



Specifications

Fargo VA Health Care System

2101 Elm Street North

Fargo, ND 58102

EHRM Infrastructure Upgrades, Tier 2

Issue for Bid Submittal

VA Contract No. 36C26319D0044

VA Station Project No. 437-21-210

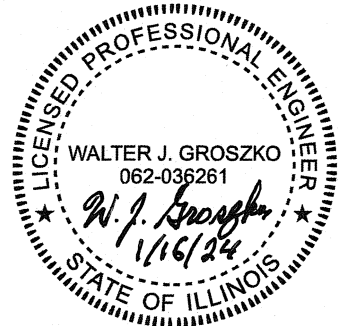
Bancroft-AE Project No. 22-113

Volume 1

Divisions 00-10

January 16, 2024

 *Bancroft*
BANCROFT ARCHITECTS + ENGINEERS
3300 Dundee Road | Northbrook, Illinois 60062
Office: 847-952-9362 | www.bancroft-ae.com



DIVISION 00

Fargo VA Health Care System
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EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-22

DEPARTMENT OF VETERANS AFFAIRS
VHA MASTER SPECIFICATIONS

TABLE OF CONTENTS
Section 00 01 10

SECTION NO.	DIVISION AND SECTION TITLES	DATE
	DIVISION 00 - SPECIAL SECTIONS	
00 01 10	Table of Contents	
00 01 15	List of Drawing Sheets	05-23
	DIVISION 01 - GENERAL REQUIREMENTS	
01 00 00	General Requirements	01-21
01 32 16.15	Project Schedules (Small Projects - Design/Bid/Build)	11-21
01 33 23	Shop Drawings, Product Data, and Samples	09-22
01 35 26	Safety Requirements	10-22
01 42 19	Reference Standards	11-20
01 45 29	Testing Laboratory Services	11-18
01 57 19	Temporary Environmental Controls	01-21
01 58 16	Temporary Interior Signage	07-15
01 74 19	Construction Waste Management	04-22
01 81 13	Sustainable Construction Requirements	10-17
01 91 00	General Commissioning Requirements	04-22
	DIVISION 02 - EXISTING CONDITIONS	
02 41 00	Demolition	08-17
02 65 00	Underground Storage Tank Removal	01-21
02 82 11	Traditional Asbestos Abatement	01-21
02 82 13.31	Glovebag Asbestos Abatement	01-21
02 83 33.13	Lead-Based Paint Removal and Disposal	01-21
	DIVISION 03 - CONCRETE	
03 30 00	Cast-in-Place Concrete	01-21
	DIVISION 04 - MASONRY	
04 05 13	Masonry Mortaring	10-17
04 05 16	Masonry Grouting	01-21
04 20 00	Unit Masonry	08-17
	DIVISION 05 - METALS	
05 12 00	Structural Steel Framing	11-18
05 31 00	Steel Decking	01-21

Contract No. 36C26319D0044
 Station Project No. 437-21-210
 Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
 Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-22

SECTION NO.	DIVISION AND SECTION TITLES	DATE
	DIVISION 06 - WOOD, PLASTICS AND COMPOSITES	
06 10 00	Rough Carpentry	10-17
	DIVISION 07 - THERMAL AND MOISTURE PROTECTION	
07 01 50.19	Preparation for Re-Roofing	01-21
07 21 13	Thermal Insulation	01-21
07 22 00	Roof and Deck Insulation	01-21
07 53 23	Ethylene-Propylene-Diene-Monomer Roofing	01-21
07 60 00	Flashing and Sheet Metal	01-21
07 71 00	Roof Specialties	10-17
07 81 00	Applied Fireproofing	01-21
07 84 00	Firestopping	04-22
07 92 00	Joint Sealants	
	DIVISION 08 - OPENINGS	
08 11 13	Hollow Metal Doors and Frames	01-21
08 14 00	Interior Wood Doors	01-21
08 31 13	Access Doors and Frames	04-22
08 56 53	Blast Resistant Façade Systems	01-21
08 71 00	Door Hardware	05-22
08 90 00	Louvers and Vents	01-21
	DIVISION 09 - FINISHES	
09 05 16	Subsurface Preparation for Floor Finishes	01-21
09 22 16	Non-Structural Metal Framing	06-18
09 29 00	Gypsum Board	04-20
09 51 00	Acoustical Ceilings	12-18
09 65 13	Resilient Base and Accessories	01-21
09 65 19	Resilient Tile Flooring	05-18
09 65 20	Conductive Electro-Static Dissipative Resilient Tile Flooring	
09 91 00	Painting	01-21
	DIVISION 10 - SPECIALTIES	
10 14 00	Signage	01-21
10 26 00	Wall and Door Protection	01-21
10 44 13	Fire Extinguisher Cabinets	08-18
	DIVISION 11 - EQUIPMENT (NOT USED)	

Contract No. 36C26319D0044
 Station Project No. 437-21-210
 Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
 Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-22

SECTION NO.	DIVISION AND SECTION TITLES	DATE
	DIVISION 12 - FURNISHINGS (NOT USED)	
	DIVISION 13 - SPECIAL CONSTRUCTION (NOT USED)	
	DIVISION 14- CONVEYING EQUIPEMENT (NOT USED)	
	DIVISION 21- FIRE SUPPRESSION	
21 08 00	Commissioning of Fire Suppression System	11-16
21 13 13	Wet-Pipe Sprinkler Systems	06-15
21 13 16	Dry-Pipe Sprinkler Systems	01-15
21-22-00	Clean Agent Fire Suppression Systems	05-15
	DIVISION 22 - PLUMBING	
22 05 11	Common Work Results for Plumbing	09-20
22 05 23	General Duty Valves for Plumbing Piping	09-20
22 08 00	Commissioning of Plumbing Systems	11-16
22 11 00	Facility Water Distribution	05-21
22 13 00	Facility Sanitary and Vent Piping	09-20
22 14 00	Facility Storm Drainage	09-15
22 40 00	Plumbing Fixtures	09-15
	DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)	
23 05 11	Common Work Results for HVAC	04-22
23 05 12	General Motor Requirements for HVAC and Steam Generation Equipment	02-20
23 05 41	Noise and Vibration Control for HVAC Piping and Equipment	02-20
23 05 93	Testing, Adjusting, and Balancing for HVAC	02-20
23 07 11	HVAC and Boiler Plant Insulation	02-20
23 08 00	Commissioning of HVAC Systems	04-22
23 09 23	Direct-Digital Control System for HVAC	09-11
23 10 00	Facility Fuel Oil Systems	04-20
23 23 00	Refrigerant Piping	02-20
23 31 00	HVAC Ducts and Casings	02-20
23 34 00	HVAC Fans	02-20
23 81 00	Decentralized Unitary HVAC Equipment	03-20
23 81 23	Computer-Room Air-Conditioners	03-20
23 82 00	Convection Heating and Cooling Units	03-20

Contract No. 36C26319D0044
 Station Project No. 437-21-210
 Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
 Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-22

SECTION NO.	DIVISION AND SECTION TITLES	DATE
	DIVISION 25 - INTEGRATED AUTOMATION (NOT USED)	
	DIVISION 26 - ELECTRICAL	
26 05 11	Requirements for Electrical Installations	01-16
26 05 13	Medium-Voltage Cables	01-17
26 05 19	Low-Voltage Electrical Power Conductors and Cables	01-17
26 05 26	Grounding and Bonding for Electrical Systems	01-17
26 05 33	Raceway and Boxes for Electrical Systems	01-18
26 05 41	Underground Electrical Construction	01-17
		11-16
26 09 23	Lighting Controls	01-18
26 12 19	Pad-Mounted, Liquid-Filled, Medium-Voltage Transformers	01-18
26 24 13	Distribution Switchboards	01-18
26 24 16	Panelboards	01-18
26 25 11	Busways	01-17
26 27 26	Wiring Devices	01-18
26 32 13	Engine Generators	01-18
26 33 53	Static Uninterruptible Power Supply	01-17
26 43 13	Surge Protective Devices	01-17
26 51 00	Interior Lighting	01-18
	DIVISION 27 - COMMUNICATIONS	
27 05 26	Grounding and Bonding for Communications Systems	06-15
27 05 33	Raceways and Boxes for Communications Systems	10-18
27 05 36	Cable Trays for Communication Systems	12-22
27 05 53	Identification for Communication Systems	12-22
27 10 00	Structured Cabling	12-22
27 11 16	Communication Cabinets, Racks, Frames, and Enclosures	12-22
27 11 19	Communication Termination Blocks and Patch Panels	12-22
27 11 26	Communication Rack Mounted Power Protection and Power Strips	12-22
27 13 13	Communications Copper Backbone Cabling	12-22
27 13 13.13	Communications Copper Cable Splicing and Terminations	12-22
27 13 23	Communications Optical Fiber Backbone Cabling	12-22
27 13 23.13	Communications Optical Fiber Cable Splicing and Terminations	12-22
27 15 13	Communications Copper Horizontal Cabling	12-22
27 16 19	Communications Patch Cords, Station Cords, and Cross Connect wire	12-22
27 78 00	Closeout Submittals for Communications	

Contract No. 36C26319D0044
 Station Project No. 437-21-210
 Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
 Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-22

SECTION NO.	DIVISION AND SECTION TITLES	DATE
	DIVISION 28 - ELECTRONIC SAFETY AND SECURITY	
28 05 00	Common Work Results for Electronic Safety and Security	04-18
28 05 13	Conductors and Cables for Electronic Safety and Security	10-18
28 05 26	Grounding and Bonding for Electronic Safety and Security	09-11
28 05 28.33	Conduits and Backboxes for Electronic Safety and Security	09-11
28 08 00	Commissioning of Electronic Safety and Security Systems	11-16
28 13 00	Physical Access Control System	10-11
28 23 00	Video Surveillance	09-11
28 31 00	Fire Detection and Alarm	10-11
	DIVISION 31 - EARTHWORK	
31 11 00	Clearing and Grubbing	07-16
31 13 00	Selective Tree Removal and Trimming	07-16
31 20 00	Earthwork	07-16
31 23 00	Excavation and Fill	07-16
31 23 33	Trenching and Backfilling	07-16
	DIVISION 32 - EXTERIOR IMPROVEMENTS	
32 05 23	Cement and Concrete for Exterior Improvements	08-16
32 12 16	Not Used(refer to 32 13 00 in lue of asphalt)	09-15
32 13 00	Rigid Paving	06-18
32 16 13	Concrete Curbs and Gutters	06-18
		06-18
32 31 40	High Security Fences and Gates	06-18
32 84 00	Planting Irrigation	06-18
32 90 00	Planting	08-16
	DIVISION 33 - UTILITIES	
33 10 00	Water Utilities	03-17
33 40 00	Storm Sewer Utilities	12-17
33 46 13	Foundation Drainage	10-11
	DIVISION 34 - TRANSPORTATION	
34 75 13.13	Active Vehicle Barriers	08-16
	DIVISION 48 - Electrical Power Generation (NOT USED)	

Contract No. 36C26319D0044
 Station Project No. 437-21-210
 Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-05-23

SECTION 00 01 15
LIST OF DRAWING SHEETS

The drawings listed below accompanying this specification form a part of the contract.

<u>Drawing No.</u>	<u>Title</u>
GENERAL	
GI-001	GENERAL - COVER SHEET
GI-002	GENERAL - DRAWING INDEX
GI-003	GENERAL - FARGO VAHCS CONSTRUCTION CRITERIA
GI-004	GENERAL - SITE ORIENTATION AND STAGING PLAN
GI-005	GENERAL - CODE AND BUILDING INFORMATION
GI-006	GENERAL - FOURTH FLOOR DATA CENTER - LIFE SAFETY PLAN
GI-007	GENERAL - BUILDING 46 - IT DEPARTMENT - LIFE SAFETY PLAN
GI-008	GENERAL - B1- UTILITY ROOMS - LIFE SAFETY PLAN
GI-009	GENERAL - B1- UTILITY ROOMS - LIFE SAFETY PLAN
GI-011	GENERAL - CONTRACTOR & BOD PROTOCOL NOTES
GI-012	GENERAL - PROTECTION PROTOCOLS AND MISCELLANEOUS NOTES
GI-013	GENERAL - GENERAL NOTES & SYMBOLS
GI-014	GENERAL - ABBREVIATIONS SYMBOLS LEGENDS AND MOUNTING HEIGHTS
GI-101	GENERAL - INFECTION CONTROL CLASS IV AND GENERAL NOTES
GI-102	GENERAL - INFECTION CONTROL - SAMPLE ICRA PERMIT AND FORMS
GI-103	GENERAL - INFECTION CONTROL - SAMPLE PCRA & ILSM FORMS
GI-104	GENERAL - INFECTION CONTROL - SAMPLE PCRA & ILSM FORMS
GI-105	GENERAL - INFECTION CONTROL - SAMPLE PCRA & ILSM FORMS
GI-106	GENERAL - INFECTION CONTROL - SAMPLE PCRA & ILSM FORMS
GI-107	GENERAL - INFECTION CONTROL - SAMPLE PCRA & ILSM FORMS
GI-108	GENERAL - INFECTION CONTROL - SAMPLE PCRA & ILSM FORMS
GI-109	GENERAL - INFECTION CONTROL - SAMPLE ILSM FORMS
GI-201	GENERAL - TRAFFIC MANAGEMENT
GI-201A	GENERAL - CONSTRUCTION SEQUENCE OF WORK NOTES
GI-202	GENERAL - CONSTRUCTION SEQUENCE OF WORK - BASEMENT
GI-203	GENERAL - CONSTRUCTION SEQUENCE OF WORK - FIRST FLOOR
GI-204	GENERAL - CONSTRUCTION SEQUENCE OF WORK - SECOND FLOOR
GI-205	GENERAL - CONSTRUCTION SEQUENCE OF WORK - THIRD FLOOR
GI-206	GENERAL - CONSTRUCTION SEQUENCE OF WORK - FOURTH FLOOR
GI-207	GENERAL - CONSTRUCTION SEQUENCE OF WORK - ROOF

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

List of Drawing Sheets

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-05-23

GI-208 GENERAL - CONSTRUCTION SEQUENCE OF WORK - OUTBUILDING

CIVIL

C-100 CIVIL - COVER SHEET
C-101 CIVIL - NOTES
C-200 CIVIL - DEMOLITION NOTES
C-300 CIVIL - GRADING & DRAINAGE PLAN
C-400 CIVIL - UTILITY PLAN
C-500 CIVIL - DETAILS
C-600 CIVIL - SECTIONS

STRUCTURAL

S-100 GENERAL STRUCTURAL NOTES
S-200 STRUCTURAL - PARTIAL SITE PLAN
S-202 STRUCTURAL - PARTIAL ROOF PLAN
S-203 STRUCTURAL - PARTIAL FRAMING PLANS
S-501 STRUCTURAL - CONCRETE DETAILS
S-502 STRUCTURAL - CONCRETE DETAILS
S-701 STRUCTURAL - STEEL DETAILS
S-702 STRUCTURAL - STEEL DETAILS

HAZARDOUS ABATEMENT

ENV-01 ABATEMENT PLAN - FOURTH FLOOR

ARCHITECTURE

AS-B1-101 ARCHITECTURAL - BUILDING 1-9-46 - BASEMENT PLAN
AS-B40-101 ARCHITECTURAL - BUILDING 40 - BASEMENT PLAN
AS-B1-111 ARCHITECTURAL - BUILDING 1-9-46 - FIRST FLOOR PLAN
AS-B1-121 ARCHITECTURAL - BUILDING 1-9-46 - SECOND FLOOR PLAN
AS-B1-131 ARCHITECTURAL - BUILDING 1-9-46 - THIRD FLOOR PLAN
AS-B1-141 ARCHITECTURAL - BUILDING 1-9-46 - FOURTH FLOOR PLAN
AS-B1-161 ARCHITECTURAL - BUILDING 1-9-46 - ROOF PLAN
AS-B1-201 ARCHITECTURAL - B1 - ARCH SITE DEMO PLAN - NORTH DOCK
AS-B1-202 ARCHITECTURAL - B1 - ARCH SITE PLAN - NORTH DOCK
AS-B1-203 ARCHITECTURAL - B1 - BE-98, BE-97, BE-35, BE-38A, BE-38B DEMO PLAN
AS-B1-204 ARCHITECTURAL - B1 - BE-98, BE-97, BE-35, BE-38A, BE-38B PLAN
AS-B1-205 ARCHITECTURAL - B1 - SITE SECURITY PLAN
AS-B1-206 ARCHITECTURAL - B1 - NORTH LOADING DOCK - SITE SECURITY PLAN
AS-B1-207 ARCHITECTURAL - B1 - SOUTH LOADING DOCK - SITE SECURITY PLAN
AS-B1-221 ARCHITECTURAL - B1 - PARTIAL ROOF PLANS
AS-B1-231 ARCHITECTURAL - B1 - THIRD FLOOR REFLECTED CEILING PLAN
AS-B1-232 ARCHITECTURAL - B1 - THIRD FLOOR REFLECTED CEILING PLAN

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

List of Drawing Sheets

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-05-23

AS-B1-241	ARCHITECTURAL - B1 - FOURTH FLOOR DEMOLITION PLAN - DATA CENTER
AS-B1-242	ARCHITECTURAL - B1 - FOURTH FLOOR PLAN - DATA CENTER
AS-B1-243	ARCHITECTURAL - B1 - FOURTH FLOOR DEMO CEILING PLAN -DATA CENTER
AS-B1-244	ARCHITECTURAL - B1 - FOURTH FLOOR CEILING PLAN - DATA CENTER
AS-B1-245	ARCHITECTURAL - B1 - FOURTH FLOOR TRUSS CEILING PLAN
AS-B1-246	ARCHITECTURAL - B1 - ENLARGED FOURTH FLOOR PLAN
AS-B1-251	ARCHITECTURAL - B1 - DEMOLITION ROOF PLAN - DATA CENTER
AS-B1-252	ARCHITECTURAL - B1 - ROOF PLAN - DATA CENTER
AS-B46-201	ARCHITECTURAL - B46 - BASEMENT DEMO PLAN - IT DEPARTMENT
AS-B46-202	ARCHITECTURAL - B46 - BASEMENT FLOOR PLAN - IT DEPARTMENT
AS-B46-203	ARCHITECTURAL - B46 - BASEMENT CEILING DEMO PLAN - IT DEPARTMENT
AS-B46-204	ARCHITECTURAL - B46 - BASEMENT CEILING PLAN - IT DEPARTMENT
AS-B46-211	ARCHITECTURAL - B46 - FIRST FLOOR DEMO & NEW PLAN - LOBBY
AS-B46-221	ARCHITECTURAL - B46 - SECOND FLOOR- ROOF DEMO PLAN
AS-B46-222	ARCHITECTURAL - B46 - SECOND FLOOR - ROOF PLAN
AS-B1-301	ARCHITECTURAL - BE-98 GENERATOR ROOM - EXTERIOR ELEVATIONS
AS-B1-302	ARCHITECTURAL - B1 - BLAST MITIGATION ENLCOSURE ELEVATIONS
AS-B1-303	ARCHITECTURAL - B1 - ELEVATIONS & SECTIONS - DATA CENTER
AS-B1-304	ARCHITECTURAL - B1 - INTERIOR ELEVATIONS - GENERATOR RM. BE-98
AS-B1-305	MAIN COMPUTER ROOM - SECTIONS
AS-B1-306	ARCHITECTURAL - B1 - SECTIONS - GENERATOR RM. BE-98 & UPS BE-97
AS-B3-101	ARCHITECTURAL - B3,11,13 & 30 - FLOOR PLANS
AS-B51-101	ARCHITECTURAL - B51,52,56 - FLOOR PLANS
AS-401	ARCHITECTURAL - BLAST MITIGATION BARRIER DETAILS
AS-501	ARCHITECTURAL - PARTITION TYPES
AS-502	ARCHITECTURAL - DETAILS
AS-503	ARCHITECTURAL - WINDOW INFILL
AS-601	ARCHITECTURAL - DOOR & FRAME SCHEDULE
AS-611	ARCHITECTURAL - FINISH SCHEDULE
AS-621	ARCHITECTURAL - SIGNAGE SCHEDULE

FIRE PROTECTION

FX-001	FIRE PROTECTION GENERAL NOTES, ABBREVIATIONS, AND LEGEND
FXD-B01-104	FIRE PROTECTION - BUILDING 1 - ENLARGED 4TH FLOOR PLAN - DEMO
FXD-B46-100	FIRE PROTECTION - BUILDING 46 - ENLARGED BASEMENT PLAN - DEMO
FX-B01-100	FIRE PROTECTION - BUILDING 1 - EMERGENCY GENERATOR - BASEMENT
FX-B01-104	FIRE PROTECTION - BUILDING 1 - ENLARGED FOURTH FLOOR PLAN
FX-B46-100	FIRE PROTECTION - BUILDING 46 - ENLARGED BASEMENT PLAN
FX-500	FIRE PROTECTION DETAILS

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

List of Drawing Sheets

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-05-23

FX-501

FIRE PROTECTION DETAILS

PLUMBING

P-001

PLUMBING GENERAL NOTES, ABBREVIATIONS, AND LEGEND

PD-B01-100

PLUMBING - BUILDING 1 - BASEMENT DEMOLITION PLAN

PD-B01-103

PLUMBING - BUILDING 1 - THIRD FLOOR DEMOLITION PLAN

PD-B01-104

PLUMBING - BUILDING 1 - FOURTH FLOOR DEMOLITION PLAN

PD-B01-105

PLUMBING - BUILDING 1 - ROOF DEMOLITION PLAN

PD-B46-100

PLUMBING - BUILDING 46 - BASEMENT DEMOLITION PLAN

P-B01-100

PLUMBING PLAN - BUILDING 1 - BASEMENT

P-B01-103

PLUMBING PLAN - BUILDING 1 - THIRD FLOOR

P-B01-104

PLUMBING - BUILDING 1 - ENLARGED FOURTH FLOOR PLAN

P-500

PLUMBING DETAILS

P-501

PLUMBING DETAILS

MECHANICAL

M-001

MECHANICAL - GENERAL NOTES, SYMBOLS AND ABBREVIATIONS

MVD-B01-104

MECHANICAL - BLDG 1 - ENLARGED PLAN - FOURTH FLOOR - DEMOLITION

MVD-B46-100

MECHANICAL VENTILATION DEMOLITION PLAN - BUILDING 46 - BASEMENT

MPD-B46-100

MECHANICAL PIPE DEMOLITION PLAN-BUILDING 46-BASEMENT

MPD-B46-101

MECHANICAL PIPE DEMOLITION PLAN-BUILDING 46-FIRST FLOOR

MPD-B46-102

MECHANICAL PIPE DEMOLITION PLAN BUILDING 46 - SECOND FLOOR

MV-B01-100

MECHANICAL - BUILDING 1 - EM. GEN. ENLARGED PLAN - BASEMENT

MV-B01-101

MECHANICAL - BUILDING 1 - FIRST FLOOR PLAN

MV-B01-102

MECHANICAL - BUILDING 1 - EM. GEN. ENLARGED PLAN - SECOND FLOOR

MV-B01-103

MECHANICAL - BUILDING 1 - THIRD FLOOR & ROOF PLAN

MV-B01-104

MECHANICAL - BUILDING 1 - ENLARGED PLAN - FOURTH FLOOR

MP-B46-100

MECHANICAL PIPE PLAN - BUILDING 46 - BASEMENT

MP-B46-101

MECHANICAL PIPE PLAN - BUILDING 46 - FIRST FLOOR

MP-B46-102

MECHANICAL PIPE PLAN - BUILDING 46 - SECOND FLOOR - ROOF

M-500

MECHANICAL DETAILS

M-501

MECHANICAL DETAILS

M-502

MECHANICAL DETAILS

M-503

MECHANICAL DETAILS

M-600

MECHANICAL SCHEDULES

M-601

MECHANICAL SCHEDULES

M-701

MECHANICAL CONTROLS

M-702

MECHANICAL CONTROLS

ELECTRICAL

E001

ELECTRICAL - GENERAL NOTES

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

List of Drawing Sheets

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-05-23

E002	ELECTRICAL - SYMBOLS AND ABBREVIATION
EPD-B1-101	ELECTRICAL - OVERALL BASEMENT DEMOLITION PLAN
EP-B1-101	ELECTRICAL - OVERALL BASEMENT PLAN
EPD-B1-201	ELECTRICAL - BLDG-1-9-46 - ENLARGED DEMO PLAN - BASEMENT
EP-B1-201	ELECTRICAL - BLDG-1 - BASEMENT 4.16KV AND FEEDERS 208V
EP-B1-202	ELECTRICAL - BLDG-1 - UPS ROOM ENLARGED PLAN
EP-B1-203	ELECTRICAL - BLDG-1 - GENERATOR ROOM ENLARGED PLAN
EP-B1-204	ELECTRICAL - BLDG-1 - OUTDOOR INSTALLATION
EP-B1-205	ELECTRICAL - B1 - SOUTH LOADING DOCK SECURITY GATE PLAN
EP-B1-401	ELECTRICAL - BLDG-1-9-46 - ENLARGED PLANS - BASEMENT
EP-B1-111	ELECTRICAL - OVERALL FIRST FLOOR PLAN
EP-B1-411	ELECTRICAL - BLDG-1-9-46 - ENLARGED PLANS - FIRST FLOOR
EP-B1-121	ELECTRICAL - OVERALL SECOND FLOOR PLAN
EP-B1-421	ELECTRICAL - BLDG-1-9-46 - ENLARGED PLANS - SECOND FLOOR
EP-B1-131	ELECTRICAL - OVERALL THIRD FLOOR PLAN
EP-B1-231	ELECTRICAL - BLDG-1 - THIRD FLOOR & ROOF POWER PLAN
EP-B1-431	ELECTRICAL - BLDG-1-9-46 - ENLARGED PLANS - THIRD FLOOR
EP-B1-141	ELECTRICAL - OVERALL FOURTH FLOOR PLAN
EP-B1-441	ELECTRICAL - BLDG-1-9-46 - ENLARGED PLANS - FOURTH FLOOR
ELD-B1-231	ELECTRICAL - BLDG-1 - THIRD FLOOR LIGHTING DEMO PLAN
EL-B1-232	ELECTRICAL - BLDG-1 - THIRD FLOOR LIGHTING PLAN
EPD-B1-241	ELECTRICAL - BLDG-1 - FOURTH FLOOR POWER DEMO - DATA CENTER
EP-B1-242	ELECTRICAL - BLDG-1 - FOURTH FLOOR POWER PLAN - DATA CENTER
ELD-B1-243	ELECTRICAL - BLDG-1 - FOURTH FLOOR LIGHTING DEMO - DATA CENTER
EL-B1-244	ELECTRICAL - BLDG-1 - FOURTH FLOOR LIGHTING PLAN - DATA CENTER
EP-B1-151	ELECTRICAL - OVERALL FIFTH FLOOR PLAN
EP-B1-451	ELECTRICAL - BLDG-1-9-46 - ENLARGED PLANS - PENTHOUSE
EPD-B46-402	ELECTRICAL - BUILDING 46 SECOND FLOOR ROOF
EPD-B46-403	ELECTRICAL - UPS SYSTEM A ROOM BC-50A AND BC-60 DEMOLITION
EP-B46-403	ELECTRICAL - UPS SYSTEM A ROOM BC-50A AND BC-60
EFD-B1-244	ELECTRICAL - FIRE ALARM DEMOLITION PLAN
EF-B1-244	ELECTRICAL - BLDG-1 - FOURTH FLOOR FIRE ALARM PLAN - DATA CENTER
EP-B40-101	ELECTRICAL - BLDG-40 - ENLARGED POWER PLAN - FIRST FLOOR
EP-B40-102	ELECTRICAL - BLDG-40 - ENLARGED POWER PLAN - SECOND FLOOR
E501	ELECTRICAL - DETAILS
E502	ELECTRICAL - DETAILS
EP500	ELECTRICAL - UPS EM POWER FAILOVER SCENARIOS
E601	ELECTRICAL - EQ MCR AND EM GEN SWITCHBOARD SCHEDULES

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

List of Drawing Sheets

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-05-23

E602	ELECTRICAL - EQUIPMENT, LIGHTING AND UPS SYSTEM SCHEDULES
E603	ELECTRICAL - EMERGENCY PANEL SCHEDULES
E604	ELECTRICAL - UPS-A PANELS WIRING SCHEDULE
E605	ELECTRICAL - EMERGENCY PANELS WIRING SCHEDULE
ED606	ELECTRICAL - BC-50 DATA CENTER PANEL SCHEDULES DEMO
E606	ELECTRICAL - DATA CENTER PANEL SCHEDULES
E607	ELECTRICAL - DATA CENTER PANEL SCHEDULES
ED707	ELECTRICAL - UPS SYSTEM A - ROOM BC-50A - DEMOLITION
E707	ELECTRICAL - MCR MONOLITHIC UPS-A & UPS-B BLOCK DIAGRAM
E708	ELECTRICAL - EM GEN 46 SWBD 46EE-SWBD, UPS-A AND UPS-B

ICT

TT-001	ICT - GENERAL NOTES, SYMBOLS + ABBREVIATIONS
TT- 202	ICT - CONSTRUCTION SEQUENCE OF WORK - BASEMENT
TT-B01-101	ICT - BUILDING 1-9-46 - BASEMENT ROUTING PLAN
TT-B01-111	ICT - BUILDING1-9-46 - FIRST ROUTING PLAN
TT-B01-121	ICT - BUILDING 1-9-46 - SECOND ROUTING PLAN
TT-B01-131	ICT - BUILDING 1-9-46 - THIRD ROUTING PLAN
TT-B01-141	ICT - BUILDING 1-9-46 - FOURTH ROUTING PLAN
TT-B01-151	ICT - BUILDING 1-9-46 - PENTHOUSE ROUTING PLAN
TT-B01-401	ICT - BUILDING 1-9-46 - ENLARGED PLAN - BASEMENT
TT-B01-402	ICT - BUILDING 1-9-46 - MCR ENLARGED PLAN
TT-B01-403	ICT - BUILDING 1-9-46 - MCR ENLARGED CABLE TRAY PLAN
TT-B01-404	ICT - BUILDING 1-9-46 - MCR ENLARGED PLAN
TT-B01-405	ICT - BUILDING 1-9-46 - MCR ENLARGED PLAN
TT-B01-406	ICT - BUILDING 1-9-46 - MCR ENLARGED SECURITY
TT-B01-407	ICT - BUILDING 1 - SECTIONS - MCR
TT-B01-408	ICT - BUILDING 1 - SECTIONS - MCR
TT-B03-101	ICT - BUILDING 3 - OVERALL ROUTING PLAN
TT-B10-101	ICT - BUILDING 10 - OVERALL ROUTING PLAN
TT-B11-101	ICT - BUILDING 11 - OVERALL ROUTING PLAN
TT-B12-101	ICT - BUILDING 12 - OVERALL ROUTING PLAN
TT-B13-101	ICT - BUILDING 13 - OVERALL ROUTING PLAN
TT-B30-101	ICT - BUILDING 30 - OVERALL ROUTING PLAN
TT-B40-101	ICT - BUILDING 40 - OVERALL ROUTING PLAN
TT-B40-102	ICT - BUILDING 40 - OVERALL ROUTING PLAN
TT-B51-101	ICT - BUILDING 51 - OVERALL ROUTING PLAN
TT-B52-101	ICT - BUILDING 52 - OVERALL ROUTING PLAN
TT-B56-101	ICT - BUILDING 56 - OVERALL ROUTING PLAN

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

List of Drawing Sheets

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-05-23

TT-500	ICT - DETAILS
TT-501	ICT - DETAILS
TT-502	ICT - DETAILS
TT-503	ICT - DETAILS
TT-504	ICT - DETAILS
TT-505	ICT - DETAILS
TT-600	ICT - SCHEMATIC
TT-601	ICT - EXISTING SITE PLAN
TT-602	ICT - RISER - BACKBONE CABLING RISER DIAGRAM (1 OF 2)
TT-603	ICT - RISER - BACKBONE CABLING RISER DIAGRAM (2 OF 2)

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DIVISION 01

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

SECTION 01 00 00
GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SAFETY REQUIREMENTS

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

1.2 GENERAL INTENTION

- A. Contractor shall completely prepare buildings and campus for operations, including demolition and removal of existing portions of structures, and furnish labor and materials and perform work for Fargo VA Health Care System - EHRM Infrastructure Upgrades, Tier 2 - 437-21-210 as required by drawings and specifications.
- B. Visits to the site by Bidders through Contracting Officer only. Only one organized site visit shall be conducted per FAR 52.236-27 Alternate I.
- C. The office of Bancroft Architects and Engineers, 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 their duly authorized representative.
- D. Before placement and installation of work subject to tests by testing laboratory retained by General Contractor and approved by VA, the Contractor shall notify the COR in sufficient time to enable personnel to be present at the site in time for witnessing taking and testing of specimens and field inspection. Such prior notice shall be not less than seven workdays unless otherwise designated by the COR.
- E. All employees of general contractor and subcontractors shall comply with VA security management program.
- F. Contractor Work Hours
1. Normal working hours for this contract will be from 8:00 a.m. to 4:30 p.m. (local time) Monday through Friday, except for weekends and established Federal Holidays.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

2. Performing on-site work outside normal working hours will require approval from the Contracting Officer and the Contracting Officer's Representative (COR). Requests shall be submitted via email at least 72 hours prior to the requested date and at no additional cost to the Government. Approvals are subject to the availability of on-site staff.

1.3 STATEMENT OF BID ITEM(S)

- A. ITEM I, GENERAL CONSTRUCTION: BASE BID 1: Work includes general construction, interior alterations, exterior building alterations, paving, walks, grading, drainage, necessary removal of existing structures and construction and certain other items. Refer to drawings and Statement of Work.

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.
3. VA Directive 6500 requires that Contractors working in IT spaces must be escorted by personnel with a VA issued PIV badge authorized by the OIT regional manager to be in the IT spaces.

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 three weeks' notice to the Contracting Officer so that security and escort arrangements can be provided for by the Station. This notice is

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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. Patients and staff are not to be photographed at any time.
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. Key Control:

1. 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.

