to final acceptance remove protective coverings from finished or ornamental surfaces. Clean and polish surfaces regarding type of material.

3.5 PAINTING AND FINISHING

- A. All equipment, except specified as architectural finish, shall be painted one coat of approved color, conforming to manufacturer's standard.
- B. Hoist machine, motor, shall be factory painted with manufacturer's standard finish and color.
- C. Controller, sheave, car frame and platform, counterweight, beams, rails and buffers except their machined surfaces, cams, brackets and all other uncoated ferrous metal items shall be painted one factory primer coat or approved equal.
- D. Stencil or apply decal floor designations not less than 100 mm (4 in.) high on hoistway doors, fascia or walls within door restrictor areas. The color of paint used shall contrast with the color of the surfaces to which it is applied.
- E. Elevator hoisting machine, controller, governor, main line shunt trip circuit breaker, safetyplank, and cross head of car shall be identified by 100 mm (4 in.) high numerals and letters located as directed. Numerals shall contrast with surrounding color and shall be stenciled or decaled.
- F. Hoistway Entrances of Passenger, and Service Elevators:
 - 1. Door panels shall be given rust resistant treatment and a factory finish of one coat of baked-on primer and one factory finish coat of baked-on enamel.
 - 2. Fascia plates, top and bottom shear guards, dust covers, hanger covers, and other metalwork, including built-in or hidden work and structural metal, (except stainless steel entrance frames and

surfaces to receive baked enamel finish) shall be given one approved prime coat in the shop, and one field coat of paint of approved color.

G. Not Used

H. Elevator Cabs for Passenger and Service Elevators:

1. Interior and exterior steel surfaces shall be given rust resistant treatment before finish is applied.
2. Interior steel surfaces shall be factory finished with one coat of paint of approved color.
3. Give exterior faces of car doors one finish coat of paint of approved color.

I. Not Used.

3.6 PRE-TESTS AND TESTS

A. Pre-test the elevators and related equipment in the presence of the COR or his authorized representative for proper operation before requesting final inspection. Conduct final inspection at other than normal working hours, if required by COR.

1. Contracting Officer shall obtain the services of a third party QEI Certified Elevator Inspector. The QEI must utilize an Elevator Acceptance Inspection Form to record the results of inspection and all testing and to identify safety code and contract deficiencies. Specific values must be provided for all tests required by ASME A17.1, ASME A17.2, and contract documents. Upon completion of inspection and testing, the QEI must sign a copy of the completed form and provide to the Contracting Officer. Within 2 weeks of the inspection, the QEI must also prepare a formal inspection report, including all test results and deficiencies. Upon successful completion of inspection and testing, the QEI will complete, sign, and provide a certificate of compliance with ASME A17.1.
2. Government shall furnish electric power including necessary current for starting, testing, and operating machinery of each elevator.
3. Contractor shall furnish the following test instruments and materials on-site and at the designated time of inspection: properly marked certified test weights, voltmeter, amp probe, thermometers, direct reading tachometer, megohm meter, vibration meter, sound

- meter, light meter, stop watch, and a means of two-way communication.
- B. Inspect workmanship, equipment furnished, and installation for compliance with specification.
 - C. Balance Tests: The percent of counterbalance shall be checked by placing test weights in car until the car and counterweight are equal in weight when located at the mid-point of travel. If the actual percent of counter balance does not conform to the specification, the amount of counterweight shall be adjusted until conformance is reached.
 - D. Full-Load Run Test: Elevator shall be tested for a period of one-hour continuous run with full contract load in the car. The test run shall consist of the elevator stopping at every floor, in either direction of travel, for not less than five or more than ten seconds per floor.
 - E. Speed Test: The actual speed of the elevator shall be determined in both directions of travel with full contract load and no load in the elevator. Speed shall be determined by applying a certified tachometer to the car hoisting ropes or governor rope. The actual measured speed of the elevator with all loads in either direction shall be within three (3) percent of specified rated speed. Full speed runs shall be quiet and free from vibration and sway.
 - F. Temperature Rise Test: The temperature rise of the hoisting motor shall be determined during the full load test run. Temperatures shall be measured using thermometers. Under these conditions, the temperature rise of the equipment shall not exceed 50 degrees Centigrade above ambient temperature. Test shall start when all machine room equipment is within five (5) degrees Centigrade of the ambient temperature. Other tests for heat runs on motors shall be performed as prescribed by the Institute of Electrical and Electronic Engineers.
 - G. Car Leveling Test: Elevator car leveling devices shall be tested for accuracy of leveling at all floors with no load in car and with contract load in car, in both directions of travel. Accuracy of floor level shall be within plus or minus 3 mm (.125 in.) of level with landing floor for which the stop has been initiated regardless of load in car or direction of travel. The car leveling device shall automatically correct over travel as well as under travel and shall maintain the car floor within plus or minus 3 mm (.125 in.) of level with the landing floor regardless of change in load.