1.6 OPERATIONS AND STORAGE AREAS (FAR 52.236-10)

- A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. 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.
- 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

- D. Working space and space available for storing materials shall be as determined by the COR.
- E. Workers are subject to rules of Fargo VA Medical Center applicable to their conduct.
- F. Execute work so as to interfere as little as possible with normal functioning of the 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. Where access by Medical Center personnel to vacated portions of buildings is not required, storage of Contractor's materials and equipment will be permitted subject to fire and safety requirements.
- G. 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 and Utility Company involved.
- H. Phasing:
 - 1. 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

2. To ensure such executions, Contractor shall furnish the COR with a schedule of approximate phasing dates on which the Contractor intends to accomplish work in each specific area of site, buildings or portions thereof. In addition, Contractor shall notify the COR three weeks in advance of the proposed date of starting work in each specific area of site, buildings or portions thereof. Arrange such phasing dates to ensure accomplishment of this work in successive phases mutually agreeable to COR and Contractor.
 3. 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.
 4. 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 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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 4 degrees C (40 degrees F) at all times, except as otherwise specified.
 2. Contractor shall maintain in operating condition existing fire protection and alarm equipment.
- 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 COR. Electrical work shall be accomplished with all affected circuits or equipment de-energized.
 2. Contractor shall submit a request to interrupt any such services to COR, in writing, 21 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 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 at no added cost to the government.
 4. Major interruptions of any system must be requested, in writing, at least 21 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.
- L. To minimize interference of construction activities with flow of Medical Center traffic, comply with the following:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.
- M. Coordinate the work for this contract with other construction operations as directed by COR.

1.7 ALTERATIONS

- A. Survey: Before any work is started, the Contractor shall make a thorough survey with the COR of areas of buildings in which alterations occur and areas which are anticipated routes of access, and furnish a report, signed by the COR 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 to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor.
- 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

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 as 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,

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

1.9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS (FAR 52.236-9)

- 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.
- 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.

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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

1.11 PROFESSIONAL LAND 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.

1.12 LAYOUT OF WORK

- A. The Contractor shall lay out the work from Government established base lines and benchmarks, 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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, roads, parking lots, 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 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

3. Lines and elevations of sewers and of all outside distribution systems.

1.13 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 hard copy and electronic version (scanned PDF) to the A/E 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.

1.14 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. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.
- 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.

1.15 TEMPORARY USE OF EXISTING ELEVATORS

- A. Use of existing elevators for handling building materials and Contractor's personnel will be permitted subject to following provisions:
 1. Contractor makes all arrangements with the COR for use of elevators.
The COR will ascertain that elevators are in proper condition.
 2. Contractor covers and provides maximum protection of following elevator components:
 - a) Entrance jambs, heads soffits and threshold plates.
 - b) Entrance columns, canopy, return panels and inside surfaces of car enclosure walls.
 - c) Finish flooring.
 3. Government will accept hoisting ropes of elevator and rope of each speed governor if they are worn under normal operation. However, if

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

these ropes are damaged by action of foreign matter such as sand, lime, grit, stones, etc., during temporary use, they shall be removed and replaced by new hoisting ropes at the contractor's expense.

4. If brake lining of elevators are excessively worn or damaged during temporary use, they shall be removed and replaced by new brake lining at the contractor's expense.
5. All parts of main controller, starter, relay panel, selector, etc., worn or damaged during temporary use shall be removed and replaced with new parts at the contractor's expense, if recommended by elevator inspector after elevator is released by Contractor.
6. Place elevator in condition equal, less normal wear, to that existing at time it was placed in service of Contractor as approved by Contracting Officer.

1.16 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. *Contractor may have for use of Contractor's workers, such toilet accommodations as may be assigned to Contractor by Medical Center. Contractor shall keep such places clean and be responsible for any damage done thereto by Contractor's workers. Failure to maintain satisfactory condition in toilets will deprive Contractor of the privilege to use such toilets.

1.17 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 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,

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

shall install and maintain all necessary temporary connections and distribution lines.

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

1. Obtain electricity by connecting to the Medical Center electrical distribution system.

D. 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. Chief Engineer to review and approve setup & equipment prior to installation. 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.

1.18 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 reasonably 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.

1.19 INSTRUCTIONS

- A. Contractor shall furnish Maintenance and Operating manuals (hard copies and electronic), approved submittals and verbal instructions when required by the various sections of the specifications and as hereinafter specified.
- B. Manuals: Maintenance and operating manuals and two compact disc (two hard copies and two electronic copies 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

1.20 RELOCATED EQUIPMENT ITEMS

- A. Contractor shall disconnect, dismantle as necessary, remove and reinstall in new location, all existing equipment and items indicated or otherwise shown to be relocated by the Contractor.
- B. Perform relocation of such equipment or items at such times and in such a manner as directed by the COR.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- C. Suitably cap existing service lines, such as steam, condensate return, water, drain, gas, air, vacuum and/or electrical, at the main whenever such lines are disconnected from equipment to be relocated. Remove abandoned lines in finished areas and cap as specified herein before under paragraph "Abandoned Lines".
- D. Provide all mechanical and electrical service connections, fittings, fastenings and any other materials necessary for assembly and installation of relocated equipment; and leave such equipment in proper operating condition.
- E. Contractor shall employ services of an installation engineer, who is an authorized representative of the manufacturer of this equipment to supervise assembly and installation of existing equipment, required to be relocated.
- F. All service lines such as noted above for relocated equipment shall be in place at point of relocation ready for use before any existing equipment is disconnected. Make relocated existing equipment ready for operation or use immediately after reinstallation.

1.21 PHOTOGRAPHIC DOCUMENTATION

- A. During the construction period through completion, provide photographic documentation of construction progress and at selected milestones including electronic indexing, navigation, storage and remote access to the documentation, as per these specifications. Contractor to provide 25 photographs of the construction site daily showing work progress and turn over to the VA weekly. The commercial photographer or the subcontractor used for this work shall meet the following qualifications:
 - 1. Demonstrable minimum experience of three (3) years in operation providing documentation.

1.22 LOCAL FARGO VA HEALTH CARE SYSTEM CONSTRUCTION CONTRACTOR ORIENTATION AND POLICIES

- A. Contracts: The following staff or resource people will be working with you at the Fargo VA Health Care System. Please feel free to contact these individuals with any questions:
 - 1. Chief Engineer: Shawn Bergan (701) 239-3700, ext. 93388 or (701) 239-3760

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

2. Project Engineer: Cliff Halverson (701) 239-3700, ext. 3905.
- B. Vehicle Traffic Rules: All construction contractors shall park their vehicles in areas assigned by the Contracting Officer or Engineering Service representatives. All persons coming on the premises of the Fargo VA Health Care System must obey the posted traffic and parking rules. Police Service will issue tickets to contractor vehicles parked in areas other than those assigned.
- C. Keys/ID Badges: VA ID badges must be worn while you are on Medical Center premises. Contact Engineering Service to obtain an ID badge and any necessary keys. Contract staff are responsible for the security of keys and ID badges issued to them and may be charged for replacement cost. You must notify Engineering (ext. 3361) personnel immediately to report any loss, theft or suspected reproduction of a Medical Center key or access card.
- D. VA Directive 6500 requires that contractors working in IT spaces must be escorted by personnel with a VA issued PIV badge authorized by the OIT regional manager to be in the IT spaces.
- E. Smoking: Smoking is prohibited throughout the entire campus.
- F. Use of Government Telephones
 1. Government telephones are for official Government business use. Contract staff may use telephones, for local calls only, to contact your place of employment or to address unforeseen events such as injury on the job, work schedule changes etc.
- G. Housekeeping
 1. All construction sites shall be kept clean, orderly and in sanitary condition.
 2. All rags/cloth and rubbish soaked with flammable and/or combustible material shall be placed in a covered metal receptacle until being disposed.
 3. A clear and unobstructed path must be maintained to all portable fire extinguishers, hose cabinets, pull stations, fire exits and electrical panels.
 4. Fire doors and smoke barrier doors shall not be blocked in a manner to prevent their protective operation in the event of a fire.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

5. The use of wedges, stops, ropes, or other unapproved methods of holding doors open is prohibited.
6. All indoor trash containers over 20 gallons will be constructed of non-combustible materials and be covered or have a self-extinguishing cover.

H. Storage

1. Any commodities that may be hazardous in combination with each other must be stored so they cannot come in contact with each other.
2. Store flammable and combustible liquids and gasses in approved storage containers.
3. A clear space of 18 inches will be maintained below sprinkler heads.
4. Items stored in tiers will be stacked, blocked, interlocked and limited in height to prevent sliding or collapse.
5. Materials will not be stored directly on the floor.
6. Storage areas will be kept free from accumulation of materials that constitute hazards.
7. Stairwells, stairways and corridors shall not be utilized for storage.
8. Storage will not be permitted within 3 feet of an electric panel in all directions.

I. Hazardous Materials

1. Discovery of any suspected asbestos containing material shall result in the contractor stopping work in the area and reporting the discovery immediately to the Engineering Office (ext. 3361) or one of the contact persons indicated above. Engineering Service shall then evaluate the suspect material and if it contains asbestos shall arrange for the removal of the asbestos.
2. Contractors shall maintain and provide to the VA Project Engineer MSDS's for products used during construction which shall explain the labeling system and all other required information. Report any discovery of an existing hazardous material to Engineering Service, (ext. 3361).

J. Infection Control

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

1. PURPOSE: To prevent the acquisition of nosocomial infection in patients and healthcare workers during Medical Center renovation or construction activities.
2. The Contractor shall contact Engineering Service (239-3760 or EXT. 3361) prior to beginning construction in any areas so that a Pre-Construction Risk Assessment (PCRA) may be performed and all applicable forms completed. Once completed the Contractor shall obtain a completed and approved copy of a PCRA form for each area of work in which the Contractor is involved. The Contractor shall conform to all of the requirements (ILSM's, Infection Control Precautions, etc.) as noted on the completed forms. The Contractor shall post a copy of the completed form outside the construction barrier at each work site in plain view and accessible to VA Staff for verification that requirements noted on PCRA form are being adhered to.
3. General: The goal of Infection Control is to identify and reduce the risks of acquiring and transmitting infections among patients, employees, service workers and visitors to the Medical Center. During construction or renovation projects, hidden infectious disease hazards may be released into the air, carried on dust particles, on workers clothing or be present in damp areas or areas where water has collected. One particular organism of concern is a fungal organism known as Aspergillus. Aspergillus can be found in decaying leaves and compost, plaster and drywall, and settled dust. These organisms like many others encountered in our everyday lives usually do not cause problems in healthy people, however a hospital is full of sick patients. Aspergillus and other organisms can cause severe illness and even death in some patients. Therefore, it is critical that everyone do their best to help prevent conditions that might lead to the dispersion of this or other infectious organisms by:
 - a. Maintaining barrier walls that keep dust and dirt inside the worksite.
 - b. Maintaining a state of negative air pressure within the construction site to prevent dust and dirt from dispersing

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

into the Medical Center from the worksite. The Contractor shall install bulb type pressure differential monitoring devices or an alarm system in temporary construction barriers and shall monitor and maintain negative air pressure in construction areas.

- c. Removing demolition debris in a manner that minimizes any contamination of the environment outside the worksite by dust and debris.
 - d. Utilizing walk off mats and making sure clothing is free of loose soil and debris when leaving the construction site.
 - e. Assuring that any water or sludge found during demolition of plumbing or in the construction process is collected and disposed of in a controlled manner.
 - f. Keeping demolition chutes sealed when not in use to maintain dust control. Use a water spray to minimize dust generation when using chutes if possible.
 - g. Using only designated entry and exit pathways.
- 4. Please feel free to contact Infection Control at ext. 3668 if you have questions or concerns.
 - 5. If you find any needles, syringes, sharp medical objects please do not handle or remove yourself. Contact the Medical Center project coordinator or Project Engineer at 239-3760 or at Medical Center extension 3361 for removal.
 - 6. Infection control activities are critical in all areas of the Medical Center. Construction activities causing disturbance of existing dust, or generating new dust must be conducted in ways that will minimize dust generation and dispersion.
 - 7. All construction/maintenance workers and contract workers must follow the infection control procedures as described in this guideline.
 - 8. The following infection control procedures shall be followed at a minimum:
 - a. BARRIERS - Complete all critical barriers before construction begins.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 1) Construction or renovation sites not capable of containment within a single room must be separated from patient-care areas and other critical areas by barriers that keep the dirt and dust inside the work site.
- 2) The integrity of the barrier walls must assure a complete seal of the construction area from adjacent areas.
- 3) Temporary barriers and enclosures must be dust proof with airtight seals maintained at the full perimeter of the walls, floors and upper decking, as well as all penetrations. Seal holes, pipes, conduits and punctures appropriately.
- 4) Tightly sealing doors (zipper) or an overlapping flap of at least 2 feet in width of a durable poly must be used at points of personnel access, where plastic/poly barriers are approved for use by VA Project Engineer.
- 5) Elevator shafts or stairways must be isolated outside of the construction field to prevent dispersion of dust from the work site.

b. ENVIRONMENTAL CONTROLS

- 1) Isolate the HVAC system in areas where work is being done to prevent contamination of the duct system.
- 2) Maintain negative air pressure within work site. Utilize HEPA-filtration units if air is being re-circulated.
- 3) Seal holes, pipes, conduits and punctures appropriately.
- 4) Provide a designated area within the work site where all personnel leaving the work site can vacuum off with a HEPA-filtered vacuum to remove all loose dust and debris from clothing.
- 5) Vacuum with a HEPA-filtered vacuum and/or wet mop frequently at entrance and exit points.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 6) "Sticky" or walk-off mats shall be utilized immediately outside the construction area to remove dust and soil from shoes, cart wheels, etc. as personnel exit the area. The mats must be large enough to cover the entire exit and changed frequently to prevent accumulation of dust. Hourly or as needed. Contractor shall place a form on a wall adjacent to each mat with space to record date, time and exchanger's signature so VA Staff can monitor that mats are changed at required frequency.
- 7) Contain construction debris during transport in tightly covered containers.
- 8) Debris must be removed from the construction area on a daily basis in tightly covered carts using specified traffic patterns.
- 9) Control, collection and disposal must be provided for any drain liquid or sludge encountered when demolishing plumbing.

c. CLEANING

- 1) The construction zone and adjacent areas must be maintained by wet mopping the area daily or more frequently as needed to minimize dust generation.
- 2) Final cleaning of the area must be completed prior to acceptance of the completed project area by VA.
- 3) Do not remove barriers from work area until the project is completed and area is thoroughly cleaned. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction.
- 4) Clothing shall be free of loose soil and debris before exiting the construction zone.
- 5) Personnel entering sterile/invasive procedure areas will be provided with a disposable jump suit, head covering and shoe covers to wear while working in the

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

area. They must be removed when exiting the area and new coverings obtained when reentering the areas.

- 6) Tools and equipment must be damp-wiped prior to entry and exit from sterile and invasive procedure areas.
- 7) Tools and equipment soiled with blood or body fluids must be cleaned with a hospital-approved disinfectant prior to removing from the area.

d. ENVIRONMENTAL MONITORING AND COMPLETION

- 1) Infection Control, in cooperation with Engineering and Safety will make periodic visits to the work site to ensure compliance with the infection control guidelines.
- 2) Whenever safe infection control conditions are not met the appropriate contractor will be notified to correct the conditions immediately.
- 3) All work will be stopped on a project if a hazardous infection control deficiency exists that would result in patients being put at significant risk.
- 4) Water supply lines shall be flushed before placing newly renovated or constructed areas into service. Industrial Hygiene tests as noted will assure the water supply lines are safe for use.

K. Construction Safety

1. The Medical Center policy is to provide an environment for patients, visitors and staff that is free from danger. Within the Medical Center, the NFPA Life Safety Code is followed. Interim life safety measures (ILSM's) are applied to all construction projects as necessary and are defined in construction contracts. Minimum ILSM's are:
 - a. Exits - provide free and unobstructed egress.
 - b. Free and unobstructed access to emergency department/service for emergency forces.
 - c. Temporary construction partitions are in accordance with contract requirements.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- d. Smoking is prohibited through the VA campus.
- e. Storage, housekeeping and debris removal policies and procedures that reduce the flammable and combustible fire load are enforced.
- f. Hazard surveillance is increased in construction areas.

L. Fire Safety

- 1. The contractors shall coordinate all construction activities with the VA Engineering Service to determine if fire alarm initiating devices are located within the construction area. Engineering Service shall disable the appropriate alarm initiating devices. Once work in the area is complete it is the contractor's responsibility to contact Engineering Services to have the fire alarm initiation devices enabled.
- 2. Fire alarm, detection and suppression systems are not to be impaired unless there is work on the system to be performed. If fire alarm, detection and suppression systems are impaired for more than four hours the contractor shall implement a fire watch, at no additional cost to the Government, in compliance with NFPA requirements and shall obtain VA Engineering Service approval.
- 3. Additional firefighting equipment is provided and employees are trained in its use.
- 4. Hot works permits and fire extinguishers are required when working with open flames, or hot items and for activities that may generate sparks. Contact Engineering Service to obtain a hot work permit.
- 5. In the event of a fire alarm, "Code Red" and the location of a fire will be communicated by an overhead announcement. The "all clear" is authorized by the Fargo Fire Department or by the personnel conducting the fire drill and will be communicated by an overhead announcement. If a fire or fire drill is located in or adjacent to the construction area, construction contractor staff shall be responsible for the following:
 - a. Be alert to the Code Red announcement.
 - b. Participate in fire drills.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- c. Follow the RACE Plan (Rescue, Alarm, Contain, Extinguish) if fire is discovered by a construction contractor.
- d. Close all corridor doors within the construction area.
- e. Evacuate the immediate area.

M. Utilities

- 1. Engineering (ext. 3361) is responsible for all utilities within the Medical Center. If there are problems or failures of the utilities, call extension 3361 during normal business hours (Monday through Friday, 8:00 a.m. to 4:30 p.m.). After hours and on weekends, contact the Police Service at ext. 3251 to report problems and failures. A utilities failure and its type/location will be communicated by a "Utility Failure" overhead announcement.
- 2. All utility service connections shall be reviewed with and approved by Engineering Service just prior to the connection being made with the existing utility. This condition shall apply to both temporary and permanent connections. This final utility system connection check is meant to ensure the following:
 - a. The Medical Center is prepared for the connection.
 - b. The contractor is prepared for the connection work, which shall include but not be limited to, all safety measures have been taken or are in place, backflow preventers are in place, hot work permits have been issued, fire watch is in place, fire alarm initiation devices have been disabled if necessary, etc.

N. Emergencies

- 1. "Disaster Alert" - The Medical Center has initiated a process that provides an "all-hazard" approach to disaster management. Construction contractor staff shall ensure corridors are free of obstructions and a foreman or representative shall report to the Engineering Service office for further instructions.
- 2. Hostage Situations - Immediately report to Police Service (ext. 2222), any incident in which the safety of any person is threatened by another.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

3. "Bomb Threat" - React calmly and evacuate. Notify Police Service (ext. 2222) if the threat poses immediate danger to a person or destruction of property. If you discover a suspicious object, do not touch or move the object.
4. Severe Weather - In the event of an overhead announcement, all personnel are expected to take cover in windowless interior corridors that are not on the top floor of the building.
5. Armed Assailant - React calmly and evacuate. Avoid area(s) where it has been indicated an armed assailant is in the building or on the ground.

O. RECORDS MANAGEMENT OBLIGATIONS

A. Applicability

This clause applies to all Contractors whose employees create, work with, or otherwise handle Federal records, as defined in Section B, regardless of the medium in which the record exists.

B. Definitions

"Federal Record" as defined in 44 U.S.C. § 3301, includes all recorded information, regardless of form or characteristics, made or received by a Federal agency under Federal law or in connection with the transaction of public business and preserved or appropriate for preservation by that agency or its legitimate successor as evidence of the organization, functions, policies, decisions, procedures, operations, or other activities of the United States Government or because of the informational value of data in them.

The term Federal record:

1. includes [Agency] records.
2. does not include personal materials.
3. applies to records created, received, or maintained by Contractors pursuant to their [Agency] contract.
4. may include deliverables and documentation associated with deliverables.

C. Requirements

1. Contractor shall comply with all applicable records management laws and regulations, as well as National Archives and Records Administration (NARA) records policies, including but not limited

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- to the Federal Records Act (44 U.S.C. chs. 21, 29, 31, 33), NARA regulations at 36 CFR Chapter XII Subchapter B, and those policies associated with the safeguarding of records covered by the Privacy Act of 1974 (5 U.S.C. 552a). These policies include the preservation of all records, regardless of form or characteristics, mode of transmission, or state of completion.
2. In accordance with 36 CFR 1222.32, all data created for Government use and delivered to, or falling under the legal control of, the Government are Federal records subject to the provisions of 44 U.S.C. chapters 21, 29, 31, and 33, the Freedom of Information Act (FOIA) (5 U.S.C. 552), as amended, and the Privacy Act of 1974 (5 U.S.C. 552a), as amended and must be managed and scheduled for disposition only as permitted by statute or regulation.
 3. In accordance with 36 CFR 1222.32, Contractor shall maintain all records created for Government use or created in the course of performing the contract and/or delivered to, or under the legal control of the Government and must be managed in accordance with Federal law. Electronic records and associated metadata must be accompanied by sufficient technical documentation to permit understanding and use of the records and data.
 4. Fargo VA Health Care System and its contractors are responsible for preventing the alienation or unauthorized destruction of records, including all forms of mutilation. Records may not be removed from the legal custody of [Fargo VA Health Care System] or destroyed except for in accordance with the provisions of the agency records schedules and with the written concurrence of the Head of the Contracting Activity. Willful and unlawful destruction, damage or alienation of Federal records is subject to the fines and penalties imposed by 18 U.S.C. 2701. In the event of any unlawful or accidental removal, defacing, alteration, or destruction of records, Contractor must report to Fargo VA Health Care System. The agency must report promptly to NARA in accordance with 36 CFR 1230.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

5. The Contractor shall immediately notify the appropriate Contracting Officer upon discovery of any inadvertent or unauthorized disclosures of information, data, documentary materials, records or equipment. Disclosure of non-public information is limited to authorized personnel with a need-to-know as described in the [contract vehicle]. The Contractor shall ensure that the appropriate personnel, administrative, technical, and physical safeguards are established to ensure the security and confidentiality of this information, data, documentary material, records and/or equipment is properly protected. The Contractor shall not remove material from Government facilities or systems, or facilities or systems operated or maintained on the Government's behalf, without the express written permission of the Head of the Contracting Activity. When information, data, documentary material, records and/or equipment is no longer required, it shall be returned to [Fargo VA Health Care System] control or the Contractor must hold it until otherwise directed. Items returned to the Government shall be hand carried, mailed, emailed, or securely electronically trans-mitted to the Contracting Officer or address prescribed in the [contract vehicle]. Destruction of records is EXPRESSLY PROHIBITED unless in accordance with Paragraph (4).
6. The Contractor is required to obtain the Contracting Officer's approval prior to engaging in any contractual relationship (sub-contractor) in support of this contract requiring the disclosure of information, documentary material and/or records generated under, or relating to, contracts. The Contractor (and any sub-contractor) is required to abide by Government and [Fargo VA Health Care System] guidance for protecting sensitive, proprietary information, classified, and controlled unclassified information.
7. The Contractor shall only use Government IT equipment for purposes specifically tied to or authorized by the contract and in accordance with Fargo VA Health Care System policy.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

8. The Contractor shall not create or maintain any records containing any non-public [Fargo VA Health Care System] information that are not specifically tied to or authorized by the contract.
 9. The Contractor shall not retain, use, sell, or disseminate copies of any deliverable that contains information covered by the Privacy Act of 1974 or that which is generally protect-ed from public disclosure by an exemption to the Freedom of Information Act.
 10. The [Fargo VA Health Care System] owns the rights to all data and records produced as part of this contract. All deliverables under the contract are the property of the U.S. Government for which [Fargo VA Health Care System] shall have unlimited rights to use, dispose of, or disclose such data contained therein as it determines to be in the public interest. Any Contractor rights in the data or deliverables must be identified as required by FAR 52.227-11 through FAR 52.227-20.
 11. Training. All Contractor employees assigned to this contract who create, work with, or otherwise handle records are required to take VHA-provided records management training. The Contractor is responsible for confirming training has been completed according to agency policies, including initial training and any annual or refresher training.
- D. Flowdown of Requirements to Subcontractors.
1. The Contractor shall incorporate the substance of this clause, its terms and requirements including this paragraph, in all subcontracts under this [contract vehicle], and require written subcontractor acknowledgment of same.
 2. Violation by a subcontractor of any provision set forth in this clause will be attributed to the Contractor.

PART 2 (NOT USED)

PART 3 (NOT USED)

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Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

03-01-20

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 (COR).
- 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 COR, 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

03-01-20

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 COR 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

03-01-20

1.5 THE COMPLETE PROJECT SCHEDULE SUBMITTAL

A. Within 14 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

03-01-20

- B. 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.
- C. 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.
- D. The Complete Project Schedule shall contain one work activity/event.

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

03-01-20

- 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 852.232 for (PAYMENTS UNDER FIXED PRICE CONSTRUCTION).
- 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 workdays at the end of each phase and immediately preceding any VA move activity/event required by the contract phasing for that phase.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

03-01-20

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 workdays 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 workdays.
 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 COR. 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 COR's approval of the Project Schedule.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

03-01-20

- 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 the AIA application and certificate for payment documents G702 & G703 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 852.232 for (PAYMENTS UNDER FIXED PRICE CONSTRUCTION). 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 COR 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 COR three workdays 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

03-01-20

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 Contracting Officer's Representative 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 Contracting Officer's Representative. 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 Contracting Officer's Representative 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**

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

03-01-20

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, COR, and all subcontractors needed, as determined by the COR, 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 COR 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

03-01-20

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 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

03-01-20

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). The Contractor shall include, as a part of each change order proposal, a sketch showing all CPM logic revisions, duration (in workdays) 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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Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01 32 16.15 - 11
Project Schedules (Small Projects - Design/Bid/Build)

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 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

05-01-17

- 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

05-01-17

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.
- 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. The initial submittal for each specification section shall include all items

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

05-01-17

indicated to be provided under Part 1.5 of that specification section.

An initial incomplete submittal will be returned unreviewed, and the time required for resubmittal shall not be considered as a delay to the project schedule.

- 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 excessive amount of irrelevant or unnecessary data will be returned unreviewed. The time required for resubmittal shall not be considered as a delay to the project schedule
- 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01 33 23-4

Shop Drawings, Product Data, and Samples

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

05-01-17

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: _____

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01 33 23-5
Shop Drawings, Product Data, and Samples

05-01-17

1.6 SUBMITTAL FORMAT AND TRANSMISSION

- A. Summary: Shop drawings, test reports, certificates and manufacturer's literature and data, shall be submitted for approval using Oracle's Primavera Submittal Exchange.
- B. Procedures: A submittal log will be created in an electronic submittal website service by inserting required submittals listed in individual specification section.
- C. 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.
- D. Compile the electronic submittal file as a single, complete document. Name the electronic submittal file specifically according to its contents.
- E. 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.
- F. All documents (submittals) shall be sent through 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.
- G. Provide hard copies of submittals when requested by the Contracting Officer. Up to 3 additional hard copies of any submittal may be requested at the discretion of the Contracting Officer, at no additional cost to the VA.

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

05-01-17

- 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 21 working days for submittals.
- E. VA review period is 21 working days for RFIs.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01 33 23-7

Shop Drawings, Product Data, and Samples

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

05-01-17

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01 33 23-8

Shop Drawings, Product Data, and Samples

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

05-01-17

- - - E N D - - -

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01 33 23-9
Shop Drawings, Product Data, and Samples

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

SECTION 01 35 26
SAFETY REQUIREMENTS

TABLE OF CONTENTS

1.1	APPLICABLE PUBLICATIONS	2
1.2	DEFINITIONS	3
1.3	REGULATORY REQUIREMENTS	4
1.4	ACCIDENT PREVENTION PLAN (APP)	4
1.5	ACTIVITY HAZARD ANALYSES (AHAs)	9
1.6	PRECONSTRUCTION CONFERENCE	10
1.7	"SITE SAFETY AND HEALTH OFFICER" (SSHO) and "COMPETENT PERSON" (CP)	10
1.8	TRAINING	11
1.9	INSPECTIONS	12
1.10	ACCIDENTS, OSHA 300 LOGS, AND MAN-HOURS	12
1.11	PERSONAL PROTECTIVE EQUIPMENT (PPE)	13
1.12	INFECTION CONTROL	14
1.13	TUBERCULOSIS SCREENING	19
1.14	FIRE SAFETY	20
1.15	ELECTRICAL	21
1.16	FALL PROTECTION	23
1.17	SCAFFOLDS AND OTHER WORK PLATFORMS	23
1.18	EXCAVATION AND TRENCHES	24
1.19	CRANES	26
1.20	CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)	26
1.21	CONFINED SPACE ENTRY	26
1.22	WELDING AND CUTTING	27
1.23	LADDERS	27
1.24	FLOOR & WALL OPENINGS	27

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

SECTION 01 35 26
SAFETY REQUIREMENTS

1.1 APPLICABLE PUBLICATIONS:

A. Latest publications listed below form part of this Article to extent referenced. Publications are referenced in text by basic designations only.

B. American Society of Safety Engineers (ASSE):

A10.1-2011.....Pre-Project & Pre-Task Safety and Health
Planning

A10.34-2012.....Protection of the Public on or Adjacent to
Construction Sites

A10.38-2013.....Basic Elements of an Employer's Program to
Provide a Safe and Healthful Work Environment
American National Standard Construction and
Demolition Operations

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

E84-2013.....Surface Burning Characteristics of Building
Materials

D. The Facilities Guidelines Institute (FGI):

FGI Guidelines-2010Guidelines for Design and Construction of
Healthcare Facilities

E. National Fire Protection Association (NFPA):

10-2017.....Standard for Portable Fire Extinguishers

30-2018.....Flammable and Combustible Liquids Code

51B-2019.....Standard for Fire Prevention During Welding,
Cutting and Other Hot Work

70-2020.....National Electrical Code

70B-2019.....Recommended Practice for Electrical Equipment
Maintenance

70E-2018 Standard for Electrical Safety in the Workplace

99-2021.....Health Care Facilities Code

241-2019.....Standard for Safeguarding Construction,
Alteration, and Demolition Operations

F. The Joint Commission (TJC)

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01 35 26-2
Safety Requirements

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

- TJC Manual Comprehensive Accreditation and Certification
Manual
- G. U.S. Nuclear Regulatory Commission
- 10 CFR 20 Standards for Protection Against Radiation
- H. U.S. Occupational Safety and Health Administration (OSHA):
- 29 CFR 1904 Reporting and Recording Injuries & Illnesses
- 29 CFR 1910 Safety and Health Regulations for General
Industry
- 29 CFR 1926 Safety and Health Regulations for Construction
Industry
- CPL 2-0.124.....Multi-Employer Citation Policy
- I. VHA Directive 2005-007

1.2 DEFINITIONS:

- A. Critical Lift. A lift with the hoisted load exceeding 75% of the crane's maximum capacity; lifts made out of the view of the operator (blind picks); lifts involving two or more cranes; personnel being hoisted; and special hazards such as lifts over occupied facilities, loads lifted close to power-lines, and lifts in high winds or where other adverse environmental conditions exist; and any lift which the crane operator believes is critical.
- B. OSHA "Competent Person" (CP). One who is capable of identifying existing and predictable hazards in the surroundings and working conditions which are unsanitary, hazardous or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them (see 29 CFR 1926.32(f)).
- C. "Qualified Person" means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project.
- D. High Visibility Accident. Any mishap which may generate publicity or high visibility.
- E. Accident/Incident Criticality Categories:
- No impact - near miss incidents that should be investigated but are not required to be reported to the VA;
- Minor incident/impact - incidents that require first aid or result in minor equipment damage (less than \$5000). These incidents must be investigated but are not required to be reported to the VA;

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

Moderate incident/impact - Any work-related injury or illness that results in:

1. Days away from work (any time lost after day of injury/illness onset);
2. Restricted work;
3. Transfer to another job;
4. Medical treatment beyond first aid;
5. Loss of consciousness;
6. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (5) above or,
7. any incident that leads to major equipment damage (greater than \$5000).

These incidents must be investigated and are required to be reported to the VA;

Major incident/impact - Any mishap that leads to fatalities, hospitalizations, amputations, and losses of an eye as a result of contractors' activities. Or any incident which leads to major property damage (greater than \$20,000) and/or may generate publicity or high visibility. These incidents must be investigated and are required to be reported to the VA as soon as practical, but not later than 2 hours after the incident.

- E. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even through provided by a physician or registered personnel.

1.3 REGULATORY REQUIREMENTS:

- A. In addition to the detailed requirements included in the provisions of this contract, comply with 29 CFR 1926, comply with 29 CFR 1910 as incorporated by reference within 29 CFR 1926, comply with ASSE A10.34, and all applicable [federal, state, and local] laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern except with specific approval and acceptance by either the CO or COR.

1.4 ACCIDENT PREVENTION PLAN (APP):

- A. The APP (aka Construction Safety & Health Plan) shall interface with the Contractor's overall safety and health program. Include any portions of the Contractor's overall safety and health program referenced in the APP in the applicable APP element and ensure it is

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all worksite safety and health of each subcontractor(s). Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out.

B. The APP shall be prepared as follows:

1. Written in English by a qualified person who is employed by the Prime Contractor articulating the specific work and hazards pertaining to the contract (model language can be found in ASSE A10.33). Specifically articulating the safety requirements found within these VA contract safety specifications.
2. Address both the Prime Contractors and the subcontractors work operations.
3. State measures to be taken to control hazards associated with materials, services, or equipment provided by suppliers.
4. Address all the elements/sub-elements and in order as follows:
 - a. **SIGNATURE SHEET.** Title, signature, and phone number of the following:
 - 1) Plan preparer (Qualified Person such as corporate safety staff person or contracted Certified Safety Professional with construction safety experience);
 - 2) Plan approver (company/corporate officers authorized to obligate the company);
 - 3) Plan concurrence (e.g., Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional). Provide concurrence of other applicable corporate and project personnel (Contractor).
 - b. **BACKGROUND INFORMATION.** List the following:
 - 1) Contractor;
 - 2) Contract number;
 - 3) Project name;
 - 4) Brief project description, description of work to be performed, and location; phases of work anticipated (these will require an AHA).
 - c. **STATEMENT OF SAFETY AND HEALTH POLICY.** Provide a copy of current corporate/company Safety and Health Policy Statement, detailing commitment to providing a safe and healthful workplace for all

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

employees. The Contractor's written safety program goals, objectives, and accident experience goals for this contract should be provided.

d. RESPONSIBILITIES AND LINES OF AUTHORITIES. Provide the following:

- 1) A statement of the employer's ultimate responsibility for the implementation of his SOH program;
- 2) Identification and accountability of personnel responsible for safety at both corporate and project level. Contracts specifically requiring safety or industrial hygiene personnel shall include a copy of their resumes.
- 3) The names of Competent and/or Qualified Person(s) and proof of competency/qualification to meet specific OSHA Competent/Qualified Person(s) requirements must be attached.;
- 4) Requirements that no work shall be performed unless a designated competent person is present on the job site;
- 5) Requirements for pre-task Activity Hazard Analysis (AHAs);
- 6) Lines of authority;
- 7) Policies and procedures regarding noncompliance with safety requirements (to include disciplinary actions for violation of safety requirements) should be identified;

e. SUBCONTRACTORS AND SUPPLIERS. If applicable, provide procedures for coordinating SOH activities with other employers on the job site:

- 1) Identification of subcontractors and suppliers (if known);
- 2) Safety responsibilities of subcontractors and suppliers.

f. TRAINING.

- 1) Site-specific SOH orientation training at the time of initial hire or assignment to the project for every employee before working on the project site is required.
- 2) Mandatory training and certifications that are applicable to this project (e.g., explosive actuated tools, crane operator, rigger, crane signal person, fall protection, electrical lockout, machine/equipment lockout, confined space, etc.) and any requirements for periodic retraining/recertification are required.
- 3) Procedures for ongoing safety and health training for supervisors and employees shall be established to address changes in site hazards/conditions.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

- 4) OSHA 10-hour training is required for all workers on site and the OSHA 30-hour training is required for Trade Competent Persons (CPs)

g. SAFETY AND HEALTH INSPECTIONS.

- 1) Specific assignment of responsibilities for a minimum daily job site safety and health inspection during periods of work activity: Who will conduct (e.g., "Site Safety and Health CP"), proof of inspector's training/qualifications, when inspections will be conducted, procedures for documentation, deficiency tracking system, and follow-up procedures.
- 2) Any external inspections/certifications that may be required (e.g., contracted CSP or CSHT)

h. ACCIDENT/INCIDENT INVESTIGATION & REPORTING. The Contractor shall conduct mishap investigations of all Moderate and Major as well as all High Visibility Incidents. The APP shall include accident/incident investigation procedure and identify person(s) responsible to provide the following to the CO, COR or Government Designated Authority:

- 1) Exposure data (man-hours worked);
- 2) Accident investigation reports;
- 3) Project site injury and illness logs.

i. PLANS (PROGRAMS, PROCEDURES) REQUIRED. Based on a risk assessment of contracted activities and on mandatory OSHA compliance programs, the Contractor shall address all applicable occupational, patient, and public safety risks in site-specific compliance and accident prevention plans. These Plans shall include but are not be limited to procedures for addressing the risks associates with the following:

- 1) Emergency response;
- 2) Contingency for severe weather;
- 3) Fire Prevention;
- 4) Medical Support;
- 5) Posting of emergency telephone numbers;
- 6) Prevention of alcohol and drug abuse;
- 7) Site sanitation (housekeeping, drinking water, toilets);
- 8) Night operations and lighting;
- 9) Hazard communication program;
- 10) Welding/Cutting "Hot" work;

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

- 11) Electrical Safe Work Practices (Electrical LOTO/NFPA 70E);
- 12) General Electrical Safety;
- 13) Hazardous energy control (Machine LOTO);
- 14) Site-Specific Fall Protection & Prevention;
- 15) Excavation/trenching;
- 16) Asbestos abatement;
- 17) Lead abatement;
- 18) Crane Critical lift;
- 19) Respiratory protection;
- 20) Health hazard control program;
- 21) Radiation Safety Program;
- 22) Abrasive blasting;
- 23) Heat/Cold Stress Monitoring;
- 24) Crystalline Silica Monitoring (Assessment);
- 25) Demolition plan (to include engineering survey);
- 26) Formwork and shoring erection and removal;
- 27) Precast Concrete;
- 28) Public (Mandatory compliance with ANSI/ASSE A10.34-2012).

- C. Submit the APP to the CO or COR for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES 15 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP.
- D. Once accepted by the CO or COR, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer in accordance with FAR Clause 52.236-13, *Accident Prevention*, until the matter has been rectified.
- E. Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the CO or COR. Should any severe hazard exposure, i.e. imminent danger, become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate/remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public and the environment.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01 35 26-8
Safety Requirements

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

1.5 ACTIVITY HAZARD ANALYSES (AHAS) :

- A. AHAs are also known as Job Hazard Analyses, Job Safety Analyses, and Activity Safety Analyses. Before beginning each work activity involving a type of work presenting hazards not experienced in previous project operations or where a new work crew or sub-contractor is to perform the work, the Contractor(s) performing that work activity shall prepare an AHA (Example electronic AHA forms can be found on the US Army Corps of Engineers web site)
- B. AHAs shall define the activities being performed and identify the work sequences, the specific anticipated hazards, site conditions, equipment, materials, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level of risk.
- C. Work shall not begin until the AHA for the work activity has been accepted by the CO or COR and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.
 - 1. The names of the Competent/Qualified Person(s) required for a particular activity (for example, excavations, scaffolding, fall protection, other activities as specified by OSHA and/or other State and Local agencies) shall be identified and included in the AHA. Certification of their competency/qualification shall be submitted to the Government Designated Authority (GDA) for acceptance prior to the start of that work activity.
 - 2. The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified person(s).
 - a. If more than one Competent/Qualified Person is used on the AHA activity, a list of names shall be submitted as an attachment to the AHA. Those listed must be Competent/Qualified for the type of work involved in the AHA and familiar with current site safety issues.
 - b. If a new Competent/Qualified Person (not on the original list) is added, the list shall be updated (an administrative action not requiring an updated AHA). The new person shall acknowledge in writing that he or she has reviewed the AHA and is familiar with current site safety issues.
 - 3. Submit AHAs to the CO or COR for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES for review at least 15 calendar days prior to the start of each phase. Subsequent AHAs as shall be formatted as amendments to the APP. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

4. The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.
5. Develop the activity hazard analyses using the project schedule as the basis for the activities performed. All activities listed on the project schedule will require an AHA. The AHAs will be developed by the contractor, supplier, or subcontractor and provided to the prime contractor for review and approval and then submitted to the CO or COR.

1.6 PRECONSTRUCTION CONFERENCE:

- A. Contractor representatives who have a responsibility or significant role in implementation of the accident prevention program, as required by 29 CFR 1926.20(b)(1), on the project shall attend the preconstruction conference to gain a mutual understanding of its implementation. This includes the project superintendent, subcontractor superintendents, and any other assigned safety and health professionals.
- B. Discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, review, and acceptance of AHAs to preclude project delays.
- C. Deficiencies in the submitted APP will be brought to the attention of the Contractor within 14 days of submittal, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Do not begin work until there is an accepted APP.S

1.7 "SITE SAFETY AND HEALTH OFFICER" (SSHO) AND "COMPETENT PERSON" (CP):

- A. The Prime Contractor shall designate a minimum of one dedicated SSHO at each project site that will be identified as the SSHO to administer the Contractor's safety program and government-accepted Accident Prevention Plan. Each subcontractor shall designate a minimum of one CP in compliance with 29 CFR 1926.20 (b)(2) that will be identified as a CP to administer their individual safety programs.
- B. Further, all specialized Competent Persons for the work crews will be supplied by the respective contractor as required by 29 CFR 1926 (i.e. Asbestos, Electrical, Cranes, & Derricks, Demolition, Fall Protection,

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

Fire Safety/Life Safety, Ladder, Rigging, Scaffolds, and Trenches/Excavations).

- C. These Competent Persons can have collateral duties as the subcontractor's superintendent and/or work crew lead persons as well as fill more than one specialized CP role (i.e. Asbestos, Electrical, Cranes, & Derricks, Demolition, Fall Protection, Fire Safety/Life Safety, Ladder, Rigging, Scaffolds, and Trenches/Excavations).
- D. The SSHO or an equally-qualified Designated Representative/alternate will maintain a presence on the site during construction operations in accordance with FAR Clause 52.236-6: *Superintendence by the Contractor*. CPs will maintain presence during their construction activities in accordance with above mentioned clause. A listing of the designated SSHO and all known CPs shall be submitted prior to the start of work as part of the APP with the training documentation and/or AHA as listed in Section 1.8 below.
- E. The repeated presence of uncontrolled hazards during a contractor's work operations will result in the designated CP as being deemed incompetent and result in the required removal of the employee in accordance with FAR Clause 52.236-5: Material and Workmanship, Paragraph (c).

1.8 TRAINING:

- A. The designated Prime Contractor SSHO must meet the requirements of all applicable OSHA standards and be capable (through training, experience, and qualifications) of ensuring that the requirements of 29 CFR 1926.16 and other appropriate Federal, State and local requirements are met for the project. As a minimum the SSHO must have completed the OSHA 30-hour Construction Safety class and have five (5) years of construction industry safety experience or three (3) years if he/she possesses a Certified Safety Professional (CSP) or certified Construction Safety and Health Technician (CSHT) certification or have a safety and health degree from an accredited university or college.
- B. All designated CPs shall have completed the OSHA 30-hour Construction Safety course within the past 5 years.
- C. In addition to the OSHA 30 Hour Construction Safety Course, all CPs with high hazard work operations such as operations involving asbestos, electrical, cranes, demolition, work at heights/fall protection, fire safety/life safety, ladder, rigging, scaffolds, and trenches/excavations shall have a specialized formal course in the hazard recognition & control associated with those high hazard work operations. Documented "repeat" deficiencies in the execution of safety requirements will require retaking the requisite formal course.
- D. All other construction workers shall have the OSHA 10-hour Construction Safety Outreach course and any necessary safety training to be able to identify hazards within their work environment.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

- E. Submit training records associated with the above training requirements to the COR for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES 15 calendar days prior to the date of the preconstruction conference for acceptance.
- F. Prior to any worker for the contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the SSHO or his/her designated representative. As a minimum, this briefing shall include information on the site-specific hazards, construction limits, VAMC safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of VAMC equipment, emergency procedures, accident reporting etc... Documentation shall be provided to the COR that individuals have undergone contractor's safety briefing.
- G. Ongoing safety training will be accomplished in the form of weekly documented safety meeting.

1.9 INSPECTIONS:

- A. The SSHO shall conduct frequent and regular safety inspections (daily) of the site and each of the subcontractors CPs shall conduct frequent and regular safety inspections (daily) of their work operations as required by 29 CFR 1926.20(b)(2). Each week, the SSHO shall conduct a formal documented inspection of the entire construction areas with the subcontractors' "Trade Safety and Health CPs" present in their work areas. Coordinate with, and report findings and corrective actions weekly to COR.
- B. A Certified Safety Professional (CSP) with specialized knowledge in construction safety or a certified Construction Safety and Health Technician (CSHT) shall randomly conduct a monthly site safety inspection. The CSP or CSHT can be a corporate safety professional or independently contracted. The CSP or CSHT will provide their certificate number on the required report for verification as necessary.
 - 1. Results of the inspection will be documented with tracking of the identified hazards to abatement.
 - 2. The COR will be notified immediately prior to start of the inspection and invited to accompany the inspection.
 - 3. Identified hazard and controls will be discussed to come to a mutual understanding to ensure abatement and prevent future reoccurrence.
 - 4. A report of the inspection findings with status of abatement will be provided to the COR within one week of the onsite inspection.

1.10 ACCIDENTS, OSHA 300 LOGS, AND MAN-HOURS:

- A. The prime contractor shall establish and maintain an accident reporting, recordkeeping, and analysis system to track and analyze all injuries and illnesses, high visibility incidents, and accidental property damage (both government and contractor) that occur on site.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

Notify the COR or other available Government Authority as soon as practical, but no more than four hours after any accident meeting the definition of a Moderate or Major incidents, High Visibility Incidents, or any weight handling and hoisting equipment accident. Within notification include contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the COR or other Government Authority determine whether a government investigation will be conducted.

- B. Conduct an accident investigation for all Minor, Moderate and Major incidents as defined in paragraph DEFINITIONS, and property damage accidents resulting in at least \$20,000 in damages, to establish the root cause(s) of the accident. Complete the VA Form 2162 (or equivalent) and provide the report to the COR or other Government Authority within 5 calendar days of the accident. The COR or other Government Authority will provide copies of any required or special forms.
- C. A summation of all man-hours worked by the contractor and associated sub-contractors for each month will be reported to the COR monthly.
- D. A summation of all Minor, Moderate, and Major incidents experienced on site by the contractor and associated sub-contractors for each month will be provided to the COR monthly. The contractor and associated sub-contractors' OSHA 300 logs will be made available to the COR as requested.

1.11 PERSONAL PROTECTIVE EQUIPMENT (PPE) :

- A. PPE is governed in all areas by the nature of the work the employee is performing. For example, specific PPE required for performing work on electrical equipment is identified in NFPA 70E, Standard for Electrical Safety in the Workplace.
- B. Mandatory PPE includes:
 - 1. Hard Hats - unless written authorization is given by the COR in circumstances of work operations that have limited potential for falling object hazards such as during finishing work or minor remodeling. With authorization to relax the requirement of hard hats, if a worker becomes exposed to an overhead falling object hazard, then hard hats would be required in accordance with the OSHA regulations.
 - 2. Safety glasses - unless written authorization is given by the COR in circumstances of no eye hazards, appropriate safety glasses meeting the ANSI Z.87.1 standard must be worn by each person on site.
 - 3. Appropriate Safety Shoes - based on the hazards present, safety shoes meeting the requirements of ASTM F2413-11 shall be worn by

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

each person on site unless written authorization is given by the COR in circumstances of no foot hazards.

4. Hearing protection - Use personal hearing protection at all times in designated noise hazardous areas or when performing noise hazardous tasks.

1.12 INFECTION CONTROL

- A. Infection Control is critical in all medical center facilities. Interior construction activities causing disturbance of existing dust, or creating new dust, must be conducted within ventilation-controlled areas that minimize the flow of airborne particles into patient areas. Exterior construction activities causing disturbance of soil or creates dust in some other manner must be controlled.
- B. An AHA associated with infection control will be performed by VA personnel in accordance with FGI Guidelines (i.e. Infection Control Risk Assessment (ICRA)). The ICRA procedure found on the American Society for Healthcare Engineering (ASHE) website will be utilized. The ICRA will be posted outside the appropriate construction area.

1. Class I requirements:

a. During Construction Work:

- 1) Execute work by methods to minimize raising dust from construction operations.
- 2) Ceiling tiles: Immediately replace ceiling tiles displaced for visual inspection.

b. Upon Completion:

- 1) Clean work area upon completion of task

2. Class II requirements:

a. During Construction Work:

- 1) Provide active means to prevent airborne dust from dispersing into atmosphere such as wet methods or tool mounted dust collectors where possible.
- 2) Water mist work surfaces to control dust while cutting.
- 3) Seal unused doors with duct tape.
- 4) Block off and seal air vents.
- 5) Remove or isolate HVAC system in areas where work is being performed.

b. Upon Completion:

- 1) Wipe work surfaces with cleaner/disinfectant.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

- 2) Contain construction waste before transport in tightly covered containers.
- 3) Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area.
- 4) Upon completion, restore HVAC system where work was performed

3. Class III requirements:

a. During Construction Work:

- 1) Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system.
- 2) Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. Install construction barriers and ceiling protection carefully, outside of normal work hours.
- 3) Maintain negative air pressure, 0.01 inches of water gauge, within work site utilizing HEPA equipped air filtration units and continuously monitored with a digital display, recording and alarm instrument, which must be calibrated on installation, maintained with periodic calibration and monitored by the contractor.
- 4) Contain construction waste before transport in tightly covered containers.
- 5) Cover transport receptacles or carts. Tape covering unless solid lid.

b. Upon Completion:

- 1) Do not remove barriers from work area until completed project is inspected by the COR and thoroughly cleaned by the VA Environmental Services Department.
- 2) Remove construction barriers and ceiling protection carefully to minimize spreading of dirt and debris associated with construction, outside of normal work hours.
- 3) Vacuum work area with HEPA filtered vacuums.
- 4) Wet mop area with cleaner/disinfectant.
- 5) Upon completion, restore HVAC system where work was performed.

4. Class IV requirements:

a. During Construction Work:

- 1) Isolate HVAC system in area where work is being done to prevent contamination of duct system.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

- 2) Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. Install construction barriers and ceiling protection carefully, outside of normal work hours.
- 3) Maintain negative air pressure, 0.01 inches of water gauge, within work site utilizing HEPA equipped air filtration units and continuously monitored with a digital display, recording and alarm instrument, which must be calibrated on installation, maintained with periodic calibration and monitored by the contractor.5) Seal holes, pipes, conduits, and punctures.
- 4) Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave work site.
- 5) All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area.

b. Upon Completion:

- 1) Do not remove barriers from work area until completed project is inspected by the COR with thorough cleaning by the VA Environmental Services Dept.
- 2) Remove construction barriers and ceiling protection carefully to minimize spreading of dirt and debris associated with construction, outside of normal work hours.
- 3) Contain construction waste before transport in tightly covered containers.
- 4) Cover transport receptacles or carts. Tape covering unless solid lid.
- 5) Vacuum work area with HEPA filtered vacuums.
- 6) Wet mop area with cleaner/disinfectant.
- 7) Upon completion, restore HVAC system where work was performed.

C. Barriers shall be erected as required based upon classification (Class III & IV requires barriers) and shall be constructed as follows:

1. Class III and IV - closed door with masking tape applied over the frame and door is acceptable for projects that can be contained in a single room.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

2. Construction, demolition or reconstruction not capable of containment within a single room must have the following barriers erected and made presentable on hospital occupied side:
 - a. Class III & IV (where dust control is the only hazard, and an agreement is reached with the Resident Engineer and Medical Center) - Airtight plastic barrier that extends from the floor to ceiling. Seams must be sealed with duct tape to prevent dust and debris from escaping
 - b. Class III & IV - Drywall barrier erected with joints covered or sealed to prevent dust and debris from escaping.
 - c. Class III & IV - Seal all penetrations in existing barrier airtight
 - d. Class III & IV - Barriers at penetration of ceiling envelopes, chases and ceiling spaces to stop movement air and debris
 - e. Class IV only - Anteroom or double entrance openings that allow workers to remove protective clothing or vacuum off existing clothing
 - f. Class III & IV - At elevators shafts or stairways within the field of construction, overlapping flap minimum of two feet wide of polyethylene enclosures for personnel access.

D. Products and Materials:

1. Sheet Plastic: Fire retardant polystyrene, 6-mil thickness meeting local fire codes
2. Barrier Doors: Self Closing One-hour fire-rated solid core wood in steel frame, painted.
3. Dust proof one-hour fire-rated drywall
4. High Efficiency Particulate Air-Equipped filtration machine rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. HEPA filters should have ASHRAE 85 or other prefilter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Maintenance of equipment and replacement of the HEPA filters and other filters will be in accordance with manufacturer's instructions.
5. Exhaust Hoses: Heavy duty, flexible steel reinforced; Ventilation Blower Hose
6. Adhesive Walk-off Mats: Provide minimum size mats of 24 inches x 36 inches
7. Disinfectant: Hospital-approved disinfectant or equivalent product
8. Portable Ceiling Access Module

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

- E. Before any construction on site begins, all contractor personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the medical center.
- F. A dust control program will be established and maintained as part of the contractor's infection preventive measures in accordance with the FGI Guidelines for Design and Construction of Healthcare Facilities. Prior to start of work, prepare a plan detailing project-specific dust protection measures with associated product data, including periodic status reports, and submit to COR for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- G. Medical center Infection Control personnel will monitor for airborne disease (e.g. aspergillosis) during construction. A baseline of conditions will be established by the medical center prior to the start of work and periodically during the construction stage to determine impact of construction activities on indoor air quality with safe thresholds established.
- H. In general, the following preventive measures shall be adopted during construction to keep down dust and prevent mold.
 - 1. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. HEPA filtration is required where the exhaust dust may reenter the medical center.
 - 2. Exhaust hoses shall be exhausted so that dust is not reintroduced to the medical center.
 - 3. Adhesive Walk-off/Carpet Walk-off Mats shall be used at all interior transitions from the construction area to occupied medical center areas. These mats shall be changed as often as required to maintain clean work areas directly outside construction area at all times.
 - 4. Vacuum and wet mop all transition areas from construction to the occupied medical center at the end of each workday. Vacuum shall utilize HEPA filtration. Maintain surrounding area frequently. Remove debris as it is created. Transport these outside the construction area in containers with tightly fitting lids.
 - 5. The contractor shall not haul debris through patient-care areas without prior approval of the Resident Engineer and the Medical Center. When, approved, debris shall be hauled in enclosed dust proof containers or wrapped in plastic and sealed with duct tape. No sharp objects should be allowed to cut through the plastic. Wipe down the exterior of the containers with a damp rag to remove dust. All equipment, tools, material, etc. transported through occupied areas shall be made free from dust and moisture by vacuuming and wipe down.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

6. There shall be no standing water during construction. This includes water in equipment drip pans and open containers within the construction areas. All accidental spills must be cleaned up and dried within 12 hours. Remove and dispose of porous materials that remain damp for more than 72 hours.
7. At completion, remove construction barriers and ceiling protection carefully, outside of normal work hours. Vacuum and clean all surfaces free of dust after the removal.

I. Final Cleanup:

1. Upon completion of project, or as work progresses, remove all construction debris from above ceiling, vertical shafts and utility chases that have been part of the construction.
2. Perform HEPA vacuum cleaning of all surfaces in the construction area. This includes walls, ceilings, cabinets, furniture (built-in or free standing), partitions, flooring, etc.
3. All new air ducts shall be cleaned prior to final inspection.

J. Exterior Construction

1. Contractor shall verify that dust will not be introduced into the medical center through intake vents or building openings. HEPA filtration on intake vents is required where dust may be introduced.
2. Dust created from disturbance of soil such as from vehicle movement will be wetted with use of a water truck as necessary
3. All cutting, drilling, grinding, sanding, or disturbance of materials shall be accomplished with tools equipped with either local exhaust ventilation (i.e. vacuum systems) or wet suppression controls.

1.13 TUBERCULOSIS SCREENING

- A. Contractor shall provide written certification that all contract employees assigned to the work site have had a pre-placement tuberculin screening within 90 days prior to assignment to the worksite and been found have negative TB screening reactions. Contractors shall be required to show documentation of negative TB screening reactions for any additional workers who are added after the 90-day requirement before they will be allowed to work on the work site. NOTE: This can be the Center for Disease Control (CDC) and Prevention and two-step skin testing or a Food and Drug Administration (FDA)-approved blood test.
 1. Contract employees manifesting positive screening reactions to the tuberculin shall be examined according to current CDC guidelines prior to working on VHA property.
 2. Subsequently, if the employee is found without evidence of active (infectious) pulmonary TB, a statement documenting examination by a

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

physician shall be on file with the employer (construction contractor), noting that the employee with a positive tuberculin screening test is without evidence of active (infectious) pulmonary TB.

3. If the employee is found with evidence of active (infectious) pulmonary TB, the employee shall require treatment with a subsequent statement to the fact on file with the employer before being allowed to return to work on VHA property.

1.14 FIRE SAFETY

- A. Fire Safety Plan: Establish and maintain a site-specific fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submit to COR for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. This plan may be an element of the Accident Prevention Plan.
- B. Site and Building Access: Maintain free and unobstructed access to facility emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.
- C. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from existing buildings and new construction by distances in accordance with NFPA 241. For small facilities with less than 6 m (20 feet) exposing overall length, separate by 3m (10 feet).
- D. Temporary Construction Partitions:
 1. Install and maintain temporary construction partitions to provide smoke-tight separations between construction areas and adjoining areas. Construct partitions of gypsum board or treated plywood (flame spread rating of 25 or less in accordance with ASTM E84) on both sides of fire retardant treated wood or metal steel studs. Extend the partitions through suspended ceilings to floor slab deck or roof. Seal joints and penetrations. At door openings, install Class C, ¾ hour fire/smoke rated doors with self-closing devices.
 2. Install one-hour and two-hour fire-rated temporary construction partitions as shown on drawings to maintain integrity of existing exit stair enclosures, exit passageways, fire-rated enclosures of hazardous areas, horizontal exits, smoke barriers, vertical shafts and openings enclosures.
 3. Close openings in smoke barriers and fire-rated construction to maintain fire ratings. Seal penetrations with listed through-penetration firestop materials in accordance with Section 07 84 00, FIRESTOPPING.
- E. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

- F. Means of Egress: Do not block exiting for occupied buildings, including paths from exits to roads. Minimize disruptions and coordinate with the COR.
- G. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to the COR.
- H. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.
- I. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.
- J. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately under construction, and temporarily for connections. Provide fire watch for impairments more than 4 hours in a 24-hour period. Request interruptions in accordance with Article, OPERATIONS AND STORAGE AREAS, and coordinate with COR. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the medical center. Parameters for the testing and results of any tests performed shall be recorded by the medical center and copies provided to the COR.
- K. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with COR.
- L. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with COR. Obtain permits from the project COR or others in the Project Section prior to the work.
- M. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to COR.
- N. Smoking: Smoking is prohibited in and adjacent to construction areas inside existing buildings and additions under construction. In separate and detached buildings under construction, smoking is prohibited except in designated smoking rest areas.
- O. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.

1.15 ELECTRICAL

- A. All electrical work shall comply with NFPA 70 (NEC), NFPA 70B, NFPA 70E, 29 CFR Part 1910 Subpart J - General Environmental Controls, 29 CFR Part 1910 Subpart S - Electrical, and 29 CFR 1926 Subpart K in addition to other references required by contract.
- B. All qualified persons performing electrical work under this contract shall be licensed journeyman or master electricians. All apprentice electricians performing under this contract shall be deemed unqualified

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

persons unless they are working under the immediate supervision of a licensed electrician or master electrician.

- C. All electrical work will be accomplished de-energized and in the Electrically Safe Work Condition (refer to NFPA 70E for Work Involving Electrical Hazards, including Exemptions to Work Permit). Any Contractor, subcontractor or temporary worker who fails to fully comply with this requirement is subject to immediate termination in accordance with FAR clause 52.236-5(c). Only in rare circumstance where achieving an electrically safe work condition prior to beginning work would increase or cause additional hazards, or is infeasible due to equipment design or operational limitations is energized work permitted. The COR, Facility Safety, and Director of Engineering with approval of the Medical Center Director will make the determination if the circumstances would meet the exception outlined above. An AHA and permit specific to energized work activities will be developed, reviewed, and accepted by the VA prior to the start of that activity.
1. Development of a Hazardous Electrical Energy Control Procedure is required prior to de-energization. A single Simple Lockout/Tagout Procedure for multiple work operations can only be used for work involving qualified person(s) de-energizing one set of conductors or circuit part source. Task specific Complex Lockout/Tagout Procedures are required at all other times.
 2. Verification of the absence of voltage after de-energization and lockout/tagout is considered "energized electrical work" (live work) under NFPA 70E, and shall only be performed by qualified persons wearing appropriate shock protective (voltage rated) gloves and arc rate personal protective clothing and equipment, using Underwriters Laboratories (UL) tested and appropriately rated contact electrical testing instruments or equipment appropriate for the environment in which they will be used.
 3. Personal Protective Equipment (PPE) and electrical testing instruments will be readily available for inspection by the COR.
- D. Before beginning any electrical work, an Activity Hazard Analysis (AHA) will be conducted to include Shock Hazard and Arc Flash Hazard analyses (NFPA Tables can be used only as a last alternative and it is strongly suggested a full Arc Flash Hazard Analysis be conducted). Work shall not begin until the AHA for the work activity and permit for energized work has been reviewed and accepted by the COR and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.
- E. Ground-fault circuit interrupters. GFCI protection shall be provided where an employee is operating or using cord- and plug-connected tools related to construction activity supplied by 125-volt, 15-, 20-, or 30-ampere circuits. Where employees operate or use equipment supplied by greater than 125-volt, 15-, 20-, or 30-ampere circuits, GFCI protection or an assured equipment grounding conductor program shall be

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

implemented in accordance with NFPA 70E - 2015, Chapter 1, Article 110.4(C) (2) .

1.16 FALL PROTECTION

- A. The fall protection (FP) threshold height requirement is 6 ft. (1.8 m) for ALL WORK, unless specified differently or the OSHA 29 CFR 1926 requirements are more stringent, to include steel erection activities, systems-engineered activities (prefabricated) metal buildings, residential (wood) construction and scaffolding work.
 - 1. The use of a Safety Monitoring System (SMS) as a fall protection method is prohibited.
 - 2. The use of Controlled Access Zone (CAZ) as a fall protection method is prohibited.
 - 3. A Warning Line System (WLS) may ONLY be used on floors or flat or low-sloped roofs (between 0 - 18.4 degrees or 4:12 slope) and shall be erected around all sides of the work area (See 29 CFR 1926.502(f) for construction of WLS requirements). Working within the WLS does not require FP. No worker shall be allowed in the area between the roof or floor edge and the WLS without FP. FP is required when working outside the WLS.
 - 4. Fall protection while using a ladder will be governed by the OSHA requirements.

1.17 SCAFFOLDS AND OTHER WORK PLATFORMS

- A. All scaffolds and other work platforms construction activities shall comply with 29 CFR 1926 Subpart L.
- B. The fall protection (FP) threshold height requirement is 6 ft. (1.8 m) as stated in Section 1.16.
- C. The following hierarchy and prohibitions shall be followed in selecting appropriate work platforms.
 - 1. Scaffolds, platforms, or temporary floors shall be provided for all work except that can be performed safely from the ground or similar footing.
 - 2. Ladders less than 20 feet may be used as work platforms only when use of small hand tools or handling of light material is involved.
 - 3. Ladder jacks, lean-to, and prop-scaffolds are prohibited.
 - 4. Emergency descent devices shall not be used as working platforms.
- D. Contractors shall use a scaffold tagging system in which all scaffolds are tagged by the Competent Person. Tags shall be color-coded: green indicates the scaffold has been inspected and is safe to use; red indicates the scaffold is unsafe to use. Tags shall be readily visible, made of materials that will withstand the environment in which they are used, be legible and shall include:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

1. The Competent Person's name and signature;
 2. Dates of initial and last inspections.
- E. Mast Climbing work platforms: When access ladders, including masts designed as ladders, exceed 20 ft. (6 m) in height, positive fall protection shall be used.

1.18 EXCAVATION AND TRENCHES

- A. All excavation and trenching work shall comply with 29 CFR 1926 Subpart P. Excavations less than 5 feet in depth require evaluation by the contractor's "Competent Person" (CP) for determination of the necessity of an excavation protective system where kneeling, laying in, or stooping within the excavation is required.
- B. All excavations and trenches 24 inches in depth or greater shall require a written trenching and excavation permit. (NOTE - some States and other local jurisdictions require separate state/jurisdiction-issued excavation permits). The permit shall have two sections, one section will be completed prior to digging or drilling and the other will be completed prior to personnel entering the excavations greater than 5 feet in depth. Each section of the permit shall be provided to the COR and/or other Government Designated Authority prior to proceeding with digging or drilling and prior to proceeding with entering the excavation. After completion of the work and prior to opening a new section of an excavation, the permit shall be closed out and provided to the COR and/or other Government Designated Authority. The permit shall be maintained onsite and the first section of the permit shall include the following:
1. Estimated start time & stop time
 2. Specific location and nature of the work.
 3. Indication of the contractor's "Competent Person" (CP) in excavation safety with qualifications and signature. Formal course in excavation safety is required by the contractor's CP.
 4. Indication of whether soil or concrete removal to an offsite location is necessary.
 5. Indication of whether soil samples are required to determine soil contamination.
 6. Indication of coordination with local authority (i.e. "One Call") or contractor's effort to determine utility location with search and survey equipment.
 7. Indication of review of site drawings for proximity of utilities to digging/drilling.

The second section of the permit for excavations greater than five feet in depth shall include the following:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

1. Determination of OSHA classification of soil. Soil samples will be from freshly dug soil with samples taken from different soil type layers as necessary and placed at a safe distance from the excavation by the excavating equipment. A pocket penetrometer will be utilized in determination of the unconfined compression strength of the soil for comparison against OSHA table (Less than 0.5 Tons/FT2 - Type C, 0.5 Tons/FT2 to 1.5 Tons/FT2 - Type B, greater than 1.5 Tons/FT2 - Type A without condition to reduce to Type B).
 2. Indication of selected protective system (sloping/benching, shoring, shielding). When soil classification is identified as "Type A" or "Solid Rock", only shoring or shielding or Professional Engineer designed systems can be used for protection. A Sloping/Benching system may only be used when classifying the soil as Type B or Type C. Refer to Appendix B of 29 CFR 1926, Subpart P for further information on protective systems designs.
 3. Indication of the spoil pile being stored at least 2 feet from the edge of the excavation and safe access being provided within 25 feet of the workers.
 4. Indication of assessment for a potential toxic, explosive, or oxygen deficient atmosphere where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist. Internal combustion engine equipment is not allowed in an excavation without providing force air ventilation to lower the concentration to below OSHA PELs, providing sufficient oxygen levels, and atmospheric testing as necessary to ensure safe levels are maintained.
- C. As required by OSHA 29 CFR 1926.651(b)(1), the estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation.
1. The planned dig site will be outlined/marked in white prior to locating the utilities.
 2. Used of the American Public Works Association Uniform Color Code is required for the marking of the proposed excavation and located utilities.
 3. 811 will be called two business days before digging on all local or State lands and public Right-of Ways.
 4. Digging will not commence until all known utilities are marked.
 5. Utility markings will be maintained
- D. Excavations will be hand dug or excavated by other similar safe and acceptable means as excavation operations approach within 3 to 5 feet of identified underground utilities. Exploratory bar or other

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

detection equipment will be utilized as necessary to further identify the location of underground utilities.