- H. Brake Test: The action of the brake shall be prompt and a smooth stop shall result in the up and down directions of travel with no load and rated load in the elevator. Down stopping shall be tested with 125 percent of rated load in the elevator.
- I. Insulation Resistance Test: The elevator's complete wiring system shall be free from short circuits and ground faults and the insulation resistance of the system shall be determined by use of megohm meter, at the discretion of the Elevator Inspector conducting the test.
- J. Safety Devices: Car and counterweight safety devices shall be tested.
- K. Overload Devices: Test all overload current protection devices in the system at final inspection.
- L. Limit Stops:
 - 1. The position of the car when stopped by each of the normal limit switches with no load and with contract load in the car shall be accurately measured.
 - 2. Final position of the elevator relative to the terminal landings shall be determined when the elevator has been stopped by the final limits. The lower limit stop shall be made with contract load in the elevator. Elevator shall be operated at inspection speed for both tests. Normal limit stopping devices shall be inoperative for the tests.
- M. Oil Buffer Tests: These tests shall be conducted with operating device and limit stops inoperative and with contract load in the elevator for the car buffer and with no load in the elevator for the counterweight buffer. Preliminary test shall be made at the lowest (leveling) speed. Final tests shall be conducted at contract speed. Buffers shall compress and return to the fully extended position without oil leakage.
- N. Operating and Signal System: The elevator shall be operated by the operating devices provided and the operation signals and automatic floor leveling shall function in accordance with requirements specified. Starting, stopping and leveling shall be smooth and comfortable without appreciable steps of acceleration or deceleration.
- O. Performance of the Elevator supervisory system shall be witnessed and approved by the elevator inspector and a representative of the COR.
- P. If equipment fails test requirements and a re-inspection is required, the Contractor shall be responsible for the cost of re-inspection;

salaries, transportation expenses, and per-diem expenses incurred by the elevator inspector and representative of the COR.

3.7 INSTRUCTION OF VA PERSONNEL

- A. Provide competent instruction to VA personnel regarding the operation of equipment and accessories installed under this contract, for a period equal to one eight-hour day. Instruction shall commence after completion of all work and at the time and place directed by the COR.
- B. Written instructions in triplicate relative to care, adjustments and operation of all equipment and accessories shall be furnished and delivered to the COR in independently bound folders. DVD recordings will also be acceptable. Written instructions shall include correct and legible wiring diagrams, nomenclature sheet of all electrical apparatus including location of each device, complete and comprehensive sequence of operation, complete replacement parts list of with descriptive literature, and identification and diagrams of equipment and parts. Information shall also include electrical operation characteristics of all circuits, relays, timers, electronic devices, and related characteristics for all rotating equipment.
- C. Provide supplementary instruction for any new equipment that may become necessary because of changes, modifications or replacement of equipment or operation under requirements of paragraph entitled "Warranty of Construction".

3.8 INSPECTION AND MAINTENANCE SERVICE: GUARANTEE PERIOD OF SERVICE

- A. Furnish complete inspection and maintenance service on entire elevator installation for a period of one (1) year after completion and acceptance of all the elevators in this specification by the COR. This maintenance service shall run concurrently with the warranty. Maintenance work shall be performed by Certified Elevator Mechanics and Apprentices.
- B. This contract will cover full maintenance including emergency call back service, inspections, and servicing the elevators listed in the schedule of elevators. The Elevator Contractor shall perform the following:
 - 1. Bi-weekly systematic examination of equipment.
 - 2. During each maintenance visit the Elevator Contractor shall clean, lubricate, adjust, repair and replace all parts as necessary to keep the equipment in like new condition and proper working order.

3. Furnishing all lubricant, cleaning materials, parts and tools necessary to perform the work required. Lubricants shall be only those products recommended by the manufacturer of the equipment.
 4. Equalizing tension, shorten or renew hoisting ropes.
 5. As required, motors, controllers, selectors, leveling devices, operating devices, switches on cars and in hoistways, hoistway doors and car doors or gate operating device, interlock contacts, guide shoes, guide rails, car door sills, hangers for doors, car doors or gates, signal system, car safety device, governors, tension sheaves, and buffers shall be cleaned, lubricated and adjusted.
 6. Guide rails, overhead sheaves and beams, counterweight frames, and bottom of platforms shall be cleaned every three months. Car tops and machine room floors shall be cleaned monthly. Accumulated rubbish shall be removed from the pits monthly. A general cleaning of the entire installation including all machine room equipment and hoistway equipment shall be accomplished quarterly. Cleaning supplies and vacuum cleaner shall be furnished by the Contractor.
 7. Maintain the performance standards set forth in this specification.
 8. The operational system shall be maintained to the standards specified hereinafter including any changes or adjustments required to meet varying conditions of hospital occupancy.
 9. Maintain smooth starting, stopping, and accurate leveling.
- C. Maintenance service shall not include the performance of work required because of improper use, accidents, and negligence for which the Elevator Contractor is not directly responsible.
- D. Provide 24-hour emergency call-back service that shall consist of promptly responding to calls within two hours for emergency service should a shutdown or emergency develop between regular examinations. Overtime emergency call-back service shall be limited to minor adjustments and repairs required to protect the immediate safety of persons and equipment in and about the elevator.
- E. Service and emergency personnel shall report to the COR or his authorized representative upon arrival at the hospital and again upon completion of the required work. A copy of the work ticket containing a complete description of the work performed shall be given to the COR or his authorized representative.

- F. The Elevator Contractor shall maintain a log book in the machine room.
The log shall list the date and time of all weekly examinations and all trouble calls. Each trouble call shall be fully described including the nature of the call, necessary correction performed or parts replaced.
- G. Written "Maintenance Control Program" shall be in place to maintain the equipment in compliance with ASME A17.1.

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10-01-18
Renovate Tower of Building 1
VAMC, Sioux Falls, SD
VA Project #438-18-102

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