- E. Excavations greater than 20 feet in depth require a Professional Engineer designed excavation protective system.

1.19 CRANES

- A. All crane work shall comply with 29 CFR 1926 Subpart CC.
- B. Prior to operating a crane, the operator must be licensed, qualified or certified to operate the crane. Thus, all the provisions contained with Subpart CC are effective and there is no "Phase In" date.
- C. A detailed lift plan for all lifts shall be submitted to the COR 14 days prior to the scheduled lift complete with route for truck carrying load, crane load analysis, siting of crane and path of swing and all other elements of a critical lift plan where the lift meets the definition of a critical lift. Critical lifts require a more comprehensive lift plan to minimize the potential of crane failure and/or catastrophic loss. The plan must be reviewed and accepted by the General Contractor before being submitted to the VA for review. The lift will not be allowed to proceed without prior acceptance of this document.
- D. Crane operators shall not carry loads
 - 1. over the general public or VAMC personnel
 - 2. over any occupied building unless
 - a. the top two floors are vacated
 - b. or overhead protection with a design live load of 300 psf is provided

1.20 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

- A. All installation, maintenance, and servicing of equipment or machinery shall comply with 29 CFR 1910.147 except for specifically referenced operations in 29 CFR 1926 such as concrete & masonry equipment [1926.702(j)], heavy machinery & equipment [1926.600(a)(3)(i)], and process safety management of highly hazardous chemicals (1926.64). Control of hazardous electrical energy during the installation, maintenance, or servicing of electrical equipment shall comply with Section 1.15 to include NFPA 70E and other VA specific requirements discussed in the section.

1.21 CONFINED SPACE ENTRY

- A. All confined space entry shall comply with 29 CFR 1926, Subpart AA except for specifically referenced operations in 29 CFR 1926 such as excavations/trenches [1926.651(g)].
- B. A site-specific Confined Space Entry Plan (including permitting process) shall be developed and submitted to the COR.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

1.22 WELDING AND CUTTING

As specified in section 1.14, Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with project COR or others in the Project Section prior to the work.

1.23 LADDERS

- A. All Ladder use shall comply with 29 CFR 1926 Subpart X.
- B. All portable ladders shall be of sufficient length and shall be placed so that workers will not stretch or assume a hazardous position.
- C. Manufacturer safety labels shall be in place on ladders
- D. Step Ladders shall not be used in the closed position
- E. Top steps or cap of step ladders shall not be used as a step
- F. Portable ladders, used as temporary access, shall extend at least 3 ft. (0.9 m) above the upper landing surface.
 - 1. When a 3 ft. (0.9-m) extension is not possible, a grasping device (such as a grab rail) shall be provided to assist workers in mounting and dismounting the ladder.
 - 2. In no case shall the length of the ladder be such that ladder deflection under a load would, by itself, cause the ladder to slip from its support.
- G. Ladders shall be inspected for visible defects on a daily basis and after any occurrence that could affect their safe use. Broken or damaged ladders shall be immediately tagged "DO NOT USE," or with similar wording, and withdrawn from service until restored to a condition meeting their original design.

1.24 FLOOR & WALL OPENINGS

- A. All floor and wall openings shall comply with 29 CFR 1926 Subpart M.
- B. Floor and roof holes/openings are any that measure over 2 in (51 mm) in any direction of a walking/working surface which persons may trip or fall into or where objects may fall to the level below. Skylights located in floors or roofs are considered floor or roof hole/openings.
- C. All floor, roof openings or hole into which a person can accidentally walk or fall through shall be guarded either by a railing system with toe boards along all exposed sides or a load-bearing cover. When the cover is not in place, the opening or hole shall be protected by a removable guardrail system or shall be attended when the guarding system has been removed, or other fall protection system.
 - 1. Covers shall be capable of supporting, without failure, at least twice the weight of the worker, equipment and material combined.
 - 2. Covers shall be secured when installed, clearly marked with the word "HOLE", "COVER" or "Danger, Roof Opening-Do Not Remove" or color-

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-17

coded or equivalent methods (e.g., red or orange "X"). Workers must be made aware of the meaning for color coding and equivalent methods.

3. Roofing material, such as roofing membrane, insulation or felts, covering or partly covering openings or holes, shall be immediately cut out. No hole or opening shall be left unattended unless covered.
4. Non-load-bearing skylights shall be guarded by a load-bearing skylight screen, cover, or railing system along all exposed sides.
5. Workers are prohibited from standing/walking on skylights.

- - - E N D - - -

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01 35 26-28
Safety Requirements

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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-20

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 https://www.aabc.com
AAMA	American Architectural Manufacturer's Association http://www.aamanet.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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-20

AGC	Associated General Contractors of America http://www.agc.org
AGMA	American Gear Manufacturers Association, Inc. http://www.agma.org
AH	American Hort https://www.americanhort.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 https://aitc-glulam.org
AMCA	Air Movement and Control Association, Inc. http://www.amca.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
ARPM	Association for Rubber Product Manufacturers https://arpm.com

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-20

ASABE	American Society of Agricultural and Biological Engineers https://www.asabe.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 International http://www.asse-plumbing.org
ASTM	American Society for Testing and Materials International http://www.astm.org
AWI	Architectural Woodwork Institute https://www.awinet.org
AWS	American Welding Society https://www.aws.org
AWWA	American Water Works Association https://www.awwa.org
BHMA	Builders Hardware Manufacturers Association https://www.buildershardware.com
BIA	The Brick Industry Association http://www.gobrick.com
CAGI	Compressed Air and Gas Institute https://www.cagi.org
CGA	Compressed Gas Association, Inc. https://www.cganet.com
CI	The Chlorine Institute, Inc. https://www.chlorineinstitute.org

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-20

CISCA	Ceilings and Interior Systems Construction Association https://www.cisca.org
CISPI	Cast Iron Soil Pipe Institute https://www.cispi.org
CLFMI	Chain Link Fence Manufacturers Institute https://www.chainlinkinfo.org
CPA	Composite Panel Association https://www.compositepanel.org
CPMB	Concrete Plant Manufacturers Bureau https://www.cpmc.org
CRA	California Redwood Association http://www.calredwood.org
CRSI	Concrete Reinforcing Steel Institute https://www.crsi.org
CTI	Cooling Technology Institute https://www.cti.org
DHA	Decorative Hardwoods Association https://www.decorativehardwoods.org
DHI	Door and Hardware Institute https://www.dhi.org
EGSA	Electrical Generating Systems Association http://www.egsa.org
EEI	Edison Electric Institute https://www.eei.org
EPA	United States Environmental Protection Agency https://www.epa.gov
ETL	ETL Testing Services http://www.intertek.com

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-20

FAA	Federal Aviation Administration https://www.faa.gov
FCC	Federal Communications Commission https://www.fcc.gov
FPS	Forest Products Society http://www.forestprod.org
GANA	Glass Association of North America http://www.glasswebsite.com
FM	Factory Mutual Global Insurance https://www.fmglobal.com
GA	Gypsum Association https://gypsum.org
GSA	General Services Administration https://www.gsa.gov
HI	Hydraulic Institute http://www.pumps.org
ICC	International Code Council https://shop.iccsafe.org
ICEA	Insulated Cable Engineers Association https://www.icea.net
ICAC	Institute of Clean Air Companies http://www.icac.com
IEEE	Institute of Electrical and Electronics Engineers https://www.ieee.org/
IGMA	Insulating Glass Manufacturers Alliance https://www.igmaonline.org
IMSA	International Municipal Signal Association http://www.imsasafety.org

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-20

MBMA	Metal Building Manufacturers Association https://www.mbma.com
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry http://msshq.org
NAAMM	National Association of Architectural Metal Manufacturers https://www.naamm.org
PHCC	Plumbing-Heating-Cooling Contractors Association https://www.phccweb.org
NBS	National Bureau of Standards See - NIST
NBBI	The National Board of Boiler and Pressure Vessel Inspectors https://www.nationalboard.org
NEC	National Electric Code See - NFPA National Fire Protection Association
NEMA	National Electrical Manufacturers Association https://www.nema.org
NFPA	National Fire Protection Association https://www.nfpa.org
NHLA	National Hardwood Lumber Association https://www.nhla.com
NIH	National Institute of Health https://www.nih.gov
NIST	National Institute of Standards and Technology https://www.nist.gov
NELMA	Northeastern Lumber Manufacturers Association, Inc. http://www.nelma.org
NPA	National Particleboard Association (See CPA, Composite Panel Association)

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-20

NSF	National Sanitation Foundation http://www.nsf.org
OSHA	Occupational Safety and Health Administration Department of Labor https://www.osha.gov
PCA	Portland Cement Association https://www.cement.org
PCI	Precast Prestressed Concrete Institute https://www.pci.org
PPI	Plastics Pipe Institute https://www.plasticpipe.org
PEI	Porcelain Enamel Institute http://www.porcelainenamel.com
PTI	Post-Tensioning Institute http://www.post-tensioning.org
RFCI	Resilient Floor Covering Institute https://www.rfci.com
RIS	Redwood Inspection Service (See Western Wood Products Association) https://www.wwpa.org
SCMA	Southern Cypress Manufacturers Association http://www.cypressinfo.org
SDI	Steel Door Institute http://www.steeldoor.org
SJI	Steel Joist Institute https://www.steeljoist.org
SMACNA	Sheet Metal & Air-Conditioning Contractors' National Association https://www.smacna.org

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-20

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

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

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

TCNA Tile Council of North America
<https://www.tcnatile.com>

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

TPI Truss Plate Institute
<https://www.tpinst.org>

UBC The Uniform Building Code
(See ICC)

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

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

WCLB West Coast Lumber Inspection Bureau
<http://www.wclib.org>

WDMA Window and Door Manufacturers Association
<https://www.wdma.com>

WRCLA Western Red Cedar Lumber Association
<https://www.realcedar.com>

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

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Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01 42 19-9
Reference Standards

01/16/2024

11-01-18

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 General Contractor.

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):
- T27-11.....Standard 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
- T99-10.....Standard 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
- T180-10.....Standard 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
- T310-13.....Standard 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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

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

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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

C1077-11c.....Standard Practice for Agencies Testing Concrete
and Concrete Aggregates for Use in Construction
and Criteria for Testing Agency Evaluation

C1314-11a.....Standard Test Method for Compressive Strength
of Masonry Prisms

D422-63(2007).....Standard Test Method for Particle-Size Analysis
of Soils

D698-07e1.....Standard 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-07e1.....Standard Test Methods for Deep Foundations
Under Static Axial Compressive Load

D1188-07e1.....Standard Test Method for Bulk Specific Gravity
and Density of Compacted Bituminous Mixtures
Using Coated Samples

D1556-07.....Standard Test Method for Density and Unit
Weight of Soil in Place by the Sand-Cone Method

D1557-09.....Standard Test Methods for Laboratory Compaction
Characteristics of Soil Using Modified Effort
(56,000ft lbf/ft³ (2,700 KNm/m³))

D2166-06.....Standard 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

D2216-10.....Standard Test Methods for Laboratory
Determination of Water (Moisture) Content of
Soil and Rock by Mass

D2974-07a.....Standard Test Methods for Moisture, Ash, and
Organic Matter of Peat and Other Organic Soils

D3666-11.....Standard Specification for Minimum Requirements
for Agencies Testing and Inspecting Road and
Paving Materials

D3740-11.....Standard Practice for Minimum Requirements for
Agencies Engaged in Testing and/or Inspection

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

of Soil and Rock as used in Engineering Design
and Construction
D6938-10.....Standard 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
E164-08.....Standard Practice for Contact Ultrasonic
Testing of Weldments
E329-11c.....Standard Specification for Agencies Engaged in
Construction Inspection, Testing, or Special
Inspection
E543-09.....Standard 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
E709-08.....Standard Guide for Magnetic Particle
Examination
E1155-96 (R2008).....Determining FF Floor Flatness and FL Floor
Levelness Numbers
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

E. American Welding Society (AWS):

D1.D1.1M-10.....Structural 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

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 Officer's Representative. When it appears materials furnished, or work performed by Contractor fail to meet construction contract requirements, Testing Laboratory shall direct attention of Contracting Officer's Representative to such failure.
- C. Written Reports: Testing laboratory shall submit test reports to Contracting Officer's Representative, Contractor, unless other arrangements are agreed to in writing by the Contracting Officer's Representative. Submit reports of tests that fail to meet construction contract requirements on colored paper.
- D. Verbal Reports: Give verbal notification to Contracting Officer's 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 Contracting Officer's Representative 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 Officer's Representative extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.
 - 2. Provide full time observation of fill placement and compaction and field density testing in building areas and provide full time observation of fill placement and compaction and field density

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

testing in pavement areas to verify that earthwork compaction obtained is in accordance with contract documents.

3. Provide supervised geotechnical technician to inspect excavation, subsurface preparation, and backfill for structural fill.

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, AASHTO T191 or ASTM D2167 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 Officer's 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 Contracting Officer's Representative. In each

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

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 20 cubic yards stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with 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 Officer's Representative.

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 Officer's Representative.

3.5 ASPHALT CONCRETE PAVING:

- A. Aggregate Base Course:
 - 1. Determine maximum density and optimum moisture content for aggregate base material in accordance with AASHTO T180, Method D.
 - 2. Make a minimum of three field density tests on each day's final compaction on each aggregate course in accordance ASTM D1556.
 - 3. Sample and test aggregate as necessary to ensure compliance with specification requirements for gradation, wear, and soundness as specified in the applicable state highway standards and specifications.
- B. Asphalt Concrete:
 - 1. Aggregate: Sample and test aggregates in stock pile and hot-bins as necessary to insure compliance with specification requirements for gradation (AASHTO T27), wear (AASHTO T96), and soundness (AASHTO T104).

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

2. Temperature: Check temperature of each load of asphalt concrete at mixing plant and at site of paving operation.
3. Density: Make a minimum of two field density tests in accordance with ASTM D1188 of asphalt base and surface course for each day's paving operation.

3.6 SITE WORK CONCRETE:

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

3.8 CONCRETE:

A. Batch Plant Inspection and Materials Testing:

1. Perform continuous batch plant inspection until concrete quality is established to satisfaction of Contracting Officer's Representative with concurrence of Contracting Officer and perform periodic inspections thereafter as determined by Contracting Officer's Representative.
2. Periodically inspect and test batch proportioning equipment for accuracy and report deficiencies to Contracting Officer's 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

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 Officer's 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. Notify laboratory technician at batch plant of mix irregularities and request materials and proportioning check.
8. Verify that specified mixing has been accomplished.
9. 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
Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

- 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

- c. Provide the Contractor and the Contracting Officer's 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 Officer's 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 Officer's 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/m^3 (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 REINFORCEMENT:

A. Review mill test reports furnished by Contractor.
Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

3.13 MASONRY:

- A. 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

- 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. Welding Radiographic Testing: Test in accordance with ASTM E94, and AWS D1.1 for 5 percent of all full penetration welds at random.
- 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

- 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 Officer's 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 Contracting Officer's Representative.

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 Officer's 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 Officer's Representative.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

- 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 Officer's Representative.

3.18 TYPE OF TEST:

Approximate Number of Tests Required

A. Earthwork:

Laboratory Compaction Test, Soils:

ASTM D698) 100

Field Density, Soils (AASHTO T191, T205, or T310) 100

Penetration Test, Soils 20

B. Landscaping:

Topsoil Test 20

C. Aggregate Base:

Laboratory Compaction, ASTM D1557) 40

Field Density, ASTM D1556) 40

Aggregate, Base Course Gradation (AASHTO T27) 10

Wear (AASHTO T96) 10

Soundness (AASHTO T104) 10

D. Asphalt Concrete:

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

	11-01-18
Field Density, ASTM D1188	<u>20</u>
Aggregate, Asphalt Concrete Gradation (AASHTO T27)	<u>20</u>
Wear (AASHTO T96)	<u>20</u>
Soundness (AASHTO T104)	<u>20</u>
E. Concrete:	
Making and Curing Concrete Test Cylinders (ASTM C31)	<u>35</u>
Compressive Strength, Test Cylinders (ASTM C39)	<u>35</u>
Concrete Slump Test (ASTM C143)	<u>7</u>
Concrete Air Content Test (ASTM C173)	<u>7</u>
Unit Weight, Lightweight Concrete (ASTM C567)	<u>N/A</u>
Aggregate, Normal Weight: Gradation (ASTM C33)	<u>N/A</u>
Deleterious Substances (ASTM C33)	<u>N/A</u>
Soundness (ASTM C33)	<u>N/A</u>
Abrasion (ASTM C33)	<u>N/A</u>
Aggregate, Lightweight Gradation (ASTM C330)	<u>N/A</u>
Deleterious Substances (ASTM C330)	<u>N/A</u>
Unit Weight (ASTM C330)	<u>N/A</u>
Flatness and Levelness Readings (ASTM E1155) (number of days)	<u>1</u>
F. Reinforcing Steel:	
Tensile Test (ASTM A370)	<u>N/A</u>
Bend Test (ASTM A370)	<u>N/A</u>
Mechanical Splice (ASTM A370)	<u>N/A</u>
G. Masonry:	
Prism Tests (ASTM C1314)	<u>4</u>
H. Structural Steel:	
Ultrasonic Testing of Welds (ASTM E164)	<u>N/A</u>
Magnetic Particle Testing of Welds (ASTM E709)	<u>10</u>
Radiographic Testing of Welds (ASTM E94)	<u>N/A</u>

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Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 affect 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. Biological hazards: biological agents, infectious micro-organisms, germs, viral organisms, etc. which can be airborne or transmitted via contaminated surfaces.
 3. Particulate hazards: dust and any other deleterious substance that may cause irritation, inflammation, respiratory hazard to humans.
 4. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.
 5. Sediment: Soil and other debris that has been eroded and transported by runoff water.
 6. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, and agricultural operations and from community activities.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

7. 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.
8. Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass and crockery, metal and lumber scrap, tin cans, and bones.
9. 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 Contracting Officer's Representative (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 Contracting Officer for approval, a written and/or graphic Environmental Protection Plan including, but not limited to, the following:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01 57 19-2
Temporary Environmental Controls

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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 material storage areas, structures 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. Drawings showing locations for temporary interior ICRA installations, details, and phasing.
- k. Environmental Monitoring Plans for the job site including land, water, air, and noise.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01 57 19-3
Temporary Environmental Controls

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

1. 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.
- m. Inclusion of "best management practices" and methodologies.
- 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, topsoil, and landforms 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. Provide erosion control plans, in phases where required.
 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01 57 19-4
Temporary Environmental Controls

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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 or permanent sediment basins that accommodate the runoff of a local 100 (design year) 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 COR. Topsoil use and requirements are specified in Section 31 20 00, EARTHWORK.
 - 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 and permanent erosion and sedimentation control features shown on the Environmental Protection Plan. Maintain temporary erosion and sediment control measures such as berms, dikes, drains, inlet protection, sedimentation basins, grassing, and mulching, until permanent drainage and erosion control facilities are completed and operative.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01 57 19-5
Temporary Environmental Controls

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

6. Manage and control spoil areas on Government property to limit spoil to areas shown on the Environmental Protection Plan and prevent erosion of soil or sediment from entering nearby water courses or lakes.
 7. Protect adjacent areas from despoilment by temporary excavations and embankments.
 8. 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.
 9. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
 10. 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. Monitor water areas affected by construction.
- D. 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 North Dakota Pollution Control Agency rules and regulations and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01 57 19-6
Temporary Environmental Controls

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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. Interior Infection Control Risk Assessment Assemblies: Contractor shall provide Edge-Guard Barrier systems or VA-Approved equivalent products to ensure biological and particulate containment within construction work areas in accordance with these Specifications and the construction drawing documents. Edge-Guard systems is the Basis Of Design criteria.
 3. 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.
 4. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
 5. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- E. 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. Coordinate construction activities involving repetitive, high-level impact noise with 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01 57 19-7

Temporary Environmental Controls

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

Less than 30 seconds of any hour 85

Less than three minutes of any hour 80

Less than 12 minutes of any hour 75

Prior authorization and coordination with COR and adjacent area managers is required before beginning construction activities involving repetitive, high-level impact noise or vibrations. This activity may require work outside of normal hours which may include overnight and/or weekend work.

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 meter (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
SCRAPERS	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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

01 57 19-8

Temporary Environmental Controls

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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.
- F. 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.
- G. 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 COR. 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.

- - - E N D - - -

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

07-01-15

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 doorknob, 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

07-01-15

- - - E N D - - -

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01 58 16-2
Temporary Interior Signage

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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:
- D. Waste Management Plan development and implementation.
- E. Techniques to minimize waste generation.
- F. Sorting and separating of waste materials.
- G. Salvage of existing materials and items for reuse or resale.
- H. Recycling of materials that cannot be reused or sold.
- I. At a minimum, the following waste categories shall be diverted from landfills:
- J. Soil.
- K. Inerts (eg, concrete, masonry and asphalt).
- L. Clean dimensional wood and palette wood.
- M. Green waste (biodegradable landscaping materials).
- N. Engineered wood products (plywood, particle board and I-joists, etc).
- O. Metal products (eg, steel, wire, beverage containers, copper, etc).
- P. Sheathings
- Q. Cardboard, paper and packaging.
- R. Bitumen roofing materials.
- S. Plastics (eg, ABS, PVC).
- T. Carpet and/or pad.
- U. Gypsum board.
- V. Insulation.
- W. Paint.
- X. Fluorescent lamps.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.
- D. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.
 - a) The names and locations of mixed debris reuse and recycling facilities or sites.
 - b) The names and locations of trash disposal landfill facilities or sites.
 - c) 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01 74 19-5
Construction Waste Management

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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.
- E. Target waste diversion rate by material and an overall diversion rate.
- F. Final report documenting the results of implementation of the preconstruction waste management plan.

1.6 APPLICABLE PUBLICATIONS (NOT USED)

1.7 RECORDS (NOT USED)

PART 2 - PRODUCTS

2.1 MATERIALS

- A. List of each material and quantity to be salvaged, recycled, reused.
- A. List of each material and quantity proposed to be taken to a landfill.
- B. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

- - - E N D - - -

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.

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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

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 the 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

01 81 13-4

Sustainable Construction Requirements

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

- 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 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 the 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. Green Seal Standard GS-11, Paints, 1st Edition, May 20, 1993.
- C. Green Seal Standard GC-03, Anti-Corrosive Paints, 2nd Edition, January 7, 1997.
- D. Green Seal Standard GC-36, Commercial Adhesives, October 19, 2000.
- E. South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004.
- F. South Coast Air Quality Management District (SCAQMD) Rule 1168, July 1, 2005 and rule amendment date of January 7, 2005.
- G. Sheet Metal and Air Conditioning National Contractors' Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd Edition (ANSI/SMACNA 008-2008), Chapter 3.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

- H. 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).
- I. Federal Trade Commission Guides for the Use of Environmental Marketing Claims (16 CFR Part 260).
- J. 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) Cove Base Adhesives: 50 g/L.
 - 3) Architectural Non-Porous Sealant Primer: 250 g/L.
 - 4) Architectural Porous Sealant Primer: 775 g/L.
 - 5) Other Sealant Primer: 750 g/L.
 - 6) Architectural Sealant: 250 g/L.
 - 7) 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.
Porous Material (Except Wood) Substrate Adhesive: 50 g/L.
 - 3) Architectural Non-Porous Sealant Primer: 250 g/L.
 - 4) Architectural Porous Sealant Primer: 775 g/L.
 - 5) Other Sealant Primer: 750 g/L.
 - 6) Contact Adhesive: 80 g/L.
 - 7) Architectural Sealants: 250 g/L.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

- 8) 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) Floor Coating: 100 g/L.
 - 3) Interior Flat Paint, Coating or Primer: 50 g/L.
 - 4) Sealers and Undercoaters: 200 g/L.
 - 5) Concrete Curing Compounds: 350 g/L.
 - 6) Waterproofing Sealers: 250 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

- 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. Nonpressure pipe.
 - e. Roofing materials.
- 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) Erosion Control Materials.
 - 5) Dust Suppressants.
 - 6) Fertilizers.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

- 7) Floor Cleaners and Protectors.
- 8) Floor Coverings (Non-Carpet).
- 9) Glass Cleaners.
- 10) Hydraulic Fluids.
- 11) Industrial Cleaners.
- 12) Interior Paints and Coatings.
- 13) Mulch and Compost Materials.
- 14) Multipurpose Cleaners.
- 15) Multipurpose Lubricants.
- 16) Packaging Films.
- 17) Paint Removers.
- 18) Concrete Sealers.

E. 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: (NOT USED)
- b. Electronics and Information Technology:
 - 1) Audio/Video Equipment.
 - 2) Data Center Storage.
 - 3) Enterprise Servers.
 - 4) Uninterruptible Power Supplies.
 - 5) Voice over Internet Protocol (VoIP) Phones.
- c. Food Service Equipment (Commercial): (NOT USED)
- d. Other:
 - 1) Light Fixtures.

F. 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. Electric Chillers, Air-Cooled (Commercial).
2. Electric Chillers, Water-Cooled (Commercial).
3. Fluorescent Ballasts.
4. Fluorescent Lamps, General Service.
5. Light Emitting Diode (LED) Luminaires.

G. Electronic products and equipment being installed which fall into any of the following categories shall be EPEAT registered. Electronic

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

products and equipment covered by EPEAT program as of 09/14/2017

include: (NOT USED)

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

-----END-----

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

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. 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.
- C. Where training or educational services for VA are required and specified in other sections of the specifications, including but not limited to Division 7, Division 8, Division 21, Division 22, Division 23, Division 26, Division 27, Division 28, and Division 31 series sections of the specification, these services are intended to be provided in addition to the training and educational services specified herein.
- D. 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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.
- E. 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 Resident Engineer 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 Contracting Officer Representative (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.
- 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 (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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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 the 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 the 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 the COR, with appropriate technical guidance from the 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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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.

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
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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

List of Acronyms	
Acronym	Meaning
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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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".

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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. (Not Included in the project Scope of Work.)

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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

IDIQ A/E) to conduct peer reviews. (Not included in the project Scope of Work.)

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. (Not included in the project Scope of Work.)

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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 (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 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:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

Systems To Be Commissioned	
System	Description
Building Exterior Closure (NOT USED)	
Specialties (NOT USED)	
Equipment (NOT USED)	
Conveying Equipment	
Elevators	Interface with other systems (fire alarm, etc.) [ASTM testing and certification by others]
Fire Suppression	
Fire Pump	Fire Pump, jockey pump, fire pump controller/ATS
Fire Sprinkler Systems	Wet pipe system, dry pipe system, pre-action system, special agent systems
Plumbing	
Wastewater Pump Systems	Sump pumps
HVAC	
Noise and Vibration Control	Noise and vibration levels for critical equipment such as Air Handlers, Chillers, Cooling Towers, Boilers, Generators, etc. 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]
HVAC Air Handling Systems**	Air handling Units, packaged rooftop AHU, Outdoor Air conditioning units, humidifiers, DDC control panels
HVAC Terminal Unit Systems**	VAV Terminal Units, CAV terminal units, fan coil units, fin-tube radiation, unit heaters

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
 Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
 Bancroft Architects + Engineers

04-01-22

Systems To Be Commissioned	
System	Description
Solar Energy Heating Systems **	Solar collectors, heat exchangers, storage tanks, solar-boasted domestic hot water heater, pumps, valves, instrumentation
Electrical	
Medium-Voltage Electrical Distribution Systems	Medium-Voltage Switchgear, Medium-Voltage Switches, Underground ductbank and distribution, Pad-Mount Transformers, Medium-Voltage Load Interrupter Switches,
Grounding & Bonding Systems	Witness 3rd party testing, review reports
Electric Power Monitoring Systems	Metering, sub-metering, power monitoring systems, PLC control systems
Electrical System Protective Device Study	Review reports, verify field settings consistent with Study
Secondary Unit Substations	Medium-voltage components, transformers, low-voltage distribution, verify breaker testing results (injection current, etc)
Low-Voltage Distribution System	Normal power distribution system, Life-safety power distribution system, critical power distribution system, equipment power distribution system, switchboards, distribution panels, panelboards, verify breaker testing results (injection current, etc)
Lighting & Lighting Control** Systems	Emergency lighting, occupancy sensors, lighting control systems, architectural dimming systems, theatrical dimming systems, exterior lighting and controls
Lightning Protection System	Witness 3rd party testing, review reports
Communications	

Contract No. 36C26319D0044
 Station Project No. 437-21-210
 Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

Systems To Be Commissioned	
System	Description
Grounding & Bonding System	Witness 3rd party testing, review reports
Structured Cabling System	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
Security Access Detection Systems	Witness 3rd party testing, review reports
Video Surveillance System	Witness 3rd party testing, review reports
Fire Detection and Alarm System	100% device acceptance testing, battery draw-down test, verify system monitoring, verify interface with other systems.
Renewable Energy Sources	
Solar Energy Electrical Power Generation Systems **	Solar collector modules, DC-AC inverter, storage batteries, combiners, Switchgear, instrumentation, monitoring and control systems
Site Utilities	
Storm Drainage Utilities	Site Storm Water Distribution
Transportation (NOT USED)	
Integrated Systems Tests	
Loss of Power Response	Loss of power to building, loss of power to campus, restoration of power to building, restoration of power to campus.
Fire Alarm Response	Integrated System Response to Fire Alarm Condition and Return to Normal

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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.

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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

- 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

- 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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 an 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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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 Resident Engineer with copies to the Contractor and Architect.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

- 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 seven days 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 seven days 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

04-01-22

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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

recommended intervals and following any repairs to the equipment.

Calibration tags shall be affixed or certificates readily available.

Fargo VA Health Care System
 Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
 Bancroft Architects + Engineers

04-01-22

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 = Contracting Office Representative A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Category	Task Description	CxA	COR	A/E	PC	O&M	Notes
Meetings	Construction Commissioning Kick Off meeting	L	A	O	P	O	
	Commissioning Meetings	L	A	O	P	O	
	Project Progress Meetings	P	A	O	L	O	
	Controls Meeting	L	A	O	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	O	P	N/A	
Cx Plan & Spec	Final Commissioning Plan	L	A	O	R	O	

Contract No. 36C26319D0044
 Station Project No. 437-21-210
 Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
 Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
 Bancroft Architects + Engineers

04-01-22

Construction Phase		CxA = Commissioning Agent COR = Contracting Office Representative A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Category	Task Description	CxA	COR	A/E	PC	O&M	Notes
Schedules	Duration Schedule for Commissioning Activities	L	A	O	R	N/A	
OPR and BOD	Maintain OPR on behalf of Owner	L	A	O	R	O	
	Maintain BOD/DID on behalf of Owner	L	A	O	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 Observations	Witness Factory Testing	P	A	P	L	O	
	Construction Observation Site Visits	L	A	R	R	O	
Functional	Final Pre-Functional Checklists	L	A	R	R	O	

Contract No. 36C26319D0044
 Station Project No. 437-21-210
 Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
 Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
 Bancroft Architects + Engineers

04-01-22

Construction Phase		CxA = Commissioning Agent					L = Lead
Commissioning Roles & Responsibilities		COR = Contracting Office Representative					P = Participate
		A/E = Design Arch/Engineer					A = Approve
		PC = Prime Contractor					R = Review
		O&M = Gov't Facility O&M					O = Optional
Category	Task Description	CxA	COR	A/E	PC	O&M	Notes
Test Protocols	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	O	R	O	
	Maintain Commissioning Issues Log	L	A	O	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					L = Lead
Commissioning Roles & Responsibilities		COR = Contracting Officer Representative					P = Participate
		A/E = Design Arch/Engineer					A = Approve
		PC = Prime Contractor					R = Review
		O&M = Gov't Facility O&M					O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes

Contract No. 36C26319D0044
 Station Project No. 437-21-210
 Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
 Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
 Bancroft Architects + Engineers

04-01-22

Acceptance Phase		CxA = Commissioning Agent COR = Contracting Officer Representative A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Meetings	Commissioning Meetings	L	A	O	P	O	
	Project Progress Meetings	P	A	P	L	O	
	Pre-Test Coordination Meeting	L	A	O	P	O	
	Lessons Learned and Commissioning Report Review Meeting	L	A	O	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	O	P	O	
Cx Plan & Spec	Maintain/Update Commissioning Plan	L	A	O	R	O	
Schedules	Prepare Functional Test Schedule	L	A	O	R	O	
OPR and BOD	Maintain OPR on behalf of Owner	L	A	RO	R	O	
	Maintain BOD/DID on behalf of Owner	L	A	O	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	

Contract No. 36C26319D0044
 Station Project No. 437-21-210
 Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

Acceptance Phase		CxA = Commissioning Agent COR = Contracting Officer Representative A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Commissioning Roles & Responsibilities							
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
	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	O	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	O	P	P	
Reports and Logs	Status Reports	L	A	O	R	O	
	Maintain Commissioning Issues Log	L	A	O	R	O	
	Final Commissioning Report	L	A	RO	R	R	
	Prepare Systems Manuals	L	A	O	R	R	

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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

Warranty Phase		CxA = Commissioning Agent					L = Lead
Commissioning Roles & Responsibilities		COR = Contracting Officer Representative A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					P = Participate A = Approve R = Review O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Meetings	Post-Occupancy User Review Meeting	L	A	O	P	P	
Site Observations	Periodic Site Visits	L	A	O	O	P	
Functional	Deferred and/or seasonal Testing	L	A	O	P	P	

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
 Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
 Bancroft Architects + Engineers

04-01-22

Warranty Phase		CxA = Commissioning Agent					L = Lead
Commissioning Roles & Responsibilities		COR = Contracting Officer Representative A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					P = Participate A = Approve R = Review O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Test Protocols							
Technical Activities	Issues Resolution Meetings	L	S	O	O	P	
	Post-Occupancy Warranty Checkup and review of Significant Outstanding Issues	L	A	O	R	P	
Reports and Logs	Final Commissioning Report Amendment	L	A	O	R	R	
	Status Reports	L	A	O	R	R	

Contract No. 36C26319D0044
 Station Project No. 437-21-210
 Bancroft-AE Project No. 22-113

01/16/2024

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

- 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 21, 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 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

- 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 (NOT USED)

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 Workstation 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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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 Resident Engineer 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 Resident Engineer. Any pre-test trend analysis comments generated by the Commissioning Team should be addressed and resolved by the Contractor, as directed by the Resident Engineer, 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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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		

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
 Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
 Bancroft Architects + Engineers

04-01-22

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
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
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

Contract No. 36C26319D0044
 Station Project No. 437-21-210
 Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
 Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
 Bancroft Architects + Engineers

04-01-22

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 #1 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Exhaust Fan #2 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min

Terminal Unit (VAV, CAV, etc.) Trending and Alarms (NOT USED)							
Point	Type	Trend Interval	Operationa l Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay

4-Pipe Fan Coil Trending and Alarms (NOT USED)							
Point	Type	Trend Interval	Operationa l Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay

2-Pipe Fan Coil Unit Trending and Alarms							
Point	Type	Trend Interval	Operationa l Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay

Unit Heater 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

Contract No. 36C26319D0044
 Station Project No. 437-21-210
 Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
 Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
 Bancroft Architects + Engineers

04-01-22

Unit Heater Trending and Alarms							
Point	Type	Trend Interval	Operationa l Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Unit Heater ON/OFF	DO	COV	12 hours	3 days	M	Status <> Command	30 min

Steam and Condensate Pumps Trending and Alarms (NOT USED)							
Point	Type	Trend Interval	Operationa l Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay

Domestic Hot Water Trending and Alarms (NOT USED)							
Point	Type	Trend Interval	Operationa l Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay

Hydronic Hot Water Trending and Alarms (NOT USED)							
Point	Type	Trend Interval	Operationa l Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay

Chilled Water System Trending and Alarms (NOT USED)							
Point	Type	Trend Interval	Operationa l Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay

Condenser Water System Trending and Alarms (NOT USED)							

Fargo VA Health Care System
 Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
 Bancroft Architects + Engineers

04-01-22

Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay

Steam Boiler System Trending and Alarms (NOT USED)							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay

Hot Water Boiler System Trending and Alarms (NOT USED)							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay

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 Resident Engineer 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.

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.

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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

- 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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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 Resident Engineer, 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 demonstrations for fire suppression systems, plumbing systems equipment, HVAC operating

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

equipment and systems, electrical systems, communication systems, and security systems. 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,

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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, fire pumps, and fire suppression systems.
 - b. Intrusion detection systems.
 - c. Conveying systems, including elevators, wheelchair lifts, escalators, and automated materials handling systems.
 - d. Medical equipment, including medical gas equipment and piping.
 - e. Laboratory equipment, including laboratory air and vacuum equipment and piping.
 - f. Heat generation, including boilers, feedwater equipment, pumps, steam distribution piping, condensate return systems, heating hot water heat exchangers, and heating hot water distribution piping.
 - g. Refrigeration systems, including chillers, cooling towers, condensers, 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 switchgear, transformers, switchboards, panelboards, uninterruptible power supplies, and motor controls.
 - k. Packaged engine generators, including synchronizing switchgear/switchboards, and transfer switches.
 - l. Lighting equipment and controls.
 - m. Communication systems, including intercommunication, surveillance, nurse call systems, public address, mass

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

evacuation, voice and data, and entertainment television equipment.

- n. Site utilities including lift stations, condensate pumping and return systems, and storm water pumping systems.

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

- 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

- 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-22

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 -----

DIVISION 02

08-01-17

SECTION 02 41 00
DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies demolition and removal of portions of buildings, utilities, other structures shown.

1.2 RELATED WORK:

- A. Demolition and removal of roads, walks, curbs, and on-grade slabs outside buildings to be demolished: Section 31 20 00, EARTHWORK.
- 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.
- F. Glovebag Asbestos Removal: Section 02 82 13.13, GLOVEBAG ASBESTOS ABATEMENT.
- G. Asbestos Floor Tile and Mastic Removal: Section 02 82 13.19, ASBESTOS FLOOR TILE AND MASTIC ABATEMENT.
- H. Lead Paint: Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL.
- I. Environmental Protection: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- J. Construction Waste Management: Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT.
- K. Infectious Control: Section 01 35 26, SAFETY REQUIREMENTS.

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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

08-01-17

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.
 - 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. Prior to the start of work, Contractor to obtain a hot work permit from Contracting Officer's Representative / Station Engineering.
 - 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 Contracting Officer's

Representative. The Contractor shall coordinate the work of this
Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

08-01-17

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 Contracting Officer's Representative 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 and Section 01 35 26, SAFETY REQUIREMENTS.

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 buildings and structures, including all appurtenances related or connected thereto, as noted below:
 - 1. As required for installation of new utility service lines.
 - 2. To full depth within an area defined by hypothetical lines located 1500 mm (5 feet) outside building lines of new structures.
- 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 Contracting Officer's Representative. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

08-01-17

- 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 (5 feet) 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 Contracting Officer's Representative. When Utility lines are encountered that are not indicated on the drawings, the Contracting Officer's Representative 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 Contracting Officer's Representative. 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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Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

SECTION 02 65 00
UNDERGROUND STORAGE TANK REMOVAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removing and disposal of underground storage tank (UST) liquid contents.
2. Removing, cleaning, and disposing UST.
3. Testing and removing contaminated soils.
4. Backfilling and restoring excavation areas.

1.2 RELATED WORK

- A. Section 01 45 29, TESTING LABORATORY SERVICES: Laboratory Services.
- B. Section 02 41 00, DEMOLITION: Demolition Exposing UST.
- C. Section 31 20 00, EARTHWORK: UST Removal Excavation.
- D. Section 31 20 00, EARTHWORK: Excavation Backfilling.
- E. Section 32 90 00, PLANTING: Excavation Surface Restoration.

1.3 PRICE AND PAYMENT PROCEDURES

- A. Differing Site Conditions: Extent of excavation and restoration for UST removal indicated on drawings and extent of additional soils sampling and testing specified in this section are estimated. Variations less than 5 percent change are not cause for contract price and time adjustments. Additional work will be paid by unit prices as directed by Contracting Officer's Representative.

1.4 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American Petroleum Institute (API):
 1. 1604-96(R2010) - Closure of Underground Petroleum Storage Tanks.
 2. 2217A-09 - Safe Work in Inert Confined Spaces in the Petroleum and Petrochemical Industries.
 3. 2015-14 - Safe Entry and Cleaning of Petroleum Storage Tanks.
- C. Code of Federal Regulations (CFR):
 1. 40 CFR Part 280 - Underground Storage Tanks; Technical Requirements.
 2. 49 CFR Part 178 - Specifications for Packagings.
- D. United States Environmental Protection Agency (EPA):

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

1. SW-846 - Evaluating Solid Waste: Physical/Chemical Methods.

1.5 PRE-REMOVAL MEETINGS

- A. Conduct pre-removal meeting at project site minimum 30 days before beginning work of this section.
 1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Inspection and Testing Agency.
 - c. Contractor.
 - d. UST removal contractor.
 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Removal schedule.
 - b. Removal sequence.
 - c. Preparatory work.
 - d. Contaminated material containment and disposal.
 - e. Removal.
 - f. Inspecting and testing.
 - g. Other items affecting successful completion.
 3. Document and distribute meeting minutes to participants to record decisions affecting UST removal/closure.

1.6 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Notice of intent to close UST.
- C. Test Reports: Submit laboratory analytical reports.
 1. UST liquid contents analysis.
 2. UST interior environment analysis.
 3. Soil sample analysis.
- D. Qualifications: Substantiate qualifications comply with specifications.
 1. UST removal contractor.
 2. Testing laboratory.
 3. Liquid disposal facility.
 4. UST and associated piping/equipment disposal facility.
 5. Soil disposal facility.
- E. UST removal plan.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

F. Record Documents:

1. Six copies of Final UST Closure Report.
2. Record Drawings in electronic computer-aided design (CAD) file format showing:
 - a. Soil sample locations.
 - b. Detailed plan view.
 - c. Piping removal diagrams.
 - d. Control removal diagrams.
 - e. Component diagrams including tank removal procedure.
 - f. Detailed sequence of procedure.
3. Photographs of work in progress showing UST removal plan compliance.
4. Chain-of-custody documentation.
5. Disposal facility receipts, disposition reports, and non-hazardous waste manifests.

1.7 QUALITY ASSURANCE

- A. UST Removal Contactor: Experienced contractor, registered or licensed by applicable state agency regulating UST removal.
- B. Testing Laboratory: State certified independent testing laboratory experienced in hazardous waste liquid and soil testing.
- C. Liquid Disposal Facility: State certified disposal facility qualified to receive and dispose UST liquid contents.
- D. UST Disposal Facility: State certified disposal facility qualified to receive and dispose UST(s).
- E. Soil Disposal Facility: State certified disposal facility qualified to receive and dispose contaminated soils.
- F. UST Removal Plan: Describe detailed procedures for:
 1. Removing and disposing UST liquid content.
 2. Removing, ventilating, cleaning and disposing UST.
 3. Soil sampling and testing.
 4. Removing and disposing contaminated soils.
- G. UST Final Closure Report: Assemble work progress documentation showing removal plan compliance, including:
 1. Sample test records.
 2. Local Fire Marshal requirement.
 3. State Agency requirements.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

4. Hazardous material plan for local VA management.

1.8 FIELD CONDITIONS

A. Do not close or obstruct streets, sidewalks or drives without Contracting Officer's Representative's approval.

1. Submit closure request minimum 30 days before starting work.

1.9 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 ACCESSORIES

A. Waste Collection Drums: 49 CFR Part 178; Type 1A2, steel, removable head, 200 L (55 gallon) capacity, capable of containing waste without loss.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate demolition specified in Section 02 41 00, DEMOLITION required to access UST site.

3.2 UST CLOSURE SEQUENCE

- A. Notify applicable State Agency minimum 30 days before UST closure.
- B. Determine if contamination from UST is present.
- C. When contamination exists, notify Contracting Officer's Representative and cooperate to record site with applicable State Agency and EPA.
- D. Remove UST liquid contents, UST, and associated equipment (i.e., product lines, dispensers).
- E. Remove contaminated soil.
- F. Backfill excavated area.
- G. Restore excavation surfaces.

3.3 UST CLOSURE

A. Conform to API 1604, 40 CFR Part 280, 29 CFR Part 1910, and 29 CFR Part 1926.

3.4 UST LIQUID CONTENTS REMOVAL

- A. Collect, test, and analyze UST liquid content samples.
 - 1. Identify individual constituents and concentrations.
 - 2. Identify lower explosive limits for constituents in gaseous form.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

3. Identify disposal facilities qualified to receive and process UST liquid contents (i.e., petroleum and/or petroleum contact water [PCW]).
- B. Remove UST liquid contents before removing UST.
 1. Record liquid volume removed from UST.
- C. Deliver UST liquid contents to disposal facility.
 1. Obtain signed receipt including date, time, total liquid volume, and description of materials received.
 2. Obtain final report of UST liquid contents disposition after disposal completion.

3.5 REMOVAL OF PIPING, ANCILLARY EQUIPMENT, AND UST

- A. Excavate overburden and soils immediately surrounding UST as specified in Section 31 20 00, EARTHWORK.
 1. Contain and cover excavated materials with 0.15 mm/6 mil polyethylene sheeting to prevent loss and mixing with other materials until completion of initial soil testing. Provide straw bale berm around the outer limits of the containment area and cover with polyethylene sheets. Secure edges of sheets to keep the polyethylene sheeting in place.
 2. Disconnect all piping and ancillary equipment from the tank. Remove the piping completely (interior and exterior of the tank). Cap all tank ancillary equipment and piping connections, except those connections necessary to inert the tank within the excavation zone. Clean the piping exterior and ancillary equipment to remove all soil and inspect for signs of corrosion and leakage. Ensure no spillage of the piping contents occurs. Remove the tank from the excavation and clean the exterior to remove all soil and inspect for signs of corrosion, structural damage, or leakage. Use only non-sparking type materials or equipment which comes into contact with the tank, or in the vicinity of the excavation such as shovels, slings and tools. After removal from the excavation, place the tank on a level surface [adjacent to the tank excavation] [at an approved location] and secure it with wood blocks to prevent movement.
- B. Place UST on ground adjacent to removal location.
- C. Secure UST before cleaning.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

3.6 UST CLEANING

- A. Measure combustible gas and oxygen concentrations within UST.
- B. Ventilate UST interior to reduce combustible gas concentrations to maximum 10 percent of lower explosive limit and to provide 19.5 to 23.5 percent oxygen concentration.
 - 1. Test UST interior atmosphere confirming gas concentrations.
 - 2. Complete required ventilation before cleaning.
- C. Cut ports in UST wall facilitating cleaning access. Comply with API Standard 2217A and API Standard 2015 for UST entry.
- D. Clean surface contaminants from UST and access port interior wall surfaces.
 - 1. Contain removed materials without producing further contamination.
 - 2. Collect removed materials in waste collection drums. Seal drums to prevent material loss.
- E. Request UST inspection by local Fire Marshal and State Agency certifying completed UST cleaning.
- F. Dismantle UST as required for transport to disposal facility.
- G. Deliver UST, removed access ports, and waste collection drums to disposal facility.
 - 1. Obtain signed receipt including date, time, quantity, and description of materials received.
 - 2. Obtain final report of materials disposition after disposal completion.

3.7 SOIL TESTING

- A. Collect appropriate amount of soil samples from UST excavation area after tank removal. Sampling requirements vary vastly from state to state. Designer should consult the latest state requirements for the appropriate sampling methods.
 - 1. Collect appropriate amount of soil samples from the UST piping, fuel island/or dispensers, and soil stockpile. Testing requirements are dependent on regulations applicable to the locations where the tanks and piping are being removed. Verify number of tests required and required location for each test. Containerize samples to prevent sample loss and preserve sample condition until tested.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

2. Test and analyze samples according to EPA SW-846 for total petroleum hydrocarbon (TPH) concentrations. Hydrocarbon tests vary vastly from state to state. Designer should consult the latest state requirements for the appropriate hydrocarbon test methods. Additional analysis will likely include: benzene, toluene, ethylbenzene, and xylenes (BTEX), and polynuclear aromatic hydrocarbons (PAHs).
- B. When soil testing reveals evidence of hydrocarbons at concentrations greater than permitted by applicable State Agency for uncontaminated soil used as fill material, collect appropriate amount of soil samples in accordance with applicable state agency.
 1. Test and analyze samples as specified for initial samples.
 2. Notify Contracting Officer's Representative when additional samples are contaminated.
 3. The base price for volume between the final tank volume of material for the enclosure and the enclosure shall not to exceed 76 cubic meters (100 cubic yards) of soil removed. Any work beyond 76 cubic meters (100 cubic yards) and more than 6 test locations shall be considered extra and shall be based on unit pricing.
- C. Perform additional soil sampling and testing around UST as directed by Contracting Officer's Representative until contamination concentration is less than permitted by applicable State Agency for uncontaminated soil used as fill material.

3.8 CONTAMINATED SOIL REMOVAL

- A. Excavate contaminated materials as specified in Section 31 20 00, EARTHWORK.
- B. Remove contaminated soil from site according to applicable State Agency requirements. Petroleum contaminated soil should be profiled, and analytical results provided to the landfill for their approval prior to transportation. Upon approval, the petroleum contaminated soil should be transported under non-hazardous waste manifest (if applicable).
- C. Deliver contaminated soils to disposal or treatment facility.
 1. Obtain signed receipt including date, time, quantity, and description of materials received.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

2. Obtain final report of materials disposition after disposal completion.
3. Obtain a copy of each non-hazardous waste manifest.

3.9 UST EXCAVATION BACKFILL AND RESTORATION

- A. Backfill excavation with fill materials and compact as specified in Section 31 20 00, EARTHWORK.
- B. Restore pavements, sidewalks, and curbs matching adjacent materials as specified in Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.
- C. Restore landscaped areas and grass areas to match adjacent materials as specified in Section 32 90 00, PLANTING.

3.10 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 the following:
 1. UST liquid contents.
 2. UST interior environment.
 3. Soils contamination.
- C. Record chain-of-custody for samples until disposal.

3.11 PROTECTION

- A. Protect restored areas from traffic and construction operations.
- B. Repair damage.

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**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

**SECTION 02 82 11
TRADITIONAL ASBESTOS ABATEMENT**

PART 1 - GENERAL

1.1 SUMMARY OF THE WORK

A. 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 or describe 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.

B. Extent of Work:

1. 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 themselves of 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

2. Removal, clean-up and disposal of asbestos containing materials (ACM) and asbestos/waste contaminated elements or debris in an appropriate regulated area for the following approximate quantities:
 - a. 36 square feet of transite panels,

C. Related Work:

1. 02 41 00, DEMOLITION
2. 02 65 00, UNDERGROUND STORAGE TANK REMOVAL
3. 02 82 13.31, ASBESTOS TRANSITE-TYPE ABATEMENT
4. 02 83 33.13, LEAD BASED PAINT REMOVAL AND DISPOSAL
5. DIVISION 03, CONCRETE
6. DIVISION 04, MASONRY
7. DIVISION 05 METALS
8. DIVISION 06, WOOD, PLASTIC AND COMPOSITES
9. DIVISION 07, THERMAL AND MOISTURE PROTECTION
10. DIVISION 08, OPENINGS
11. DIVISION 09 FINISHES
12. DIVISION 10, SPECIALTIES
13. DIVISION 21, FIRE SUPPRESSION
14. DIVISION 22, PLUMBING
15. DIVISION 23, HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)
16. DIVISION 26, ELECTRICAL
17. DIVISION 07, COMMUNICATION
18. DIVISION 28, ELECTRONIC SAFETY AND SECURITY
19. DIVISION 31, EARTHWORK
20. DIVISION 32, EXTERIOR IMPROVEMENTS
21. DIVISION 33, UTILITIES
22. DIVISION 34, TRANSPORTATION

D. Tasks:

1. 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 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.

E. Contractors Use of Premises:

- 2. 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.
- 3. 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.

1.2 VARIATIONS IN QUANTITY

- A. 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 (+/- 10 percent) 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

1.3 STOP ASBESTOS REMOVAL

A. 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 if:

4. Airborne PCM analysis results equal to or greater than 0.01 f/cc above background levels inside the building but outside the regulated area;
5. breach or break in regulated area containment barrier(s);
6. less than -0.02 inch WCG pressure in the regulated area;
7. serious injury/death at the site;
8. fire/safety emergency at the site;
9. respiratory protection system failure;

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

10. power failure or loss or inadequate use of wetting agent;
11. any visible emissions observed outside the regulated area; or
12. failure to follow project specification requirements.

1.4 DEFINITIONS

A. 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.

B. 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).

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.

Aerosol - Solid or liquid particulate suspended in air.

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

Aggressive air 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 3, Fifth Edition is used to determine the fiber levels in air. For personal samples, area air samples and clearance air testing using Phase Contrast Microscopy (PCM) analysis, the NIOSH Method 7402

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

(Issue 2, Fourth Edition) 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 (MCE) membrane for PCM (Phase Contrast Microscopy, 25 mm, 3-piece with 2 inches Static Extension Cowl, 0.8 micron pore size) and MCE for TEM (Transmission Electron Microscopy, 25 mm, 3-piece with 2 inches Static Extension Cowl, 0.45 micron pore size).

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 air sampling, 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 2-layers of 6-mil independently installed plastic sheeting (Polyethylene) secured in place at openings such as doors, windows, penetrations or any other opening into the regulated area.

Primary Barrier - Plastic barriers placed over critical barriers and exposed directly to abatement work or to secondary barrier.

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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 report to 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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.

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 - Asbestos Operations and Maintenance Activities (OSHA Class III) 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 asbestos as determined using the method specified in 40 CFR 763, 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

technician conducting asbestos abatement air sampling, 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 or Excursion Limit (EL).

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 inch 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

Penetrating encapsulant - Encapsulant that is absorbed into the ACM matrix without leaving a surface layer.

Permissible exposure limit (PEL) - The level of exposure OSHA allows for as an eight (8) hour time-weighted average (TWA). 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 (EL) 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, fall protection, 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.

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, debris or asbestos-contaminated soil.

Polarized light microscopy (PLM) - Light microscopy using dispersion staining techniques and refractive indices to identify and quantify the type 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

as PACM. The designation of PACM may be rebutted pursuant to 29 CFR 1926.1101 (k) (5).

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/CIH) 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 Subpart E, 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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-7.1-2018.

Surfacing ACM - A material containing more than 1 percent asbestos that is sprayed, troweled on or otherwise applied to surfaces for acoustical, decorative, 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 report to a Certified Industrial Hygienist (CIH).

VA Representative - The VA official responsible for on-going project work.

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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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.

C. Referenced Standards Organizations: See Section 01 42 19 REFERENCED STANDARDS.

1.5 APPLICABLE CODES AND REGULATIONS

A. General Applicability of Codes, Regulations, and Standards:

1. 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.
2. 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.
3. 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 and/or the Contractor's on-site Field Office. These standards, regulations, codes and other applicable documents, including this specification and those listed in Section 1.5 may be made available electronically.

B. Asbestos Abatement Contractor Responsibility: The Asbestos Abatement Contractor (Contractor) shall assume full responsibility and liability

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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), respiratory protection, and 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/Local requirements related to failure to comply with the regulations applicable to the work.

C. Federal Requirements:

1. Federal requirements which govern 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 1926 Subpart E - Personal Protective Equipment and Life Saving Equipment
- 3) Title 29 CFR 1910.134 - Respiratory Protection
- 4) Title 29 CFR 1926 - Construction Industry Standards
- 5) Title 29 CFR 1926.33 - Access to Employee Exposure and Medical Records
- 6) Title 29 CFR 1926.59 same as 1910.1200 - Hazard Communication
- 7) Title 29 CFR 1926 Subpart C - General Safety and Health Provisions and Subpart D - Occupational Health and Environmental Controls

b. Environmental Protection Agency **(EPA)**:

- 1) 40 CFR 61 Subpart M - National Emission Standard for Hazardous Air Pollutants - Asbestos.
- 2) 40 CFR 763 - Asbestos Hazard Emergency Response Act (AHERA) and Asbestos Hazard Abatement Reauthorization Act (ASHARA)

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

c. Department of Transportation (DOT)

1) Title 49 CFR 171 - 180 - Transportation

D. State Requirements:

1. State requirements that apply to the asbestos abatement work, disposal, clearance, etc., include, but are not limited to, the following:

- a. North Dakota Air Pollution Control Rules, Chapter 33.1-15-13, Emission Standards for Hazardous Air Pollutants.

E. Local Requirements:

1. If local requirements are more stringent than federal or state standards, the local standards are to be followed.

F. Standards:

1. Standards which govern asbestos abatement activities include, but are not limited to, the following:
 - a. American National Standards Institute (ANSI)/ASSP Z9.2-2018 - Fundamentals Governing the Design and Operation of Local Exhaust Systems and ANSI/ASSE Z88.2-2015 - Practices for Respiratory Protection.
 - b. Underwriters Laboratories (UL) 586-2009 - UL Standard for Safety of HEPA Filter Units, 9th Edition; ANSI Approval 2017-12-19.
2. Standards which govern encapsulation work include, but are not limited to the following:
 - a. American Society for Testing and Materials International (ASTM)
3. Standards which govern the fire and safety concerns in abatement work include, but are not limited to, the following:
 - a. National Fire Protection Association (NFPA) 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.
 - b. NFPA 701 - Standard Methods for Fire Tests for Flame Resistant Textiles and Film.
 - c. NFPA 101 - Life Safety Code

G. EPA Guidance Documents:

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

1. EPA guidance documents which discuss asbestos abatement work activities are listed below. These documents are made part of this section by reference.
2. Guidance for Controlling ACM in Buildings (Purple Book) EPA 560/5-85-024
3. Asbestos Waste Management Guidance EPA 530-SW-85-007
4. A Guide to Respiratory Protection for the Asbestos Abatement Industry EPA-560-OPTS-86-001
5. Guide to Managing Asbestos in Place (Green Book) TS 799 20T July 1990

H. Notices:

1. State and Local agencies: Send written notification as required by State and Local regulations prior to beginning any work on ACM as follows:
 - a. Asbestos Section, 2600 Bull Street, Columbia SC, 29201, or online at DHEC portal.
2. 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.

I. 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.

J. Posting and Filing of Regulations: 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 hard copy or electronic copy in the Contractor's office.

K. VA Responsibilities prior to commencement of work:

1. 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**

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

by OSHA in 29 CFR 1926.1101 (k) to prevent unnecessary or unauthorized access to the regulated area.

2. 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.

L. Emergency Action Plan and Arrangements:

1. 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 1926, Subpart C, Standard 1926.35 Employee Emergency Action Plans.
2. 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.
3. 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.
4. 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.
5. Employees shall be trained in regulated area/site evacuation procedures in the event of workplace emergencies.
 - a. For non-life-threatening situations - employees injured or otherwise incapacitated shall be decontaminated following normal procedures with assistance from fellow workers, if necessary,

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

before exiting the regulated area to obtain proper medical treatment.

- b. For life-threatening injury or illness, worker decontamination shall take least priority after measures to stabilize the injured worker, medical personnel shall remove them from the regulated area if back or neck injury is present, and secure proper medical treatment.
6. Telephone numbers of any/all emergency response personnel shall be prominently posted in the clean room, along with the location of the nearest telephone.
7. 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.
8. 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.

M. Pre-Construction Meeting:

1. Prior to commencing the work, the Contractor shall meet with the VA Certified Industrial Hygienist (VPIH/CIH) 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 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) Multi-Employer Worksites;
 - 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

A. The following are the minimum administrative and supervisory personnel necessary for coordination of the work.

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;

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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; last four digits of social security number; qualifications; accreditation card with color picture, if required by state; 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 or Local 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 state; 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 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 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.
- d. All personnel shall be in compliance with OSHA construction safety training as applicable and submit certification.

1.7 RESPIRATORY PROTECTION

- A. General - Respiratory Protection Program: The Contractor shall develop and implement a written Respiratory Protection Program (RPP) which is in compliance with OSHA requirements found at 29 CFR 1926.1101 and 29 CFR 1910.134. ANSI Standard Z88.2-2015 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) - Respiratory Protection Program.
- B. Respiratory Protection Program Coordinator: The Respiratory Protection Program Coordinator (RPPC) must be identified and shall have two (2) years of 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- C. 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 or in the onsite Contractor's office, for reference by employees or authorized visitors.
- D. Minimum Respiratory Protection: Shall be a $\frac{1}{2}$ -mask negative pressure air purifying respirator equipped with P100 filters, provided personal air samples in the workplace remain at or below 0.1 f/cc, determined as an 8-hour TWA. Full face powered air purifying respirator equipped with P100 filters shall be required until Contractor demonstrates that personal air samples are at or below 0.1 f/cc, determined as an 8-hour TWA. A higher level of respiratory protection shall be required, if fiber levels exceed 1 f/cc as an 8-hour TWA, inside the regulated work area. Respirator selection shall meet the requirements of 29 CFR 1926.1101 (h) and 29 CFR 1910.134 (d) (3) (i) (A) Table 1, except as indicated in this paragraph. Abatement personnel must have a respirator for their exclusive use.
- E. 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.
- F. 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.
- G. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

shall preclude that person from entering the regulated area until resolution of the problem.

- H. 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.
- I. 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

- A. 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.
- B. 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 that 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.
- C. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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.

- D. Decontamination Procedure: The Competent Person shall require all personnel to adhere to following decontamination procedures whenever they leave the regulated area.
1. When exiting the regulated area, remove disposable coveralls, and ALL other clothes, disposable head coverings, and foot coverings or boots in the equipment room.
 2. 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:
 - a. Thoroughly wet body including hair and face. If using a PAPR hold blower above head to keep filters dry.
 - b. 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.
 - c. 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.
 3. 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!)**

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

4. Shower and wash body completely with soap and water. Rinse thoroughly.
5. Rinse shower room walls and floor to drain prior to exiting.
6. Proceed from shower to clean room; dry off and change into street clothes or into new disposable work clothing.

E. 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

- A. 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.
- B. 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 or approved equivalent 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- C. 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 degrees F throughout the PDF and W/EDF.
- D. 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 and sanitary 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

either from the outside with street clothing on or is coming from the shower room completely naked and thoroughly washed. Male/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/female can enter or exit the PDF during his/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 Competent Person shall ensure that most gross contamination is removed from the outside of PPE, suits and respirators in the regulated work area, prior to

Contract No. 36C26319D0044

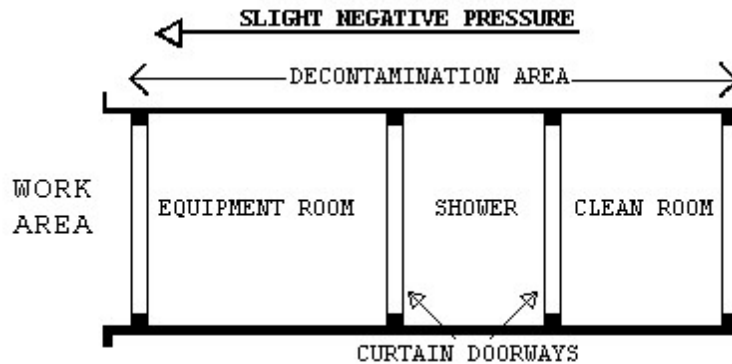
Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- entering the Equipment Room. 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.



E. Waste/Equipment Decontamination Facility (W/EDF):

1. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

shall be cleaned from the shower pan. The W/EDF shall consist of the following:

- a. 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.
- b. 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 inches x 4 inches) wood framing or approved equivalent 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.
- c. 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 inches x 4 inches) wood framing or approved equivalent 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.
- d. Clean Room: Provide a clean room to isolate the holding room from the exterior of the regulated area. Construct the clean room using 2 inches x 4 inches wood framing or approved equivalent 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.
- e. 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.

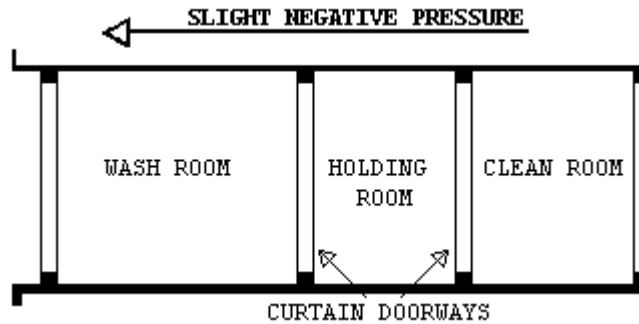
Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24



F. 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. At no time shall personnel from the clean side be allowed to enter the Wash Room.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. 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.

1. All materials shall be delivered in their original package, container or bundle bearing the name of the manufacturer and the brand name (where applicable).

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

2. 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.
3. 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.
4. 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.
5. 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.
6. 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, poly tape, furring strips, spray glue, staples, nails, screws, lumber and plywood for enclosures or approved equivalent procedures capable of sealing polyethylene to dissimilar finished or unfinished surfaces under both wet and dry conditions.
7. Polyethylene sheeting utilized for the PDF shall be opaque white or black in color, 6-mil fire retardant poly.
8. Installation and plumbing hardware, showers, hoses, drain pans, sump pumps and waste water filtration system shall be provided by the Contractor.
9. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- conduct the abatement project. All electrically operated hand tools, equipment, electric cords shall be connected to GFCI protection.
10. 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).
 11. 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.
 12. The VA shall be provided an advance copy of the Safety Data Sheets (SDS) 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.
 13. 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.
 14. 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

A. General:

1. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

area samples inside the building, but outside the regulated area. Inside the building, but outside the regulated area air samples shall be collected in the Clean Room of the PDF, at the approximate location of HEPA exhaust discharge, and at a minimum of three (3) locations in areas immediately outside the regulated work area to satisfy this specification. Additional inspection and testing requirements are also indicated in other parts of this specification.

2. 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.
3. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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.

B. Scope of Services of the VPIH/CIH Consultant:

1. 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:
 - a. Task 1: Establish background levels before abatement begins by collecting background samples. Retain samples for possible TEM analysis.
 - b. Task 2: Perform representative 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.
 - c. 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.
 - d. Task 4: Provide support to the VA representative such as evaluation of submittals from the Contractor, resolution of conflicts, interpret data, etc.
 - e. Task 5: Perform, in the presence of the VA representative, final inspection and testing of a decontaminated regulated area at the

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

conclusion of the abatement to certify compliance with all regulations and VA requirements/specifications.

f. Task 6: Issue certificate of decontamination for each regulated area and project report.

2. 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.

3. 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.

C. 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 Analytical Testing program of AIHA for fiber counting quality control assurance. The IH Technician shall also be an accredited EPA AHERA/State Contractor/Supervisor and Building Inspector. The IH Technician shall have participated in five abatement projects collecting personal and area samples and have experience in substantially similar projects in size and scope. The analytical laboratory used by the Contractor to

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 personal and area air 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 (2) personal air samples or 25 percent of representative workforce per shift shall be collected, whichever is greater, in the regulated area; a minimum of three (3) area air samples at locations inside the building but immediately outside the regulated work area; one (1) area air sample shall be collected daily in the Clean Room of the PDF; and one (1) area air sample shall be collected daily at the approximate location of HEPA exhaust discharge. 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

- A. The Contractor shall have an 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:

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

1. Minimum Personnel Qualifications
2. Emergency Action Plan/Contingency Plans and Arrangements
3. Security and Safety Procedures
4. Respiratory Protection/Personal Protective Equipment Program and Training
5. Medical Surveillance Program and Recordkeeping
6. Regulated Area Requirements - Containment Barriers/Isolation of Regulated Area
7. Decontamination Facilities and Entry/Exit Procedures (PDF and W/EDF)
8. Negative Pressure Systems Requirements
9. Monitoring, Inspections, and Testing
10. Removal Procedures for ACM
11. Removal of Contaminated Soil (if applicable)
12. Encapsulation Procedures for ACM
13. Disposal of ACM waste/equipment
14. Regulated Area Decontamination/Clean-up
15. Regulated Area Visual and Air Clearance
16. Project Completion/Closeout

2.4 SUBMITTALS

A. Pre-Start Meeting Submittals:

1. 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 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, fall protection and other required 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. 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 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 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 that the company has implemented a medical surveillance program and written respiratory protection program, and maintains recordkeeping in accordance with the above regulation. 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; medical opinion; and current respirator fit test.
 - 2) Competent Person(s)/Supervisor(s): Number; names; last four digits of 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

surveillance and respirator use); and current respirator fit test.

3) Workers: Numbers; names; last four digits of 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 methods 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 SDS and application instructions.

B. Submittals During Abatement:

1. 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 VA's representative.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

2. 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.
 - a. Removal of any poly barriers.
 - b. Visual inspection/testing by the CPIH/CIH or IH Technician prior to application of lockdown encapsulant.
 - c. Packaging and removal of ACM waste from regulated area.
 - d. Disposal of ACM waste materials; copies of Waste Shipment Records/landfill receipts to the VA's representative on a weekly basis.
- C. 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

A. Types of Encapsulants:

1. The following four types of encapsulants, if used, must comply with performance requirements as stated in paragraph 2.5.2:
 - a. Removal encapsulant - used as a wetting agent to remove ACM.
 - b. Bridging encapsulant - provides a tough, durable coating on ACM.
 - c. Penetrating encapsulant - penetrates/encapsulates ACM at least 13 mm (1/2 inches).
 - d. Lockdown encapsulant - seals microscopic fibers on surfaces after ACM removal.

B. Performance Requirements:

1. 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:

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 pounds/square foot).
- 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 pounds/square foot) (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 creating any noxious gaseous or vapors during or after application.

C. 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

A. Site Security:

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

1. 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.
2. 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.
3. 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.
4. Access to the regulated area shall be through a single decontamination unit. All other access (doors, windows, hallways, etc.) shall be sealed and demarcated as an asbestos regulated work area to prevent entry to or exit from the regulated area unless in the event of an emergency. 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.
5. 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

6. 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.
7. The regulated area shall be locked during non-working hours and secured by VA Representative or Competent Person. The VA Police shall be informed of asbestos abatement regulated areas to provide security checks during facility rounds and emergency response.

B. Signage and Power Management:

1. Post OSHA DANGER signs meeting the specifications of OSHA 29 CFR 1926.1101 at any location and approaches to the regulated area. 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.
2. 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.
3. 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 independently installed 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.

C. Negative Pressure Filtration System:

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

1. The Contractor shall provide enough HEPA negative air machines to effect ≥ -0.02 inch WCG pressure differential inside the regulated work area. 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 inch WCG pressure inside the regulated work area. Provide standby units in the event of machine failure and/or emergency in an adjacent area. HEPA equipped negative air machines shall be discharged outside of the building a minimum of 30 feet from building make-up air, doors, open windows, patients, visitors and staff.
2. NIOSH has done extensive studies and has determined that negative air machines typically operate at ~50 percent efficiency. The contractor shall consider this in their determination of number of units needed to provide ≥ -0.02 inch WCG pressure differential inside the regulated work 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 inches pressure drop across the filters.
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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 inches 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 percent. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 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.
5. Pressure Differential: The fully operational negative air system within the regulated area shall continuously maintain a pressure differential ≥ -0.02 inch WCG inside the regulated work area. Before any disturbance of any asbestos material, this shall be demonstrated to the VA by use of a pressure differential

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- meter/manometer as required by OSHA 29 CFR 1926.1101(g)(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.
6. **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 inch WCG pressure differential inside the regulated work area for the duration of the project.
 7. **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 percent of the negative air machines in operation.
 8. **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.
 9. **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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

10. Demonstration of the Negative Pressure Filtration System:
 - a. The demonstration of the operation of the negative pressure system to the VA shall include, but not be limited to, the following:
 - 1) Plastic barriers and sheeting move lightly in toward the regulated area.
 - 2) Curtains of the decontamination units move in toward regulated area.
 - 3) 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.
 - 4) 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 $> - 0.02$ inch across every barrier separating the regulated area from the rest of the building. Modify the system as necessary to meet the above requirements.
11. 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 $> - 0.02$ inch water column gauge, for the duration of the work until a final visual clearance and final air clearance has been successfully completed.
 - b. No negative air units shall be shut down at any time unless authorized by the VA Contracting Officer, verbally and in writing.
 - c. 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- d. 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.
 - e. 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.
12. 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 labels shall be attached to the units.
- D. Containment Barriers and Coverings in the Regulated Area:
- 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, Contractor 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.
 - 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 not scheduled for removal remaining in the regulated area shall be completely covered with 2 layers of 6-mil fire

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- retardant poly sheeting and secured with duct tape. Lock out and tag out any HVAC/electrical systems in the regulated area.
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.
 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.
 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 inches). Seams must overlap at least 1800 mm (6 feet) 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 inch) exterior grade plywood

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- treads held in place with duct tape/glue on the plastic. Do not cover rungs or rails with any isolation materials.
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.
 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.
 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.
 - E. Sanitary Facilities: The Contractor shall provide sanitary facilities for abatement personnel and maintain them in a clean and sanitary condition throughout the abatement project.
 - F. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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.

G. Pre-Cleaning:

1. 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.
2. 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.
3. 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 shall 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.
4. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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.

5. 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.

H. Pre-Abatement Activities:

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.
2. Pre-Abatement Construction and Operations:

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 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. Pre-Abatement Inspections and Preparations:
- a. Before any work begins on the construction of the regulated area, the Contractor will:
 - 1) 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.
 - 2) A NESHAP (destructive) ACM inspection shall 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

pipework/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. Verify during NESHAP survey that no other suspect ACM is present.

- 3) 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.
- 4) If present and required, remove and dispose of carpeting from floors in the regulated area.
- 5) Inspect existing firestopping in the regulated area. Correct as needed.

3.2 REMOVAL OF ACM

A. Wetting ACM:

1. 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.
2. Amended Water: Provide water to which a surfactant has been added 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 of one ounce of 50 percent polyoxyethylene ester and 50 percent polyoxyethylene ether mixed with 5 gallons (19L) of water.
3. Removal Encapsulant: When authorized by VA, provide a removal 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

B. Secondary Barrier and Walkways:

1. 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.
2. 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.

C. Wet Removal of ACM:

1. 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 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.**
2. If ACM does not wet well with amended water due to composition, coating or jacketing, remove as follows:

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- a. Mist work area continuously with amended water whenever necessary to reduce airborne fiber levels.
- b. 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.
- c. 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 (6 meters), 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.
- d. 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 feet x 6 feet (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.
- e. Pipe/Tank/Vessel/Boiler Insulation: Remove the outer layer of wrap while spraying with amended water in order to saturate the

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 inches from the point it contacts the ACM.

3.3 LOCKDOWN ENCAPSULATION

- A. 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.
- B. 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 SDS for the material.
- C. Worker Protection: Before beginning work with any material for which an SDS 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 or other solvent is used. The CPIH/CIH shall be responsible for provision of adequate respiratory protection. Note: Flammable and combustible encapsulants or solvents shall not be used, unless authorized in writing by the VA.
- D. Encapsulation of Scratch Coat Plaster or Piping:
 - 1. Apply two coats of lockdown encapsulant to the scratch coat plaster or piping after all ACM has been removed. Apply in strict accordance

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 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.
2. 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 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.
- E. 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

- A. General: Dispose of waste ACM and debris which is packaged in accordance with these specifications, in accordance with OSHA, EPA, State, Local and DOT requirements. The landfill requirements for packaging must also be met. Transport will be in compliance with 49 CFR 171-180 regulations. Disposal shall be done at an approved landfill. Disposal of non-friable ACM shall be done in accordance with applicable regulations.
- B. Procedures:
1. The VA must be notified at least 24 hours in advance of any waste removed from the containment.
 2. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

not be overfilled. Bags shall be evacuated with HEPA vacuum and 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.

3. 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 HEPA vacuuming before being placed in the second waste bag and sealed, which then must also be wet wiped and HEPA vacuumed.
4. 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

A. General:

1. The entire work related to project decontamination shall be performed under the close supervision and monitoring of the CPIH/CIH.
2. 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.
3. 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- B. 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.
- C. 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.
- D. Pre-Decontamination Conditions:
 - 1. 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.
 - 2. At the start of decontamination, the following shall be in place:
 - a. Primary barriers consisting of 2 layers of 6-mil poly on the floor and 4 mil poly on the walls.
 - b. 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.
 - c. Decontamination facilities for personnel and equipment in operating condition and the negative pressure system in operation.
- E. 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 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.
- F. Pre-Clearance Inspection and Testing: The CPIH/CIH and VPIH/CIH will perform a thorough and detailed visual inspection at the end of the

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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.

- G. 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

- A. 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.
- B. 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 additional cost to the VA. Dust/material samples may be collected and analyzed at no additional 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.
- C. Final Air Clearance Testing:
1. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

clearance and a minimum of two 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 presented 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.**

2. If release criteria are met, proceed to perform the abatement closeout and to issue the certificate of completion in accordance with these specifications.

D. Final Air Clearance Procedures:

1. 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 and < 70 AHERA asbestos structures per square millimeter (s/mm²) by AHERA TEM. No averaging of results will be used for this project. All five (5) TEM samples inside the regulated area shall be at or below 70 asbestos s/mm² to satisfy the project final clearance criteria.
2. 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:
 - a. 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.
 - b. 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 0.8µm MCE filters for PCM analysis and 0.45µm MCE for TEM. A minimum of 3850 Liters of air using calibrated sampling pumps shall be

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

collected for PCM samples and a minimum of 1200 Liters of air using calibrated sampling pumps shall be collected for TEM 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.

- c. 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 MCE filters for TEM. A minimum of 3850 Liters of air using calibrated sampling pumps shall be collected for PCM samples and a minimum of 1200 Liters of air using calibrated sampling pumps shall be collected for TEM 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.
- d. Random bulk 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 square feet of soil - 3 samples; >1000 to <5000 square feet of soil - 5 samples; and >5000 square feet 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 percent 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 percent asbestos, the areas shall be re-cleaned until the sample results are <1 percent.

E. Clearance Sampling Using PCM - Less than 260LF/160SF:

- 1. The VPIH/CIH will perform clearance samples as indicated by the specification.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

2. The NIOSH 7400 PCM method will be used for clearance sampling with a minimum collection volume of 3850 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. Random bulk 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 square feet of soil - 3 samples; >1000 to <5000 square feet of soil - 5 samples; and >5000 square feet 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 percent 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 percent asbestos, the areas shall be re-cleaned until the sample results are <1 percent.
- F. Clearance Sampling Using Tem - Equal to or more than 260LF/160SF: TEM
1. Clearance requires 13 samples be collected; 5 inside the regulated area; 5 outside the regulated area; and 3 field blanks.
 2. 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, no averaging of results for this specific project.
- G. 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 24-36 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.
- H. Laboratory Testing of Tem Samples: Samples shall be sent by the VPIH/CIH to a NIST NVLAP accredited laboratory for analysis by TEM. The

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

laboratory shall be successfully participating in the NIST Airborne Asbestos Analysis (TEM) program. Verbal/faxed results from the laboratory shall be available within 24-36 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.

- I. Laboratory Testing of Bulk Samples: Samples shall be sent by the VPIH/CIH or CPIH/CIH to a NIST NVLAP accredited laboratory for analysis by PLM. The laboratory shall successfully participate in the NIST NVLAP Bulk Asbestos Analysis (PLM) program. Verbal/faxed results from the laboratory shall be available within 24-36 hours after receipt of the samples. A complete record, certified by the laboratory, of all PLM and/or TEM results shall be furnished to the VA's representative and the Contractor.

3.7 ABATEMENT CLOSEOUT AND CERTIFICATE OF COMPLIANCE

A. Completion of Abatement Work:

1. 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.

- B. 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.

- C. Work Shifts: All work shall generally 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- D. Re-Insulation: If required as part of the contract, replace all asbestos containing insulation/fire-proofing with suitable non-asbestos material. Provide SDS's for all replacement materials in advance of installation for VA approval. Refer to Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

**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: _____

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

Abatement Contractor Print Name: _____

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 of worker's acknowledgement 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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: _____

1. 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.

- 2 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.

3. 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2

01-16-24

Abatement Contractor Owner's Signature _____ Date _____

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Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

SECTION 02 82 13.13
GLOVEBAG ASBESTOS ABATEMENT

PART 1 - GENERAL

1.1 SUMMARY OF WORK

- A. 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.
- B. Extent of Work: 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 to 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.
1. Removal, clean-up and disposal of ACM piping and fittings and asbestos contaminated elements in an appropriate regulated area in the following approximate quantities:
- () linear meters (feet) of <50 mm (<2 inches) diameter pipe insulation

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

() linear meters (feet) of 50 - 150 mm (2 inches - 6 inches)
diameter pipe insulation

() linear meters (feet) of >150 mm (>6 inches) diameter pipe
insulation

() fittings, saddle blocks, valves, T's, or other mechanical
appurtenances 50 - 150 mm (2 inches - 6 inches) in diameter other

B. Related Work:

1. Section 07 84 00, FIRESTOPPING
2. Section 02 41 00, DEMOLITION
3. Division 09, FINISHES
4. Division 22, PLUMBING
5. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING
6. Section 22 05 19, METERS AND GAGES FOR PLUMBING PIPING
7. Section 22 05 23, GENERAL-DUTY VALVES FOR PLUMBING PIPING
8. Section 23 05 11, COMMON WORK RESULTS FOR HVAC
9. Section 22 05 33, HEAT TRACING FOR PLUMBING PIPING
10. Section 22 11 00, FACILITY WATER DISTRIBUTION
11. Section 22 13 00, FACILITY SANITARY SEWERAGE
12. Section 22 13 23, SANITARY WASTE INTERCEPTORS
13. Section 22 14 00, FACILITY STORM DRAINAGE
14. Section 22 66 00, CHEMICAL-WASTE SYSTEMS FOR LABORATORY AND
HEALTHCARE FACILITIES
15. Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION.
16. Section 23 11 23, FACILITY NATURAL-GAS PIPING.
17. Section 23 21 13, HYDRONIC PIPING
18. Section 23 22 13, STEAM AND CONDENSATE HEATING PIPING.
19. Section 23 31 00, HVAC DUCTS AND CASINGS
20. Section 23 37 00, AIR OUTLETS AND INLETS.

C. TASKS:

1. 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.
- D. Abatement Contractor Use of Premises:
- 1. 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.
 - 2. 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

- A. 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 (+/- 10 percent) 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

discovered ACM and those prices shall be used for additional work required under the contractor.

1.3 STOP ASBESTOS REMOVAL

A. 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 if:

1. Airborne PCM analysis results equal to or greater than 0.01 f/cc above background levels inside the building but outside the regulated area;
2. breach or break in regulated area containment barrier(s);
3. less than -0.02 inch WCG pressure in the regulated area;
4. serious injury/death at the site;
5. fire/safety emergency at the site;

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

6. respiratory protection system failure;
7. power failure or loss or inadequate use of wetting agent; or
8. any visible emissions observed outside the regulated area; or
9. failure to follow project specification requirements.

1.4 DEFINITIONS

A. 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.

B. 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 air 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 3, Fifth Edition is used to determine the fiber levels in air. For personal samples, area air samples and clearance air testing

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

using Phase Contrast Microscopy (PCM) analysis, the NIOSH Method 7402 Issue 2, Fourth Edition) 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 (MCE) for PCM (Phase Contrast Microscopy, 25 mm, 3-piece with 2 inches Static Extension Cowl, 0.8 micron pore size) and MCE for TEM (Transmission Electron Microscopy, 25 mm, 3-piece with 2 inches Static Extension Cowl, 0.45 micron pore size).

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 air sampling, clearance inspections and clearance air sampling be licensed as an asbestos project monitor.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 2-layers of 6-mil independently installed plastic sheeting (Polyethylene) secured in place at openings such as doors, windows, penetrations or any other opening into the regulated area.

Primary Barrier - Plastic barriers placed over critical barriers and exposed directly to abatement work or to secondary barrier.

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 report to a certified industrial hygienist (CIH).

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

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 - Asbestos Operations and Maintenance Activities (OSHA Class III) 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 asbestos as determined using the method specified 40 CFR 763, 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).

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 air sampling, 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 or Excursion Limit (EL).

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 inch 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

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 (EL) 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, fall protection, 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.

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, debris or asbestos-contaminated soil.

Polarized light microscopy (PLM) - Light microscopy using dispersion staining techniques and refractive indices to identify and quantify the type 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 (k) (5).

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/CIH) 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 Subpart E, 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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-7.1-2018.

Surfacing ACM - A material containing more than 1 percent asbestos that is sprayed, troweled on or otherwise applied to surfaces for acoustical, decorative, 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 report to a Certified Industrial Hygienist (CIH).

VA Representative - The VA official responsible for on-going project work.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

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.

C. Referenced Standards Organizations: See Section 01 42 19 REFERENCED STANDARDS.

1.5 APPLICABLE CODES AND REGULATIONS

A. General Applicability of Codes, Regulations, and Standards:

1. 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.
2. 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.
3. 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 and/or the Contractor's on-site Field Office. These standards, regulations, codes and other

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

applicable documents, including this specification and those listed in Section 1.5 may be made available electronically.

- B. 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), respiratory protection, and 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/Local requirements related to failure to comply with the regulations applicable to the work.
- C. Federal Requirements: Federal requirements which govern some aspect of asbestos abatement include, but are not limited to, the following regulations.

1. Occupational Safety and Health Administration (**OSHA**)

- a. Title 29 CFR 1926.1101 - Construction Standard for Asbestos
- a. Title 29 CFR 1926 Subpart E - Personal Protective Equipment and Life Saving Equipment
- b. Title 29 CFR 1910.134 - Respiratory Protection
- c. Title 29 CFR 1926 - Construction Industry Standards
- d. Title 29 CFR 1926.33 - Access to Employee Exposure and Medical Records
- e. Title 29 CFR 1926.59 same as 1910.1200 - Hazard Communication
- f. Title 29 CFR 1926 Subpart C - General Safety and Health Provisions and Subpart D - Occupational Health and Environmental Controls

2. Environmental Protection Agency (**EPA**)

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- a. 1.40 CFR 61 Subpart M - National Emission Standard for Hazardous Air Pollutants - Asbestos
- a. 2.40 CFR 763.80 - Asbestos Hazard Emergency Response Act (AHERA) and Asbestos Hazard Abatement Reauthorization Act (ASHARA)
- 3. Department of Transportation (**DOT**)
 - a. Title 49 CFR 171 - 180 - Transportation

F. Standards:

- 1. Standards which govern asbestos abatement activities include, but are not limited to, the following:
 - a. American National Standards Institute (ANSI/ASSP) Z9.2-2018 - Fundamentals Governing the Design and Operation of Local Exhaust Systems and ANSI/ASSE Z88.2-2015 - Practices for Respiratory Protection.
 - b. Underwriters Laboratories (UL) 586-2009 - UL Standard for Safety of HEPA filter Units, 9th Edition; ANSI Approval 2017-12-19.
- 2. Standards which govern encapsulation work include, but are not limited to, the following:
 - a. American Society for Testing and Materials International (ASTM).
- 3. Standards which govern the fire and safety concerns in abatement work include, but are not limited to, the following:
 - a. National Fire Protection Association (NFPA) 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.
 - b. NFPA 701 - Standard Methods for Fire Tests for Flame Resistant Textiles and Film.
 - c. NFPA 101 - Life Safety Code.

G. EPA Guidance Documents:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

1. EPA guidance documents which discuss asbestos abatement work activities are listed below. These documents are made part of this section by reference. Guidance for Controlling ACM in Buildings (Purple Book) EPA 560/5-85-024.
2. Asbestos Waste Management Guidance EPA 530-SW-85-007.
3. A Guide to Respiratory Protection for the Asbestos Abatement Industry EPA-560-OPTS-86-001.
4. Guide to Managing Asbestos in Place (Green Book) TS 799 20T July 1990.

H. Notices:

1. 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:
2. 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.

I. 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 prior to beginning any work on ACM as follows.

J. 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.

K. VA Responsibilities Prior to Commencement of Work:

1. 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.**
2. 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

L. Emergency Action Plan and Arrangements:

1. 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 1926, Subpart C, Standard 1926.35 Employee Emergency Action Plans.
2. 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.
3. 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.
4. 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.
5. Employees shall be trained in regulated area/site evacuation procedures in the event of workplace emergencies.
 - a. For non-life-threatening situations - employees injured or otherwise incapacitated shall be decontaminated following normal procedures with assistance from fellow workers, if necessary, before exiting the regulated area to obtain proper medical treatment.
 - b. For life-threatening injury or illness, worker decontamination shall take least priority after measures to stabilize the injured worker, medical personnel shall remove them from the regulated

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

area if back or neck injury is present, and secure proper medical treatment.

6. Telephone numbers of any/all emergency response personnel shall be prominently posted in the clean room, along with the location of the nearest telephone.
7. 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.
8. 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.

M. Pre-Construction Meeting:

1. Prior to commencing the work, the Contractor shall meet with the VPIH/CIH 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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) Multi-Employer Worksites;
 - 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
- 2. At this meeting the Contractor shall provide all submittals as required.
- 3. Procedures for handling, packaging and disposal of asbestos waste.
- 4. Emergency Action Plan and Contingency Plan Procedures.

1.6 PROJECT COORDINATION

A. The following are the minimum administrative and supervisory personnel necessary for coordination of the work.

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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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; last four digits of social security number; qualifications; accreditation card with color picture if required by State; 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 or Local 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 State; 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 specialized EPA AHERA/OSHA training in asbestos

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

2. All personnel shall be in compliance with OSHA construction safety training as applicable and submit certification.

1.7 RESPIRATORY PROTECTION

- A. General - Respiratory Protection Program: The Contractor shall develop and implement a written Respiratory Protection Program (RPP) which is in compliance with OSHA requirements found at 29 CFR 1926.1101 and 29 CFR 1910.134. ANSI Standard Z88.2-2015 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) - Respiratory Protection Program. Respiratory Protection Program Coordinator: The Respiratory Protection Program Coordinator (RPPC) must be identified and shall have two (2) years of 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.
- B. 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 or in the onsite Contractor's office, for reference by employees or authorized visitors.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- C. Minimum Respiratory Protection: Minimum respiratory protection shall be a $\frac{1}{2}$ -mask negative pressure air purifying respirator equipped with P100 filters, provided personal air samples in the workplace remain at or below 0.1 f/cc, determined as an 8-hour TWA. Full face powered air purifying respirator equipped with P100 filters shall be required until Contractor demonstrates that personal air samples are at or below 0.1 f/cc, determined as an 8-hour TWA. A higher level of respiratory protection shall be required, if fiber levels exceed 1 f/cc as an 8-hour TWA, inside the regulated work area. Respirator selection shall meet the requirements of 29 CFR 1926.1101 (h) and 29 CFR 1910.134 (d) (3) (i) (A) Table 1, except as indicated in this paragraph. Abatement personnel must have a respirator for their exclusive use.
- D. 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.
- E. 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.
- F. 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 entering the regulated area until resolution of the problem.
- G. 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

- A. Training of Abatement Personnel: Prior to beginning any abatement activity, all personnel shall be trained in accordance with OSHA 29 CFR

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

- B. 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 that 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.
- C. 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.
- D. 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
- E. Decontamination Procedure: The Competent Person shall require all personnel to adhere to following decontamination procedures whenever they leave the regulated area.
 - 1. When exiting the regulated area, remove disposable coveralls, and ALL other clothes, disposable head coverings, and foot coverings or boots in the equipment room.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

2. 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:
 - a. Thoroughly wet body including hair and face. If using a PAPR hold blower above head to keep filters dry.
 - b. 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.
 - c. 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.
 3. 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!)**
 4. Shower and wash body completely with soap and water. Rinse thoroughly.
 5. Rinse shower room walls and floor to drain prior to exiting.
 6. Proceed from shower to clean room; dry off and change into street clothes or into new disposable work clothing.
- F. 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), 29 CFR 1926.1101 (g) (1) (i) (ii) (iii), 29 CFR 1926.1101 (g) (5) (ii) (iii) (iv) are met. All personnel in the regulated area shall not be allowed to eat,

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

drink, smoke, chew tobacco or gum, apply cosmetics, or in any way interfere with the fit of their respirator.

1.9 DECONTAMINATION FACILITIES

- A. 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.
- B. 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.
- C. 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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

D. 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 and sanitary 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. Any person entering the regulated area to perform Glovebag removal work, in which a negative exposure assessment has been performed, shall don a double outer protective suit and respirator. Male/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/female can enter or exit the PDF during his/her stay in the PDF.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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. The Competent Person shall provide a decontamination area at the outer perimeter of the regulated work area where the employees will decontaminate the outer protective suit and respirator by wet wiping and HEPA vacuuming.
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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

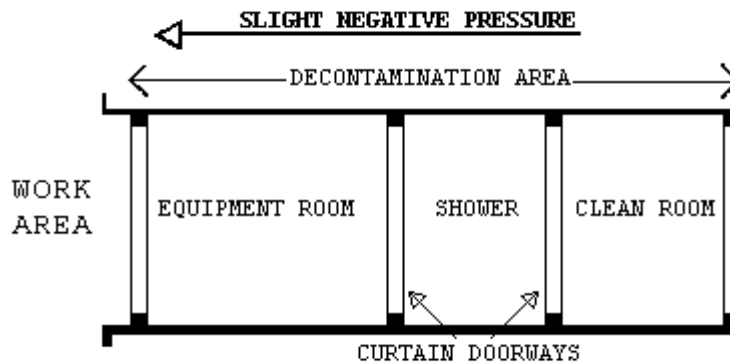
01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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. The Competent Person shall provide a decontamination area at the outer perimeter of the regulated work area where the employees will decontaminate the outer protective suit and respirator by wet wiping and HEPA vacuuming.
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.



a. .

E. . Waste/Equipment Decontamination Facility (W/EDF)

1. 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:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

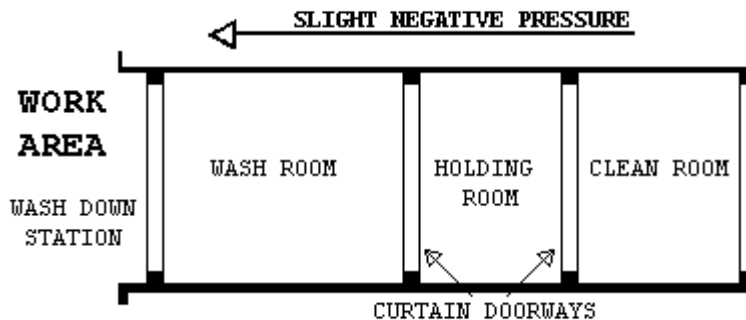
01-01-21

- a. 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.
- b. 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 inches x 4 inches) 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.
- c. 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 inches x 4 inches) wood framing or approved equivalent 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.
- d. Clean Room: Provide a clean room to isolate the holding room from the exterior of the regulated area. Construct the clean room using 2 inches x 4 inches wood framing or approved equivalent 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.
- e. 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21



F. 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. 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

A. 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.

1. All materials shall be delivered in their original package, container or bundle bearing the name of the manufacturer and the brand name (where applicable).

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

2. 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.
3. 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.
4. 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.
5. 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.
6. 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, poly tape, furring strips, spray glue, staples, nails, screws, lumber and plywood for enclosures or approved equivalent procedures capable of sealing polyethylene to dissimilar finished or unfinished surfaces under both wet and dry conditions.
7. Polyethylene sheeting utilized for the PDF shall be opaque white or black in color, 6-mil fire retardant poly.
8. Installation and plumbing hardware, showers, hoses, drain pans, sump pumps and waste water filtration system shall be provided by the Contractor.
9. 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- conduct the abatement project. All electrically operated hand tools, equipment, electric cords shall be connected to GFCI protection.
10. 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).
11. 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.
12. The VA shall be provided an advance copy of the Safety Data Sheets (SDS) 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.
13. 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, State and Local regulations shall be posted in the Clean Room.
14. 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

- A. 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 2.2.7; FIRESTOPPING.
- B. 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. Remove all

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

- C. 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.
- D. 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 independently installed 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.
- E. Secondary Barriers: 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.
- F. 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. 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.
- G. Firestopping:
 - 1. Through penetrations caused by cables, cable trays, pipes, sleeves must be firestopped with a fire-rated firestop system providing an air tight seal.
 - 2. Firestop materials that are not equal to the wall or ceiling penetrated shall be brought to the attention of the VA

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

3. 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

A. General:

1. 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 inside the building, but outside the regulated area. Inside the building, but outside the regulated area air samples shall be collected at the boundary of the regulated area and/or Clean Room of the PDF, at the approximate location of HEPA exhaust discharge (if used), and at a minimum of three (3) locations in areas immediately outside the regulated work area to satisfy this specification. Additional inspection and testing requirements are also indicated in other parts of this specification.
2. 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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.
3. 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.

B. Scope of Services of the VPIH/CIH Consultant:

1. 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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:

- a. Task 1: Establish background levels before abatement begins by collecting background samples. Retain samples for possible TEM analysis.
 - b. Task 2: Perform representative 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.
 - c. 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.
 - d. Task 4: Provide support to the VA Representative such as evaluation of submittals from the Contractor, resolution of unforeseen developments, etc.
 - e. 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.
 - f. Task 6: Issue certificate of decontamination for each regulated area or building and project report.
2. 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.
 3. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

4. 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 Analytical Testing program of AIHA for fiber counting quality control assurance. The IH Technician shall also be an accredited EPA AHERA/State Contractor/Supervisor and Building Inspector. The IH Technician shall have participated in five abatement projects collecting personal and area samples and have experience in substantially similar projects in size and scope. The analytical 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 personal and area air 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 (2)

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

personal air samples or 25% of representative workforce per shift shall be collected, whichever is greater, in the regulated area; a minimum of three (3) area air samples at locations inside the building but immediately outside the regulated work area; one (1) area air sample shall be collected daily at the boundary of the regulated area and/or Clean Room of the PDF; and one (1) area air sample shall be collected daily at the approximate location of HEPA exhaust discharge, if used. 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. Pressure readings with the containment may be omitted if negative pressure Glovebag procedures are used.

2.4 ASBESTOS HAZARD ABATEMENT PLAN

A. 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:

1. Minimum Personnel Qualifications
2. Contingency Plans and Arrangements
3. Security and Safety Procedures
4. Respiratory Protection/Personal Protective Equipment Program and Training
5. Medical Surveillance Program and Recordkeeping
6. Regulated Area Requirements for Glovebag Abatement
7. Decontamination Facilities and Entry/Exit Procedures (PDF and W/EDF) or approved equivalent.
8. Monitoring, Inspections, and Testing

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

9. Removal Procedures for Piping ACM Using the Glovebag Method
10. Disposal of ACM waste
11. Regulated Area Decontamination/Clean-up
12. Regulated Area Visual and Air Clearance
13. Project Completion/Closeout

2.5 SUBMITTALS

A. Pre-Start Meeting Submittals:

1. 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) Encapsulantys, surfactants, hand held sprayers, airless sprayers, Glovebas, and fire extinguishers.
 - 4) Respirators, water filtration system, shower system, containment barriers equipment.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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. 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; and Resolution.
 - 3) List asbestos regulatory citations (e.g., OSHA), notices of violations (e.g., Federal, State, Local NESHAP), penalties, and legal actions taken against the company including the company's officers (including damages paid) in the last 3 years. Provide copies and all information needed for verification.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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 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; medical opinion; and current respirator fit test.
 - 2) Competent Person(s)/Supervisor(s): Number; names; last four digits of 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; last four digits of 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 SDS, and application instructions.

B. Submittals During Abatement:

- 1. 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 VA's Representative.
- 2. 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.
 - a. Removal of any poly barriers and/or failure of negative pressure Glovebags.
 - b. Visual inspection/testing by the CPIH/CIH or IH Technician prior to application of lockdown encapsulant.
 - c. Packaging and removal of ACM waste from regulated area.
 - d. Disposal of ACM waste materials; copies of Waste Shipment Records/landfill receipts to the VA's Representative on a weekly basis.

C. 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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

A. Types of Encapsulants:

1. The following four types of encapsulants must comply with performance requirements as stated in paragraph 2.6.2:
 - a. Removal encapsulant - used as a wetting agent to remove ACM.
 - b. Bridging encapsulant - provides a tough, durable coating on ACM.
 - c. Penetrating encapsulant - penetrates/encapsulates ACM at least 13 mm (1/2 inch).
 - d. Lockdown encapsulant - seals microscopic fibers on surfaces after ACM removal.

B. Performance Requirements:

1. 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 pounds/square foot).
 - 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).

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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 pounds/square foot) (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 creating any noxious gaseous or vapors during or after application.

2.7 CERTIFICATES OF COMPLIANCE

- A. 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.
- B. 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

- A. Site Security:
 1. 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 shall be posted in the clean room of the decontamination unit or in a designated area located immediately outside of the regulated area established for Glovebag removal activities.
 2. 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- VA Contracting Officer or VA Representative using the most expeditious means.
3. A log book shall be maintained in the clean room of the decontamination unit or in a designated area located immediately outside of the regulated area established for Glovebag removal activities. Anyone who enters the regulated area must record their name, affiliation, time in, and time out for each entry.
 4. Access to the regulated area shall be through a single decontamination unit or in an area designated by the Competent Person for Glovebag removal activities. 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.
 5. 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.
 6. 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.
 7. The regulated area shall be locked during non-working hours and secured by VA Representative or Competent Person. The VA Police shall be informed of asbestos abatement regulated areas to provide security checks during facility rounds and emergency response.

B. OSHA Danger Signs: Post OSHA DANGER signs meeting the specifications of OSHA 29 CFR 1926.1101 at any location and approaches to the regulated

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

- C. 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.
- D. 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-ayers of independently installed 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.
- E. Containment Barriers and Coverings for the Regulated Area:
 - 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.
 - 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- above. Properly secured material/ equipment shall be considered to be outside the regulated area.
3. Controlling Access to the Regulated Area: Access to the regulated area is allowed only through the personnel decontamination facility (PDF) or in an area designated by the Competent Person for Glovebag removal activities. 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.
 4. Critical Barriers: The regulated area must be completely separated from the adjacent area(s) and the outside by at least 2-layers of independently installed 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 inches x 6 inches x 3/8 inch (150mm x 150mm x 18mm) or approved equivalent, held in place with 6d smooth masonry/galvanized nail or approved equivalent 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 feet (1200mm) maximum on centers
 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

6. Floor Barriers: All floors within 10 feet of Glovebag work shall be covered with 2-layers of 6-mil fire retardant poly. If no breach occurs during the Glovebag abatement operation, these layers of 6-mil fire retardant poly may be reused

F. Sanitary Facilities: The Contractor shall provide sanitary facilities for abatement personnel and maintain them in a clean and sanitary condition throughout the abatement project.

G. Pre-Cleaning:

1. Pre-Cleaning Movable Objects:

- a. The VA will provide water for abatement purposes. The Contractor shall connect to the existing VA system. The service to the shower(s), if used, shall be supplied with backflow prevention.
- 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. 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.
- c. 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.

2. Pre-Cleaning Fixed Objects:

- a. 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.
- b. Pre-clean all fixed objects in the regulated area using HEPA filtered vacuums and wet cleaning techniques as appropriate.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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. Pre-Cleaning Surfaces in the Regulated Area:

- a. 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.
- b. Pre-clean all surfaces in the regulated area using HEPA filtered vacuums and 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.

H. Pre-Abatement Activities:

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, the VA Representatives, 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 or documentation to the VA's Representative regarding any submittals, materials or equipment. Upon satisfactory resolution of any

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

2. Pre-Abatement Inspections and Preparations:

a. Before any work begins on the construction of the regulated area, the Contractor will:

- 1) 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.
- 2) 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 (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.
- 3) 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 4) Inspect existing firestopping in the regulated area. Correct as needed.
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

A. Wetting Materials:

1. Use amended water for the wetting of ACM prior to removal. The Competent Person shall assure that 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.
2. Amended Water: Provide water to which a surfactant has been added 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 of one

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- ounce of 50 percent polyoxyethylene ester and 50 percent polyoxyethylene ether mixed with 5 gallons (19L) of water.
3. 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.
- B. Secondary Barrier and Walkways: 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. Secure the drop cloth (6-mil poly sheet) with duct tape or approved equivalent to prevent it from moving or debris from getting behind it. Remove the drop cloth (6-mil poly sheet) at the end of the shift or as work in the area is completed. Keep residue on the drop cloth (6-mil poly sheet) wetted. When removing, fold inward to prevent spillage and place in a disposal bag.
- C. Wet Removal of ACM: 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 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.

3.3 GLOVEBAG REMOVAL PROCEDURES

- A. General: All applicable OSHA requirements and Glovebag manufacturer's recommendations shall be met during Glovebag removal 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 or work within a negative pressure mini-enclosure and follow all regulations as it pertains to removal. The Contractor shall provide enough HEPA negative air machines to continuously maintain a negative pressure differential of -0.02 inch water column gauge (WCG) inside the regulated work area relative to adjacent non-work building areas. OSHA 29 CFR 1926.1101 (g) (5) (i) (A) (2) also requires at least four (4) air changes per hour. Contractor shall increase air changes per hour as necessary to maintain volatile organic compounds below the applicable OSHA PEL. Contractor shall protect pipe insulation from being disturbed on either side of the Glovebag removal operations with a "candy stripe" layer of 6-mil poly sheet and duct tape, if Glove bag removal activities cause the piping to dislodge ACM during performance of their work.

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 percent 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

If leaks are found, they shall be taped closed using duct tape and the bag shall 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 then use 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 move 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.

B. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

3.4 LOCKDOWN ENCAPSULATION

- A. 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.
- B. 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

- A. 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 171 - 180 regulations. Disposal shall be done at an approved landfill. Disposal of non-friable ACM shall be done in accordance with applicable regulations.
- B. Procedures:
 - 1. The VA must be notified at least 24 hours in advance of any waste removed from the containment
 - 2. 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. OSHA Danger signs must be displayed 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.
 - 3. 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

HEPA vacuuming before being placed in the second waste bag and sealed, which then must also be wet wiped and HEPA vacuumed.

4. 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

A. General:

1. The entire work related to project decontamination shall be performed under the close supervision and monitoring of the CPIH/CIH.
2. 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 poly barrier prior to its removal and cleanings of the surfaces of the regulated area after the primary barrier removal.
3. 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 poly barrier prior to its removal, thus preventing contamination of the building when the regulated area critical barriers are removed.

B. 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.

C. 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.

D. Pre-Decontamination Conditions:

1. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

2. At the start of decontamination, the following shall be in place.
 - a. 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.
 - b. Decontamination facilities, if required for personnel and equipment in operating condition.
- E. 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 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, if used. Additional cleaning may be needed as determined by the CPIH/VPIH/CIH.
- F. 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.
- G. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

3.7 FINAL VISUAL INSPECTIONS AND AIR CLEARANCE TESTING

- A. 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.
- B. 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 additional cost to the VA. Dust/material samples may be collected and analyzed at no additional 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.
- C. Final Air Clearance Testing:
1. 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 two 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 presented 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.
 2. If release criteria are met, proceed to perform the abatement closeout and to issue the certificate of completion in accordance with these specifications.
- D. Final Air Clearance Procedures:
1. 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

protocol, and < 70 AHERA asbestos structures per square millimeter (s/mm²) by AHERA TEM. No averaging of results will be used for this project. All five (5) TEM samples inside the regulated area shall be at or below 70 asbestos s/mm² to satisfy the project final clearance criteria.

2. 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:
 - a. 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.
 - b. 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 0.8μ MCE filters for PCM analysis and 0.45μ MCE for TEM. A minimum of 3850 Liters of air using calibrated sampling pumps shall be collected for PCM samples and a minimum of 1200 Liters of air using calibrated sampling pumps shall be collected for TEM 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.

E. Clearance Sampling Using PCM:

1. The VPIH/CIH will perform clearance samples as indicated by the specification.
2. The NIOSH 7400 PCM method will be used for clearance sampling with a minimum collection volume of 3850 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

F. Clearance Sampling Using TEM:

1. Clearance requires 13 samples be collected; 5 inside the regulated area; 5 outside the regulated area; and 3 field blanks.
2. 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, no averaging of results for this specific project.

G. 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 24-36 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.

H. Laboratory Testing of Tem Samples: Samples shall be sent by the VPIH/CIH to a NIST NVLAP accredited laboratory for analysis by TEM. The laboratory shall be successfully participating in the NIST NVLAP Airborne Asbestos Analysis (TEM) program. Verbal/faxed results from the laboratory shall be available within 24-36 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

A. 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:

1. Remove all equipment, materials, and debris from the project area.
2. 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- packaging must also be met. Transport will be in compliance with 49 CFR 171 - 180 regulations.
3. Repair or replace all interior finishes damaged during the abatement work.
 4. The VA will be notified of any waste removed from the containment prior to 24 hours.
 5. Fulfill other project closeout requirements as specified elsewhere in this specification.
- B. 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.
- C. Work Shifts: All work shall generally 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.
- D. Re-Insulation: If required as part of the contract, replace all asbestos containing insulation with suitable non-asbestos material. Provide SDS for all replacement materials. Refer to Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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: _____

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 of worker's acknowledgement 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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: _____

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

Printed Name of CPIH/CIH: _____

Signature of Contractor: _____ Date: _____

Printed Name of Contractor: _____

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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_____

- - - END - - -

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21



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SECTION 02 82 13.19
ASBESTOS FLOOR TILE AND MASTIC ABATEMENT

PART 1 - GENERAL

1.1 SUMMARY OF THE WORK

A. 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.

B. Extent of Work:

1. 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 to 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.

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

C. Related Work:

1. Section 07 84 00, FIRESTOPPING
2. Section 02 41 00, DEMOLITION
3. Division 09, FINISHES
4. Division 22, PLUMBING

D. Tasks:

1. 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 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.

E. Abatement Contractors Use of Premises:

1. 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.
2. 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 Construction Procedure drawings of partially occupied buildings will

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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

- A. 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 (+/- 10 percent) 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

- A. 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

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 if:

1. Airborne PCM analysis results equal to or greater than 0.01 f/cc above background levels inside the building but outside the regulated area;
2. breach or break in regulated area containment barrier(s);
3. less than -0.02 inch WCG pressure in the regulated area;
4. serious injury/death at the site;
5. fire/safety emergency at the site;
6. respiratory protection system failure;
7. power failure or loss or inadequate use of wetting agent;
8. any visible emissions observed outside the regulated area; or
9. failure to follow project specification requirements.

1.4 DEFINITIONS

A. 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.

B. 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).

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.

Aerosol - Solid or liquid particulate suspended in air.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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

Aggressive air 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 3, Fifth Edition is used to determine the fiber levels in air. For personal samples, area air samples and clearance air testing using Phase Contrast Microscopy (PCM) analysis, the NIOSH Method 7402 (Issue 2, Fourth Edition) 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 (MCE) membrane for PCM (Phase Contrast Microscopy, 25 mm, 3-piece with 2 inches Static Extension Cowl, 0.8 micron pore size) and MCE for TEM (Transmission Electron Microscopy, 25 mm, 3-piece with 2 inches Static Extension Cowl, 0.45 micron pore size).

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.

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 air sampling, 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 2-layers of 6-mil independently installed plastic sheeting (Polyethylene) secured in place at openings such as doors, windows, penetrations or any other opening into the regulated area.

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

Primary Barrier - Plastic barriers placed over critical barriers and exposed directly to abatement work or to secondary barrier.

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

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 report to 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.

Crawl space - 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.

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 - Asbestos Operations and Maintenance Activities (OSHA Class III) 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 asbestos as determined using the method specified in 40 CFR 763, 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.

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 air sampling, 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 or Excursion Limit (EL).

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 inch 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.

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

Permissible exposure limit (PEL) - The level of exposure OSHA allows for as an eight (8) hour time-weighted average (TWA). 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 (EL) 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, fall protection, 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.

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, debris or asbestos-contaminated soil.

Polarized light microscopy (PLM) - Light microscopy using dispersion staining techniques and refractive indices to identify and quantify the type 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.

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 (k) (5).

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/CIH) 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 Subpart E, 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

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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-7.1-2018.

Surfacing ACM - A material containing more than 1 percent asbestos that is sprayed, troweled on or otherwise applied to surfaces for acoustical, decorative, 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

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

qualifications of a PIH, and may report to a Certified Industrial Hygienist (CIH).

VA Representative - The VA official responsible for on-going project work.

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.

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.

C. Referenced Standards Organizations: See Section 01 42 19 REFERENCED STANDARDS.

1.5 APPLICABLE CODES AND REGULATIONS

A. General Applicability of Codes, Regulations, and Standards:

1. 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.
2. 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.
3. 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
Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

the worker decontamination system and/or the Contractor's on-site Field Office. These standards, regulations, codes and other applicable documents, including this specification and those listed in Section 1.5 may be made available electronically.

B. 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 and 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/Local requirements related to failure to comply with the regulations applicable to the work.

C. Federal Requirements:

1. Federal requirements which govern 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 1926 Subpart E - Personal Protective Equipment and Life Saving Equipment
- 3) Title 29 CFR 1910.134 - Respiratory Protection
- 4) Title 29 CFR 1926 - Construction Industry Standards
- 5) Title 29 CFR 1926.33 - Access to Employee Exposure and Medical Records
- 6) Title 29 CFR 1926.59 same as 1910.1200 - Hazard Communication
- 7) Title 29 CFR 1926 Subpart C - General Safety and Health Provisions and Subpart D - Occupational Health and Environmental Controls

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

b. Environmental Protection Agency (**EPA**):

- 1) 40 CFR 61 Subpart M - National Emission Standard for Hazardous Air Pollutants - Asbestos.
- 2) 40 CFR 763 - Asbestos Hazard Emergency Response Act (AHERA) and Asbestos Hazard Abatement Reauthorization Act (ASHARA)

c. Department of Transportation (**DOT**)

- 1) Title 49 CFR 171 - 180 - Transportation

D. Not Used

E. Not Used

F. Standards:

1. Standards which govern asbestos abatement activities include, but are not limited to, the following:

a. American National Standards Institute (ANSI)/ASSP Z9.2-2018 - Fundamentals Governing the Design and Operation of Local Exhaust Systems and ANSI/ASSE Z88.2-2015 - Practices for Respiratory Protection.

b. Underwriters Laboratories (UL) 586-2009 - UL Standard for Safety of HEPA Filter Units, 9th Edition; ANSI Approval 2017-12-19.

2. Standards which govern encapsulation work include, but are not limited to the following:

a. American Society for Testing and Materials International (ASTM)

3. Standards which govern the fire and safety concerns in abatement work include, but are not limited to, the following:

a. National Fire Protection Association (NFPA) 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

b. NFPA 701 - Standard Methods for Fire Tests for Flame Resistant Textiles and Film.

c. NFPA 101 - Life Safety Code

G. EPA Guidance Documents:

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

1. EPA guidance documents which discuss asbestos abatement work activities are listed below. These documents are made part of this section by reference.
2. Guidance for Controlling ACM in Buildings (Purple Book) EPA 560/5-85-024
3. Asbestos Waste Management Guidance EPA 530-SW-85-007
4. A Guide to Respiratory Protection for the Asbestos Abatement Industry EPA-560-OPTS-86-001
5. Guide to Managing Asbestos in Place (Green Book) TS 799 20T July 1990

H. Notices:

1. State and Local agencies: Send written notification as required by State and Local regulations prior to beginning any work on ACM as follows:
2. 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 regulations prior to beginning any work on ACM as follows.

I. 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.

J. 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 hard copy or electronic copy in the Contractor's office.

K. VA Responsibilities prior to commencement of work:

1. 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.**

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

2. 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.

L. Site Security:

1. 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 shall be posted in the clean room of the decontamination unit.
2. 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 Representative.
3. 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.
4. Access to the regulated area shall be through 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.
5. 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

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

entrants are logged in/out and that only authorized personnel are allowed entrance.

6. The regulated area shall be locked during non-working hours and secured by VA security guards.

M. Emergency Action Plan and Arrangements:

1. 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 1926, Subpart C, Standard 1926.35 Employee Emergency Action Plans.
2. 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.
3. 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.
4. 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.
5. Employees shall be trained in regulated area/site evacuation procedures in the event of workplace emergencies.
 - a. For non-life-threatening situations - employees injured or otherwise incapacitated shall be decontaminated following normal procedures with assistance from fellow workers, if necessary, before exiting the regulated area to obtain proper medical treatment.
 - b. For life-threatening injury or illness, worker decontamination shall take least priority after measures to stabilize the injured worker, medical personnel shall remove them from the regulated area if back or neck injury is present, and secure proper medical treatment.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

6. Telephone numbers of any/all emergency response personnel shall be prominently posted in the clean room, along with the location of the nearest telephone.
7. 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.
8. 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.

N. Pre-Construction Meeting:

1. Prior to commencing the work, the Contractor shall meet with the VA Certified Industrial Hygienist (VPIH/CIH) 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.

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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) Multi-Employer Worksites;
 - 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

A. The following are the minimum administrative and supervisory personnel necessary for coordination of the work.

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; last four

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

digits of social security number; qualifications; accreditation card with color picture, if required by state; 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 or Local 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 state; has adequate and qualified personnel available to complete the work; has comprehensive Abatement Hazard Abatement Plans 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 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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.

- d. All personnel shall be in compliance with OSHA construction safety training as applicable and submit certification.

1.7 RESPIRATORY PROTECTION

- A. General - Respiratory Protection Program: The Contractor shall develop and implement a written Respiratory Protection Program (RPP) which is in compliance with OSHA requirements found at 29 CFR 1926.1101 and 29 CFR 1910.134. ANSI Standard Z88.2-2015 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) - Respiratory Protection Program.
- B. Respiratory Protection Program Coordinator: The Respiratory Protection Program Coordinator (RPPC) must be identified and shall have two (2) years of 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.
- C. 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 or in the onsite Contractor's office, for reference by employees or authorized visitors.
- D. Minimum Respiratory Protection: Shall be a ½-mask negative pressure air purifying respirator equipped with Combination P100 filters and Organic Vapor Cartridge, provided personal air samples in the workplace remain at or below 0.1 f/cc, and the applicable PEL for solvents, both

determined as an 8-hour TWA. Full face powered air purifying respirator
Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

equipped with P100 filters and Organic Vapor Cartridge shall be required until Contractor demonstrates that personal air samples are at or below 0.1 f/cc, and the applicable PEL for solvents, both determined as an 8-hour TWA. A higher level of respiratory protection shall be required, if fiber levels exceed 1 f/cc as an 8-hour TWA, inside the regulated work area. Respirator selection shall meet the requirements of 29 CFR 1926.1101 (h) and 29 CFR 1910.134 (d) (3) (i) (A) Table 1, except as indicated in this paragraph. Abatement personnel must have a respirator for their exclusive use.

- E. 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.
- F. 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.
- G. 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 entering the regulated area until resolution of the problem.
- H. 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.
- I. 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-

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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

- A. 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.
- B. 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 that 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.
- C. 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.
- D. 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.

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- E. Decontamination Procedure: The Competent Person shall require all personnel to adhere to following decontamination procedures whenever they leave the regulated area.
1. When exiting the regulated area, remove all disposable PPE and dispose of in a disposable bag provided in the regulated area.
 2. Carefully decontaminate and clean the respirator. Put in a clean container/bag.
- F. Regulated Area Requirements: The Competent Person shall meet all requirements of 29 CFR 1926.1101 (o) and assure that all requirements for Class II regulated areas at 29 CFR 1926.1101 (e) are met applicable to Class II work and this specification. 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

- A. Description: Provide each 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.
- B. 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

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

reduce potential for non-authorized personnel entering the regulated area.

- C. 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.

D. 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 and sanitary 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. Male/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/female can enter or exit the PDF during his/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

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

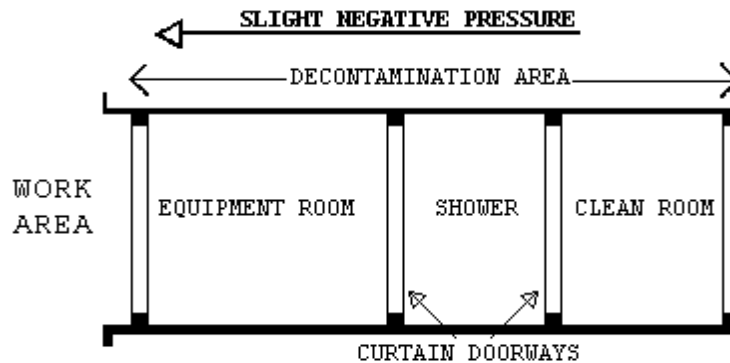
01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.



E. Waste/Equipment Decontamination Facility (W/EDF):

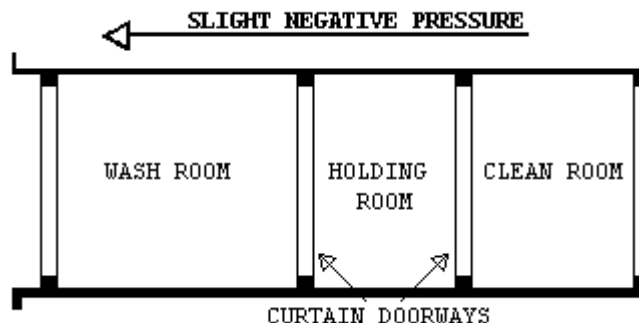
1. The Competent Person shall provide an W/EDF consisting of a wash room, holding room, and clean room for removal of waste, equipment and contaminated material from the regulated area. Personnel shall not enter or exit the W/EDF except in the event of an emergency. Clean debris and residue in the W/EDF 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:
 - a. 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.
 - b. 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 inches x 4 inches) wood framing or approved equivalent 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.

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- c. 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 inches x 4 inches) wood framing or approved equivalent 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.
- d. Clean Room: Provide a clean room to isolate the holding room from the exterior of the regulated area. Construct the clean room using 2 inches x 4 inches wood framing or approved equivalent 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.
- e. 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.



- F. 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

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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. At no time shall personnel from the clean side be allowed to enter the Wash Room.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. General Requirements (All Abatement Project): 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.

1. All materials shall be delivered in their original package, container or bundle bearing the name of the manufacturer and the brand name (where applicable).
2. 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.
3. 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.
4. 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.
5. 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.

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

6. 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, poly tape, furring strips, spray glue, staples, nails, screws, lumber and plywood for enclosures or other approved equivalent procedures capable of sealing polyethylene to dissimilar finished or unfinished surfaces under both wet and dry conditions.
7. Polyethylene sheeting utilized for the PDF shall be opaque white or black in color, 6-mil fire retardant poly.
8. Installation and plumbing hardware, showers, hoses, drain pans, sump pumps and waste water filtration system shall be provided by the Contractor.
9. 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.
10. 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).
11. 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.
12. The VA shall be provided an advance copy of the Safety Data Sheets (SDS) 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.
13. 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

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

Person. All other posters and notices required by Federal and State regulations shall be posted in the Clean Room.

14. 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).

B. Negative Pressure Filtration System:

1. The Contractor shall provide enough HEPA negative air machines to continuously maintain a negative pressure differential of -0.02 inches water column gauge (WCG) inside the regulated work area relative to adjacent non-work building areas. OSHA 29 CFR 1926.1101 (g) (5) (i) (A) (2) also requires at least four (4) air changes per hour. Contractor shall increase air changes per hour as necessary to maintain volatile organic compounds below the applicable OSHA PEL. 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 negative pressure differential of -0.02 inches WCG. Provide a standby unit in the event of machine failure and/or emergency in an adjacent area. HEPA equipped negative air machines shall be discharged outside of the building a minimum of 3 feet from building make-up air, doors, open windows, patients, visitors and staff.
2. NIOSH has done extensive studies and has determined that negative air machines typically operate at ~50 percent efficiency. The contractor shall consider this in their determination of number of units needed to continuously maintain a pressure differential of -0.02 inches 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 inches pressure drop across the filters.

C. Design and Layout:

1. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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:

- a. Method of supplying power to the units and designation/location of the panels.
- b. Description of testing method(s) for correct air volume and pressure differential.
- c. 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.

D. Negative Air Machines (HEPA Units)

1. 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 inches 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.
2. 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.
3. 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 percent. 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.

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

4. 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.
5. 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.
6. 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.
7. 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.
8. 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

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

written documentation of test results for negative air machine units with HEPA filters.

9. Pressure Differential: The fully operational negative air system within the regulated area shall continuously maintain a pressure differential $\geq$ -0.02 inches WCG inside the regulated work area. 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(g) (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

A. General:

1. 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, Contractor 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 Specification Section 07 84 00; FIRESTOPPING and Section 2.2.6.
2. 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

- ### **B. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

occupant observation. If the adjacent area is accessible to the public, the barrier must be solid and capable of withstanding the negative pressure.

- C. 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.
- D. 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.
- E. 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.
- F. Firestopping:
 - 1. 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.
 - 2. 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.
 - 3. Any visible openings whether or not caused by a penetration shall be reported by the Contractor to the VA Representative for a sealant

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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

A. General:

1. 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 inside the building, but outside the regulated area. Inside the building, but outside the regulated area air samples shall be collected in the Clean Room of the PDF, at the approximate location of HEPA exhaust discharge, and at a minimum of three (3) locations in areas immediately outside the regulated work area to satisfy this specification. Additional inspection and testing requirements are also indicated in other parts of this specification.
2. 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

3. 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

B. Scope of Services of the VPIS/CIH Consultant:

1. 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:
 - a. Task 1: Establish background levels before abatement begins by collecting background samples. Retain samples for possible TEM analysis.
 - b. Task 2: Perform Representative air monitoring, inspection, and testing outside the regulated area during actual abatement work

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

to detect any faults in the regulated area isolation and any adverse impact on the surroundings from regulated area activities.

- c. 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.
 - d. Task 4: Provide support to the VA Representative such as evaluation of submittals from the Contractor, resolution of conflicts, interpret data, etc.
 - e. 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.
 - f. Task 6: Issue certificate of decontamination for each regulated area and project report.
2. 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.
3. 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.
- C. 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

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 Analytical Testing program of AIHA for fiber counting quality control assurance. The IH Technician shall also be an accredited EPA AHERA/State Contractor/Supervisor and Building Inspector. The IH Technician shall have participated in five abatement projects collecting personal and area samples and have experience in substantially similar projects in size and scope. The analytical 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 personal and area air 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 (2) personal air samples or 25 percent of Representative workforce per shift shall be collected, whichever is greater, in the regulated area; a minimum of three (3) area air samples at locations inside the building but immediately outside the regulated work area; one (1) area air sample shall be collected daily in the Clean Room of the PDF; and one (1) area air sample shall be collected daily at the approximate location of HEPA exhaust discharge. 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

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

beginning and at the end of a shift, and submit the data in the daily report.

2.4 ASBESTOS HAZARD ABATEMENT PLAN

A. The Contractor shall have an 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:

1. Minimum Personnel Qualifications
2. Emergency Action Plan/Contingency Plans and Arrangements
3. Security and Safety Procedures
4. Respiratory Protection/Personal Protective Equipment Program and Training
5. Medical Surveillance Program and Recordkeeping
6. Regulated Area Requirements - Containment Barriers/Isolation of Regulated Area
7. Decontamination Facilities and Entry/Exit Procedures (PDF and W/EDF)
8. Negative Pressure Systems Requirements
9. Monitoring, Inspections, and Testing
10. Removal Procedures for ACM
11. Removal of Contaminated Soil (if applicable)
12. Encapsulation Procedures for ACM
13. Disposal of ACM waste/equipment
14. Regulated Area Decontamination/Clean-up
15. Regulated Area Visual and Air Clearance
16. Project Completion/Closeout

2.5 SUBMITTALS

A. Pre-Start Meeting Submittals:

1. 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:

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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, fall protection and other required 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

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 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 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

AHERA/OSHA specialized asbestos training; professional affiliations; medical opinion; and current respirator fit test.

- 2) Competent Person(s)/Supervisor(s): Number; names; last four digits of 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; last four digits of 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 methods 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 SDS, and application instructions.

B. Submittals During Abatement:

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

1. 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 VA's Representative.
2. 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.
 - a. Removal of any poly barriers.
 - b. Visual inspection/testing by the CPIH/CIH or IH Technician prior to application of lockdown encapsulant.
 - c. Packaging and removal of ACM waste from regulated area.
 - d. Disposal of ACM waste materials; copies of Waste Shipment Records/landfill receipts to the VA's Representative on a weekly basis.
- C. 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

- A. 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, the VA

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

B. Pre-Abatement Inspections and Preparations:

1. 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 (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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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 carpet comes up without disturbing ACM flooring material, the carpet can be disposed of as C&D waste. 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.
- C. Pre-Abatement Construction and Operations:
- 1. Perform all preparatory work for the first regulated area in accordance with the approved work schedule and with this specification.
 - 2. 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.
 - 3. The CPIH/CIH shall document the pre-abatement activities described above and deliver a copy to the VA's Representative.
 - 4. 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

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

3.2 REGULATED AREA PREPARATIONS

- A. 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. 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. 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.
- C. 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 and OSHA requirements for temporary electrical systems. Electricity shall be provided by the VA.
- D. 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 independently installed 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.
- E. Sanitary Facilities: The Contractor shall provide sanitary facilities for abatement personnel and maintain them in a clean and sanitary condition throughout the abatement project.

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- F. 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.
- G. 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.
- H. 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 independently installed 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.
- I. 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 24 inches.
- J. Pre-Cleaning Movable Objects:
1. 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-cleaning may not be required if flooring materials is in good condition and are the only ACM present.
 2. 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.
- K. Pre-Cleaning Fixed Objects:
1. Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure has been

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

established in the work area.

2. 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.

L. Pre-Cleaning Surfaces in the Regulated Area:

1. 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.
2. Pre-clean all surfaces in the regulated area using HEPA filtered vacuums and 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.

- M. 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

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

visual inspection and air monitoring. Air monitoring at completion must indicate background levels.

3.3 REMOVABLE OF CLASS II FLOORING AND MASTIC, MATERIALS

- A. General: All applicable requirements of OSHA, EPA, and DOT shall be followed during Class II work. Keep materials intact to the extent feasible; wet while working with it; wrap as soon as possible with 2-layers of 6-mil plastic for disposal.
- B. Removal of Flooring Materials:
1. All requirements of OSHA Flooring agreement provisions shall be followed:
 - a. The Contractor shall provide enough HEPA negative air machines to effect > -0.02 inches 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 inches pressure drop across the filters.
 - b. Flooring shall be removed intact, as much as feasible. Do not rip or tear flooring.
 - c. Mechanical chipping or sanding is not allowed.
 - d. Flooring may be removed with an infra-red heating unit operated by trained personnel following the manufacturer's instructions.
 - e. Wet clean and HEPA vacuum the floor before and after removal of flooring.
 - f. Place a 6-mil poly layer 4 feet by 10 feet adjacent to the regulated area for use as a decontamination area if a PDF is not specified. All waste must be contained in the regulated area.
 - g. Package all waste in 6-mil poly lined fiberboard drums or double bag in 6-mil polyethylene bags.

C. REMOVAL OF MASTIC

1. All chemical mastic removers must be low in volatile organic compound (VOC) content, have a flash point greater than 200 degrees Fahrenheit, contain no chlorinated solvents, and comply with California Air Resources Board (CARB) thresholds for VOCs (effective January 1, 2010).

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

2. Negative air machine as required under flooring removal shall be provided and operated in accordance with this project specification.
3. Follow all manufacturers' instructions in the use of the mastic removal material. Verify that there are no ignition sources in the work area and minimize the amount of mastic removal material used at any given time to eliminate fire hazards and objectionable odors.
4. Package all waste in 6-mil poly lined fiberboard drums or double bag in 6-mil polyethylene bags.

3.4 DISPOSAL OF CLASS II WASTE MATERIAL

- A. 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 171-180 regulations. Disposal shall be done at an approved landfill. Disposal of non-friable ACM shall be done in accordance with applicable State and Local regulations.

3.5 PROJECT DECONTAMINATION

A. General:

1. The VA must be notified at least 24 hours in advance of any waste removed from the containment.
2. The entire work related to project decontamination shall be performed under the close supervision and monitoring of the CPIH/CIH.
3. 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.
4. 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.

- B. 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

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

C. 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.

D. Pre-Decontamination Conditions:

1. 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.
2. At the start of decontamination, the following shall be in place:
 - a. 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.
 - b. Decontamination facilities, if required for personnel and equipment in operating condition.

E. 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 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

- A. 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.
- B. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

repeated at no additional cost to the VA. Dust/material samples may be collected and analyzed at no additional 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

C. Air Clearance Testing:

1. 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 two 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 presented 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.**
2. If release criteria are met, proceed to perform the abatement closeout and to issue the certificate of completion in accordance with these specifications.

D. Final Air Clearance Procedures:

1. 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 and ≤ 70 AHERA asbestos structures per square millimeter (s/mm²) by AHERA TEM. No averaging of results will be used for this project. All five (5) TEM samples inside the regulated area shall be at or below 70 asbestos s/mm² to satisfy the project final clearance criteria.
2. 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.

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- a. 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.
- b. Aggressive Sampling: All final air testing samples shall be collected using aggressive sampling techniques. Samples will be collected on 0.8µ MCE filters for PCM analysis and 0.45µ MCE for TEM. A minimum of 3850 Liters of air using calibrated sampling pumps shall be collected for PCM samples and a minimum of 1200 Liters of air using calibrated sampling pumps shall be collected for TEM 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

A. Completion of Abatement Work:

1. After thorough decontamination, complete asbestos abatement work upon meeting the regulated area 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.
 - c. Repair or replace all interior finishes damaged during the abatement work.
 - d. Fulfill other project closeout requirements as specified elsewhere in this specification

B. 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.

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

C. Work Shifts: All work shall generally 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.

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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: _____

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 of worker's acknowledgement 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: _____

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo, VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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:_____

1. 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.
- 2 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.
3. 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_____

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Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

**DEPARTMENT OF VETERANS AFFAIRS
VHA MASTER SPECIFICATIONS**

**ASBESTOS TRANSITE-TYPE ABATEMENT
SECTION 02 82 13.31**

PART 1 - GENERAL

1.1 SUMMARY OF THE WORK

A. 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.

B. Extent of Work:

1. Below is a brief description of the estimated quantities of asbestos Transite-type 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

2. Removal, clean-up and disposal of ACM Transite-type in an appropriate regulated area in the following approximate quantities.
 - a. Remove all asbestos containing transite type panels associated with 3 (three) radiators in the media center on the 4th floor as required to complete the required renovation work.
 - b. See Architectural scope of work and environmental drawings for additional details.
 - c. See Fargo VAMC Asbestos Survey Dated October 23, 2023 and June 14, 2022 for specific details and information regarding asbestos containing building materials and their locations. **Contractor required to confirm locations, quantities, and asbestos content of all building materials prior to disturbance for every material and every renovation location of the project.**

C. Related Work:

1. 02 41 00, DEMOLITION
2. 02 65 00, UNDERGROUND STORAGE TANK REMOVAL
3. 02 82 11 TRADITIONAL ASBESTOS ABATEMENT
4. 02 83 33.13, LEAD BASED PAINT REMOVAL AND DISPOSAL
5. DIVISION 03, CONCRETE
6. DIVISION 04, MASONRY
7. DIVISION 05 METALS
8. DIVISION 06, WOOD, PLASTIC AND COMPOSITES
9. DIVISION 07, THERMAL AND MOISTURE PROTECTION
10. DIVISION 08, OPENINGS
11. DIVISION 09 FINISHES
12. DIVISION 10, SPECIALTIES
13. DIVISION 21, FIRE SUPPRESSION
14. DIVISION 22, PLUMBING
15. DIVISION 23, HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)
16. DIVISION 26, ELECTRICAL
17. DIVISION 07, COMMUNICATION
18. DIVISION 28, ELECTRONIC SAFETY AND SECURITY
19. DIVISION 31, EARTHWORK
20. DIVISION 32, EXTERIOR IMPROVEMENTS

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 21. DIVISION 33, UTILITIES
- 22. DIVISION 34, TRANSPORTATION

D. Tasks:

- 1. 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 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.

E. Abatement Contractors Use of Premises:

- 1. 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.
- 2. 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

1.2 VARIATIONS IN QUANTITY

- A. 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 (+/- 10 percent) 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

- A. 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 Officer 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

is practical. The Contractor shall immediately stop asbestos removal/disturbance activities and initiate fiber reduction activities:

1. Airborne PCM analysis results equal to or greater than 0.01 f/cc above background levels inside the building but outside the regulated area;
2. breach or break in regulated area containment barrier(s);
3. less than -0.02 inch WCG pressure in the regulated area;
4. serious injury/death at the site;
5. fire/safety emergency at the site;
6. respiratory protection system failure;
7. power failure or loss of wetting agent; or
8. any visible emissions observed outside the regulated area; or
9. failure to follow project specification requirements.

1.4 DEFINITIONS

- A. 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.

- B. 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).

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.

Aerosol - Solid or liquid particulate suspended in air.

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

Aggressive air sampling - EPA AHERA defined clearance sampling method using air moving equipment such as fans and leaf blowers to

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 3, Fifth Edition is used to determine the fiber levels in air. For personal samples, area air samples and clearance air testing using Phase Contrast Microscopy (PCM) analysis, the NIOSH Method 7402 (Issue 2, Fourth Edition) 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 (MCE) membrane for PCM (Phase Contrast Microscopy, 25 mm, 3-piece with 2 inches Static Extension Cowl, 0.8 micron pore size) and MCE for TEM (Transmission Electron Microscopy, 25 mm, 3-piece with 2 inches Static Extension Cowl, 0.45 micron pore size).

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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 air sampling, 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 2-layers of 6-mil independently installed plastic sheeting (Polyethylene) secured in place at openings such as doors, windows, penetrations or any other opening into the regulated area.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

Primary Barrier - Plastic barriers placed over critical barriers and exposed directly to abatement work or to secondary barrier.

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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 report to 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.

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 - Asbestos Operations and Maintenance Activities (OSHA Class III) 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 asbestos as determined using the method specified in 40 CFR 763, 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 air sampling, 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 or Excursion Limit (EL).

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 inch 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.

Permissible exposure limit (PEL) - The level of exposure OSHA allows for as an eight (8) hour time-weighted average (TWA). 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 (EL) 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, fall protection, 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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, debris or asbestos-contaminated soil.

Polarized light microscopy (PLM) - Light microscopy using dispersion staining techniques and refractive indices to identify and quantify the type 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 (k) (5).

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/CIH) 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 Subpart E, 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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-7.1-2018.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

Surfacing ACM - A material containing more than 1 percent asbestos that is sprayed, troweled on or otherwise applied to surfaces for acoustical, decorative, 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 report to a Certified Industrial Hygienist (CIH).

VA Representative - The VA official responsible for on-going project work.

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.

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.

C. Referenced Standards Organizations: See Section 01 42 19 REFERENCED STANDARDS.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

1.5 APPLICABLE CODES AND REGULATIONS

A. General Applicability of Codes, Regulations, and Standards:

1. 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.
2. 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.
3. 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 and/or the Contractor's on-site Field Office. These standards, regulations, codes and other applicable documents, including this specification and those listed in Section 1.5 may be made available electronically.

B. 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, and 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

OSHA/EPA/State/Local requirements related to failure to comply with the regulations applicable to the work.

C. Federal Requirements:

1. Federal requirements which govern 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 1926 Subpart E - Personal Protective Equipment and Life Saving Equipment
- 3) Title 29 CFR 1910.134 - Respiratory Protection
- 4) Title 29 CFR 1926 - Construction Industry Standards
- 5) Title 29 CFR 1926.33 - Access to Employee Exposure and Medical Records
- 6) Title 29 CFR 1926.59 same as 1910.1200 - Hazard Communication
- 7) Title 29 CFR 1926 Subpart C - General Safety and Health Provisions and Subpart D - Occupational Health and Environmental Controls

b. Environmental Protection Agency **(EPA)** :

- 1) 40 CFR 61 Subpart M - National Emission Standard for Hazardous Air Pollutants - Asbestos.
- 2) 40 CFR 763 - Asbestos Hazard Emergency Response Act (AHERA) and Asbestos Hazard Abatement Reauthorization Act (ASHARA)

c. Department of Transportation **(DOT)**

- 1) Title 49 CFR 171 - 180 - Transportation

D. State Requirements:

1. State requirements that apply to the asbestos abatement work, disposal, clearance, etc., include, but are not limited to, the following:

- a. North Dakota Air Pollution Control Rules, Chapter 33.1-15-13, Emission Standards for Hazardous Air Pollutants.

E. Local Requirements:

If local requirements are more stringent than federal or state standards, the local standards are to be followed

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

F. Standards:

1. Standards which govern asbestos abatement activities include, but are not limited to, the following:
 - a. American National Standards Institute (ANSI)/ASSP Z9.2-2018 - Fundamentals Governing the Design and Operation of Local Exhaust Systems and ANSI/ASSE Z88.2-2015 - Practices for Respiratory Protection.
 - b. Underwriters Laboratories (UL) 586-2009 - UL Standard for Safety of HEPA Filter Units, 9th Edition; ANSI Approval 2017-12-19.
2. Standards which govern encapsulation work include, but are not limited to the following:
 - a. American Society for Testing and Materials International (ASTM)
3. Standards which govern the fire and safety concerns in abatement work include, but are not limited to, the following:
 - a. National Fire Protection Association (NFPA) 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.
 - b. NFPA 701 - Standard Methods for Fire Tests for Flame Resistant Textiles and Film.
 - c. NFPA 101 - Life Safety Code

G. EPA Guidance Documents:

1. EPA guidance documents which discuss asbestos abatement work activities are listed below. These documents are made part of this section by reference.
2. Guidance for Controlling ACM in Buildings (Purple Book) EPA 560/5-85-024
3. Asbestos Waste Management Guidance EPA 530-SW-85-007
4. A Guide to Respiratory Protection for the Asbestos Abatement Industry EPA-560-OPTS-86-001
5. Guide to Managing Asbestos in Place (Green Book) TS 799 20T July 1990

H. Notices:

1. 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:

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

2. 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.
- I. 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.
- J. 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.
- K. VA Responsibilities prior to commencement of work:
 1. 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.**
 2. 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.
- L. Emergency Action Plan and Arrangements:
 1. 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 1926, Subpart C, Standard 1926.35 Employee Emergency Action Plans.
 2. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- these procedures to acknowledge understanding of the regulated area layout, location of emergency exits and emergency procedures.
3. 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.
 4. 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.
 5. Employees shall be trained in regulated area/site evacuation procedures in the event of workplace emergencies.
 - a. For non-life-threatening situations - employees injured or otherwise incapacitated shall be decontaminated following normal procedures with assistance from fellow workers, if necessary, before exiting the regulated area to obtain proper medical treatment.
 - b. For life-threatening injury or illness, worker decontamination shall take least priority after measures to stabilize the injured worker, medical personnel shall remove them from the regulated area if back or neck injury is present, and secure proper medical treatment.
 6. Telephone numbers of any/all emergency response personnel shall be prominently posted in the clean room, along with the location of the nearest telephone.
 7. 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.
 8. The Emergency Action Plan shall provide for a Contingency Plan in the event that an incident occurs that may require the modification

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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.

M. Pre-Construction Meeting:

1. Prior to commencing the work, the Contractor shall meet with the VA Certified Industrial Hygienist (VPIH/CIH) 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 that all required federal, state, and local notifications have been submitted.
 - c. 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.
 - d. A list of all workers who will participate in the project, including experience and verification of training and accreditation.
 - e. 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.
 - f. Current medical written opinions for all personnel working on-site meeting the requirements of 29 CFR 1926.1101 (m).
 - g. Current fit-tests for all personnel wearing respirators on-site meeting the requirements of 29 CFR 1926.1101 (h) and Appendix C.
 - h. 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;

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 2) Notification requirements procedure of Contractor as required in 29 CFR 1926.1101 (d) Multi-Employer Worksites;
- 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.
- i. At this meeting the Contractor shall provide all submittals as required.
- j. Procedures for handling, packaging and disposal of asbestos waste.
- k. Emergency Action Plan and Contingency Plan Procedures.

1.6 PROJECT COORDINATION

A. The following are the minimum administrative and supervisory personnel necessary for coordination of the work.

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; last four digits of social security number; qualifications; accreditation card with color picture if required by State; 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:

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 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 or Local 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 State; 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 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)

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

years of similar size and complexity; has applicable medical and respiratory protection documentation; has certificate of training/current refresher and State accreditation/license.

- d. All personnel shall be in compliance with OSHA construction safety training as applicable and submit certification.

1.7 RESPIRATORY PROTECTION

- A. General - Respiratory Protection Program: The Contractor shall develop and implement a written Respiratory Protection Program (RPP) which is in compliance with OSHA requirements found at 29 CFR 1926.1101 and 29 CFR 1910.134. ANSI Standard Z88.2-2015 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) - Respiratory Protection Program.
- B. Respiratory Protection Program Coordinator: The Respiratory Protection Program Coordinator (RPPC) must be identified and shall have two (2) years of 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.
- C. 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 or in the onsite Contractor's office, for reference by employees or authorized visitors.
- D. Minimum Respiratory Protection: Minimum respiratory protection shall be a $\frac{1}{2}$ -mask negative pressure air purifying respirator equipped with P100 filters, provided personal air samples in the workplace remain at or below 0.1 f/cc, determined as an 8-hour TWA. Full face powered air purifying respirator equipped with P100 filters shall be required until Contractor demonstrates that personal air samples are at or below 0.1 f/cc, determined as an 8-hour TWA. A higher level of respiratory protection shall be required, if fiber levels exceed 1 f/cc as an 8-

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

hour TWA, inside the regulated work area. Respirator selection shall meet the requirements of 29 CFR 1926.1101 (h) and 29 CFR 1910.134 (d) (3) (i) (A) Table 1, except as indicated in this paragraph. Abatement personnel must have a respirator for their exclusive use.

- E. 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.
- F. 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.
- G. 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 entering the regulated area until resolution of the problem.
- H. 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

- A. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

refresher and accreditation proof must be submitted for each person working at the site.

- B. 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 that 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.
- C. 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.
- D. 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.
- E. Decontamination Procedure: The Competent Person shall require all personnel to adhere to following decontamination procedures whenever they leave the regulated area.
 - 1. When exiting the regulated area, remove all disposable PPE and dispose of in a disposal bag provided in the regulated area.
 - 2. Carefully decontaminate and clean the respirator. Put in a clean container/bag.
- F. Regulated Area Requirements: The Competent Person shall meet all requirements of 29 CFR 1926.1101 (o) and assure that all requirements for Class II regulated areas at 29 CFR 1926.1101 (e) are met applicable to Class II work and this specification. All personnel in the regulated

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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

- A. Description: Provide each regulated area with a fiber drum with a disposal bag in it for personnel waste materials. The Competent Person shall provide a specific area at the outer boundary of the regulated area and designate it specifically for the decontamination of personnel and respirators.
- B. Waste/Equipment Decontamination Area (W/EDA): The Competent Person shall provide a specific area in the regulated area designated for removal of all waste, equipment and contaminated material from the regulated area
- C. Waste/Equipment Decontamination Procedures: Contain all waste in 6-mil poly bags or approved equivalent. Clean/decontaminate bags and pass through a double 6-mil flap doorway into another bag or fiber drum. Remove to disposal dumpster/gondola/enclosed vehicle

PART 2 - PRODUCTS, MATERIALS AND EQUIPMENT

2.1 MATERIALS AND EQUIPMENT

- A. 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.
 - 1. All materials shall be delivered in their original package, container or bundle bearing the name of the manufacturer and the brand name (where applicable).
 - 2. 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

3. 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.
4. 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.
5. Critical penetration points into the building shall be sealed with 2-layers of 6-mil independently installed plastic sheeting (Polyethylene) secured in place at openings such as ducts, pipes, windows, louvers, penetrations or any other opening into the regulated area. A drop cloth of 1-layer of 6-mil plastic sheeting will be placed under the work area to capture falling debris and to facilitate clean-up. Fire retardant poly shall be used throughout.
6. 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, poly 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.
7. Polyethylene sheeting utilized for the PDF, if used, shall be opaque white or black in color, 6-mil fire retardant poly.
8. Installation and plumbing hardware, showers, hoses, drain pans, sump pumps and waste water filtration system shall be provided by the Contractor.
9. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- conduct the abatement project. All electrically operated hand tools, equipment, electric cords shall be connected to GFCI protection.
10. 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).
 11. Disposal bags - Materials shall be wrapped in 2-layers of 6-mil poly for Transite-type 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-type waste materials during transport. If boxed or otherwise packaged, appropriate labels shall be affixed to the outer layer of the final container.
 12. The VA shall be provided an advance copy of the Safety Data Sheets (SDS) 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.
 13. 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 and Local regulations shall be posted at the outer boundary of the regulated area or approved equivalent.
 14. 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

A. General:

1. Using critical barriers, seal off the regulated area to completely isolate the regulated area from adjacent spaces. All penetrations to 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 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 2.2.7; FIRESTOPPING.
2. 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.
- B. 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.
- C. 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.
- D. 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.
- E. 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

immediately and continue until air monitoring indicates background levels are met.

F. Firestopping:

1. Through penetrations caused by cables, cable trays, pipes, ducts, sleeves, conduits, etc. must be firestopped with a fire-rated firestop system providing an air tight seal.
2. 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.
3. 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

A. General:

1. 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 daily area air samples inside the building, but outside the regulated area. At a minimum three (3) perimeter area air samples shall be

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

collected daily inside the building but outside the regulated work area. Additional inspection and testing requirements are also indicated in other parts of this specification.

2. 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.
3. 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,

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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.

B. Scope of Services of the VPIH/CIH Consultant:

1. 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:
 - a. Task 1: Establish background levels before abatement begins by collecting background samples. Retain samples for possible TEM analysis.
 - b. Task 2: Perform representative 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.
 - c. 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.
 - d. Task 4: Provide support to the VA Representative such as evaluation of submittals from the Contractor, resolution of conflicts, interpret data, etc.
 - e. 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- f. Task 6: Issue certificate of decontamination for each regulated area and project report.
2. 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.
3. 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.
- C. 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 Analytical Testing program of AIHA for fiber counting quality control assurance. The IH Technician shall also be an accredited EPA AHERA/State Contractor/Supervisor and Building Inspector. The IH Technician shall have participated in five abatement projects collecting personal and area samples and have experience in substantially similar projects in size and scope. The analytical laboratory used by the Contractor to analyze the samples shall be AIHA accredited for asbestos PAT and

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 personal and area air 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. The CPIH/CIH shall personally manage air sample collection, analysis, and evaluation for personnel, regulated area, and daily area air samples inside the building, but outside the regulated area. At a minimum three (3) perimeter area air samples shall be collected daily inside the building but outside the regulated work area. 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.

2.4 ASBESTOS HAZARD ABATEMENT PLAN

- A. The Contractor shall have an 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:
1. Minimum Personnel Qualifications
 2. Emergency Action Plan and Arrangements
 3. Security and Safety Procedures
 4. Respiratory Protection/Personal Protective Equipment Program and Training
 5. Medical Surveillance Program and Recordkeeping

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

6. Regulated Area Requirements for Class II work
7. Decontamination Facilities and Entry/Exit Procedures (PDF and W/EDF)
8. Monitoring, Inspections, and Testing
9. Removal Procedures for Class II Materials
10. Disposal of ACM Waste
11. Regulated Area Decontamination/Clean-up
12. Regulated Area Visual and Air Clearance
13. Project Completion/Closeout

2.5 SUBMITTALS

A. Pre-Start Meeting Submittals:

1. 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) 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, and containment barriers.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 3) Encapsulants, surfactants, hand held sprayers, airless sprayers, and fire extinguishers.
- 4) Respirators, protective clothing, fall protection and other required 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. 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 and Local EPA),

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 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; medical opinion; and current respirator fit test.
 - 2) Competent Person(s)/Supervisor(s): Number; names; last four digits of 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; last four digits of 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 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 methods 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 SDS and application instructions.

B. Submittals During Abatement:

- 1. 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 VA's Representative.
- 2. 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.
 - a. Removal of any poly barriers.
 - b. Visual inspection/testing by the CPIH/CIH or IH Technician prior to application of lockdown encapsulant, if used.
 - c. Packaging and removal of ACM waste from regulated area.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- d. Disposal of ACM waste materials; copies of Waste Shipment Records/landfill receipts to the VA's Representative on a weekly basis.
- C. 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

- A. Site Security:
 - 1. 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.
 - 2. 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 Representative.
 - 3. 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.
 - 4. Access to the regulated area shall be through the PDF or approved equivalent. All other access (doors, windows, hallways, etc.) shall

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 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 or outside; however, they shall be sealed with poly sheeting and taped until needed.
5. 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.
 6. 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.
 7. The regulated area shall be locked during non-working hours and secured by VA Representative or Competent Person. The VA Police shall be informed of asbestos abatement regulated areas to provide security checks during facility rounds and emergency response.
- B. 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.
- C. Shut down - Lock Out Electric: 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

D. Shut Down and Lock Out HVAC:

1. 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.
2. 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 independently installed 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.

E. Negative Pressure Filtration System:

1. The Contractor shall provide enough HEPA negative air machines to continuously maintain a negative pressure differential of -0.02 inch water column gauge (WCG) inside the regulated work area relative to adjacent non-work building areas. OSHA 29 CFR 1926.1101 (g) (5) (i) (A) (2) also requires at least four (4) air changes per hour. 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 negative pressure differential of -0.02 inch WCG. Provide standby units in the event of machine failure and/or emergency in an adjacent area. HEPA equipped negative air machines shall be discharged outside of the building a minimum of 30 feet from building make-up air, doors, open windows, patients, visitors and staff.
2. NIOSH has done extensive studies and has determined that negative air machines typically operate at ~50 percent efficiency. The contractor shall consider this in their determination of number of units needed to provide -0.02 inch 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 inches pressure drop across the filters.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

F. Containment Barriers and Coverings in the Regulated Area:

1. General: 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, Contractor 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 2.2.7; FIRESTOPPING.
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. 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 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.
4. Critical Barriers: Completely separate any operations in the regulated area from adjacent areas using 2-layers of independently installed 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,

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- doors, windows, convectors, speakers, or any other objects/openings in the regulated area. Heat must be shut off any objects covered with poly.
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. 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.
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.
- G. 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.
- H. Sanitary Facilities: The Contractor shall provide sanitary facilities for abatement personnel and maintain them in a clean and sanitary condition throughout the abatement project.
- I. Pre-Cleaning:
1. Pre-Cleaning Moveable Objects:
- a. 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-cleaning is not required if Transite-type materials are in good condition and are the only ACM present.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- b. 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. Pre-cleaning is not required if Transite-type materials are in good condition and are the only ACM present.
- 2. Pre-Cleaning Fixed Objects:
 - a. 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-cleaning is not required if Transite-type materials are in good condition and are the only ACM present.
 - b. 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. Pre-Cleaning Surfaces in the Regulated Area:
 - a. 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-cleaning is not required if transite type materials are in good condition and are the only ACM present.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- b. 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. Pre-cleaning is not required if Transite type materials are in good condition and are the only ACM present.
- J. Pre-Abatement Activities:
- 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, 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.
 - 2. Pre-Abatement Inspections and Preparation:
 - a. Before any work begins on the construction of the regulated area, the Contractor will:
 - 1) 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 2) 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 shall 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-type piping/ductwork/sheets; behind radiators; lab fume hoods; Transite-type 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.
- 3) If present and required clean, remove or properly protect all furniture, machinery, equipment, curtains, drapes, blinds, and other movable objects .
- 4) Shut down and seal with a minimum of 2-layers of independently installed 6-mil fire retardant poly all HVAC systems and critical openings in the regulated area. The regulated area critical barriers shall completely isolate the regulated area from any other air in the building. The VA's Representative will monitor the isolation provision.
- 5) 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

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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.

- 6) If required, remove and dispose of carpeting from floors in the regulated area.
- 7) Inspect existing firestopping in the regulated area. Correct as needed.

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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

3.2 REMOVAL OF CLASS II TRANSITE-TYPE MATERIALS

- A. 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.
- B. 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. Place 6-mil polyethylene sheeting placed 25 feet out from the outer perimeter of the work area to aid in cleaning Transite-type material debris that may fall off building.
- C. 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.
- D. Roof/Elevated Work Area Protection: The competent person shall determine if the walking/working surfaces on which the employees are to

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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.

- E. 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.

F. Removal of Transite-Type:

1. All Transite-type must be wetted prior to removal. Unfasten Transite-type panels without disturbance. Keep Transite-type material intact to the extent feasible.
2. All waste must be wrapped in two layers of 6-mil poly and lowered carefully to the ground.
3. 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

- A. 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 171-180 regulations. Disposal shall be done at an approved landfill in accordance with State and Local requirements,

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

which are generally more restrictive than Federal EPA. Disposal of non-friable ACM shall be done in accordance with applicable State and Local regulations.

3.4 PROJECT DECONTAMINATION

A. General:

1. The entire work related to project decontamination shall be performed under the close supervision and monitoring of the CPIH/CIH.
2. 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.
3. 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.

B. 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.

C. 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.

D. Pre-Decontamination Conditions:

1. 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.
2. At the start of decontamination, the following shall be in place:
 - a. Critical barriers over all openings consisting of two layers of independently installed 6-mil poly which is the sole barrier

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

between the regulated area and the rest of the building or outside.

- b. Decontamination facilities, if required for personnel and equipment in operating condition.
- E. 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

- A. 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.
- B. 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 additional cost to the VA. Dust/ material samples may be collected and analyzed at no additional 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.
- C. Air Clearance Testing:
 - 1. 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 and this specification. If work is less than 260 lf/160 sf/35 cf, 5 PCM samples shall be collected for

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 and 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.

2. If release criteria are met, proceed to perform the abatement closeout and to issue the certificate of completion in accordance with these specifications.

D. Final Air Clearance Procedures:

1. 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 and ≤ 70 AHERA asbestos structures per square millimeter (s/mm²) by AHERA TEM. No averaging of results will be used for this project. All five (5) TEM samples inside the regulated area shall be at or below 70 asbestos s/mm² to satisfy the project final clearance criteria.
 - a. 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. Samples will be collected on 0.8 μ MCE filters for PCM analysis and 0.45 μ MCE for TEM. A minimum of 3850 Liters of air using calibrated sampling pumps shall be collected for PCM samples and a

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

minimum of 1200 Liters of air using calibrated sampling pumps shall be collected for TEM 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

A. Completion of Abatement Work:

1. After thorough decontamination, complete asbestos abatement work upon meeting the regulated area 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.
 - c. Repair or replace all interior finishes damaged during the abatement work.
 - d. Fulfill other project closeout requirements as specified elsewhere in this specification.

B. 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.

C. Work Shifts:

1. All work shall generally 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.
2. Workers will be provided with adequate washing and break area facilities located away from the containment site.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

**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: _____

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2

01-16-24

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 of worker's acknowledgement 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

Signature of CPIH/CIH: _____ Date: _____

Printed Name of CPIH/CIH: _____

Signature of Contractor: _____ Date: _____

Printed Name of Contractor: _____

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 _____

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Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2

01-16-24

DEPARTMENT OF VETERANS AFFAIRS
VHA MASTER SPECIFICATIONS

LEAD-BASED PAINT REMOVAL AND DISPOSAL
SECTION 02 83 33.13

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removing and disposal of lead-based paint (LBP) at interior and exterior locations indicated in existing conditions report.

1.2 RELATED WORK

1. 02 41 00, DEMOLITION
2. 02 65 00, UNDERGROUND STORAGE TANK REMOVAL
3. 02 82 11, TRADITIONAL ASBESTOS ABATEMENT
4. 02 82 13.31, ASBESTOS TRANSITE-TYPE ABATEMENT
5. 02 83 33.13, LEAD BASED PAINT REMOVAL AND DISPOSAL
6. DIVISION 03, CONCRETE
7. DIVISION 04, MASONRY
8. DIVISION 05 METALS
9. DIVISION 06, WOOD, PLASTIC AND COMPOSITES
10. DIVISION 07, THERMAL AND MOISTURE PROTECTION
11. DIVISION 08, OPENINGS
12. DIVISION 09 FINISHES
13. DIVISION 10, SPECIALTIES
14. DIVISION 21, FIRE SUPPRESSION
15. DIVISION 22, PLUMBING
16. DIVISION 23, HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)
17. DIVISION 26, ELECTRICAL
18. DIVISION 07, COMMUNICATION
19. DIVISION 28, ELECTRONIC SAFETY AND SECURITY
20. DIVISION 31, EARTHWORK
21. DIVISION 32, EXTERIOR IMPROVEMENTS
22. DIVISION 33, UTILITIES
23. DIVISION 34, TRANSPORTATION

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

1.3 DEFINITIONS

- A. Action Level: Employee exposure, without regard to use of respirator, to an airborne lead concentration of 30 micrograms(μ) per cubic meter (m^3) of air determined as an 8-hour Time-Weighted Average (TWA). As used in this section, "30 micrograms per cubic meter of air" refers to OSHA 29 CFR 1926.62 Lead in Construction Action Level (AL).
- 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 Certified in the Comprehensive Practice of Industrial Hygiene by the American Board of Industrial Hygiene and Board for Global EHS Credentialing, 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 prevents cross contamination.
- F. Competent Person: Person capable of identifying lead hazards in work area and authorized by contractor to take corrective action. Meets the OSHA definition of Competent Person.
- 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 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 of air ($50 \mu\text{g}/\text{m}^3$) determined as an 8-hour TWA as determined by 29 CFR Part 1926.62. When employee is exposed for more than 8-hours per work day, determine PEL by the following formula. PEL micrograms/cubic meter (parts per million) of air = $400/\text{No. of hrs. worked per day}$.
- M. Personnel Monitoring: Sampling of lead concentrations within employee breathing zone to determine 8-hour time weighted average concentration according to 29 CFR Part 1926.62. Take samples that are representative of the various 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):
 - Z9.2-2018.....Fundamentals Governing the Design & Operation of Local Exhaust Ventilation Systems.
- C. Code of Federal Regulations (CFR):
 - 29 CFR Part 1910.....Occupational Safety and Health Standards.
 - 29 CFR Part 1926.....Safety and Health Regulations for Construction.
 - 40 CFR Part 260.....Hazardous Waste Management System: General.
 - 40 CFR Part 261.....Identification and Listing of Hazardous Waste.
 - 40 CFR Part 262.....Standards Applicable to Generators of Hazardous Waste.
 - 40 CFR Part 263.....Standards Applicable to Transporters of Hazardous Waste.
 - 40 CFR Part 264.....Standards for Owners and Operations of Hazardous Waste Treatment, Storage, and Disposal Facilities.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 40 CFR Part 265.....Interim Status Standards for Owners and
Operators of Hazardous Waste Treatment,
Storage, and Disposal Facilities.
- 40 CFR Part 268.....Land Disposal Restrictions.
- 49 CFR Part 172.....Hazardous Material Table, Special Provisions,
Hazardous Material Communications, Emergency
Response Information, and Training
Requirements, and Security Plans.
- 49 CFR Part 178.....Specifications for Packaging.

D. Underwriters Laboratories (UL):

- 586-09.....High-Efficiency, Particulate, Air Filter Units.

1.5 PRE-REMOVAL MEETINGS

A. Conduct pre-removal meeting at project site a minimum of 30 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 lead 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 American Industrial Hygiene Association (AIHA) Laboratory Accreditation Program (LAP), LLC, Environmental Lead Laboratory Accreditation Program (ELLAP).
 - 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

F. Record Documents:

1. Completed and signed hazardous waste manifest from waste transporter if required.
2. Toxicity Characteristic Leaching Procedure (TCLP) test results to determine if waste is hazardous.
3. Paint disposal facility receipts and disposition reports.
4. Certification of medical examinations.
5. Medical Opinion that employee is qualified to wear a respirator, that employees has been trained and fit tested for the respirator.
6. 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. Comply with applicable requirements of 29 CFR Part 1926.62.
 - b. 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.

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 American Industrial Hygiene Association (AIHA) Laboratory Accreditation Program (LAP), LLC, Environmental Lead Laboratory Accreditation Program (ELLAP).

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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 and 29 CFR Part 1926.62.
1. Provide each employee negative pressure or other appropriate respirator.
 - a. Respirator fit each employee's respirator at initial fitting and at least annually thereafter, as required by 29 CFR Part 1910.134 Respiratory Protection.
- H. Hazard Communication Program: Establish and implement program required by 29 CFR Part 1910.1200 which is the same as 29 CFR 1926.59.
- I. Hazardous Waste Management Plan: Establish and implement plan according to applicable requirements of Federal, State, and Local hazardous waste regulations including the following:
- Contract No. 36C26319D0044
- Station Project No. 437-21-210
- Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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, State, and Local hazardous waste permit applications permits and 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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 (j) Medical Surveillance.
- B. Maintain complete and accurate employee medical records according to 29 CFR Part 1910.1020.
- 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 20 days 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:

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

1. Provide ventilation system to control personnel exposure to lead using HEPA equipped negative air machines.
 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 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 24
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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

- 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. HEPA vacuum clean and wet wipe with detergent solution 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. Re-clean 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:

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

**Fargo VA Medical Center
Fargo, North Dakota
EHRM Infrastructure Upgrades - Tier 2**

01-16-24

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. Minimum 14 days before delivery, notify Contracting Officer's Representative who will arrange for job site inspection of drums and manifests by paint disposal facility personnel.
2. Contracting Officer's Representative will arrange hazardous wastes removal, transport and delivery to paint disposal facility to ensure drums do not remain on project site longer than 90 calendar days from drum label date.

F. 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.

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Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

DIVISION 03

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies cast-in-place structural concrete and materials and mixes for other concrete.

1.2 RELATED WORK

- A. Section 01 45 29, TESTING LABORATORY SERVICES: Materials testing and inspection during construction.
- B. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS
- C. Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS: Concrete roads, walks, and similar exterior site work.

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).

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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. All items indicated below are required submittals requiring Contracting Officer's Representative (COR) review and approval.
- 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. Lightweight aggregate for structural concrete.
 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. Waterstops.
 10. Expansion joint filler.
 11. Adhesive binder.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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.
- G. Shoring and Reshoring Sequence: Submit for approval a shoring and reshoring sequence for flat slab/flat plate portions, prepared by a registered Professional Engineer. As a minimum, include timing of form stripping, reshoring, number of floors to be re-shored and timing of re-shore removal to serve as an initial outline of procedures subject to modification as construction progresses. Submit revisions to sequence, whether initiated by COR (see FORMWORK) or Contractor.
- H. Test reports on splitting tensile strength (F_{ct}) of lightweight concrete.

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.

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

12/18/2023

01-01-21

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; lightweight aggregate manufacturer; 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 MOCK-UP

- A. In addition to the other specified samples and tests, construct a mock-up using the materials, reinforcing, forming system and construction methods proposed for use in exposed architectural concrete.
- B. Construct the mock-up with at least a 2.5 m by 2.5 m (8 feet by 8 feet) exposed surface and suitable foundations. Include the following where applicable: Control joints, reglets, recesses or other typical architectural details.
- C. Before casting the mock-up, submit full detailed Shop Drawings of the mock-up formwork for review by the Architect. Perform all necessary preliminary tests to ensure that concrete used for the mock-up will exactly match the approved sample in color and texture.
- D. Perform the surface treatment proposed for use on one or more areas not less than 300 mm by 300 mm (1 foot by 1 foot) on the back side of the mock-up to establish the texture of finish required by the Architect. Repeat as required until a sample satisfactory to the Architect has been obtained.
- E. Treat the finished front surface of the mock-up to produce a uniform appearance similar in every respect to the approved sample area.
- F. The completed mock-up shall be inspected by the Architect. Failure of the mock-up to match the approved sample will require the construction

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

of further mock-ups until approval is obtained. Remove rejected mock-ups immediately.

- G. Maintain the approved mock-ups in good condition at the job site until all architectural concrete surfaces have been completed and approved by the Architect. Remove the mock-up from the site after completion of the above.

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):

117-10.....Specifications for Tolerances for Concrete
Construction and Materials and Commentary
211.1-91 (R2009).....Standard Practice for Selecting Proportions for
Normal, Heavyweight, and Mass Concrete
211.2-98 (R2004).....Standard Practice for Selecting Proportions for
Structural Lightweight Concrete
214R-11 (R2019).....Guide to Evaluation of Strength Test Results of
Concrete
301-16.....Specifications for Structural Concrete
304R-00 (R2009).....Guide for Measuring, Mixing, Transporting, and
Placing Concrete
305.1-14.....Specification for Hot Weather Concreting
306.1-90 (R2002).....Standard Specification for Cold Weather
Concreting
308.1-11.....Specification for Curing Concrete
309R-05.....Guide for Consolidation of Concrete
318/318-19.....Building Code Requirements for Structural
Concrete and Commentary
347R-14.....Guide to Formwork for Concrete
SP-66-04.....ACI Detailing Manual

- C. American National Standards Institute and American Hardboard Association (ANSI/AHA):

A135.4-2012.....Basic Hardboard

- D. ASTM International (ASTM):

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

A615/A615M-20.....Standard Specification for Deformed and Plain
Carbon Steel Bars for Concrete Reinforcement
A653/A653M-20.....Standard Specification for Steel Sheet, Zinc
Coated (Galvanized) or Zinc Iron Alloy Coated
(Galvannealed) by the Hot Dip Process
A706/A706M-16.....Standard Specification for Deformed and Plain
Low-Alloy Steel Bars for Concrete Reinforcement
A767/A767M-19.....Standard Specification for Zinc Coated
(Galvanized) Steel Bars for Concrete
Reinforcement
A775/A775M-19.....Standard Specification for Epoxy Coated Steel
Reinforcing Bars
A820/820M-16.....Standard Specification for Steel Fibers for
Fiber Reinforced Concrete
A996/A996M-16.....Standard Specification for Rail Steel and Axle
Steel Deformed Bars for Concrete Reinforcement
A1064/A1064M-18a.....Standard Specification for Carbon-Steel Wire
and Welded Wire Reinforcement, Plain and
Deformed, for Concrete
C31/C31M-19a.....Standard Practice for Making and Curing
Concrete Test Specimens in the field
C33/C33M-18.....Standard Specification for Concrete Aggregates
C39/C39M-20.....Standard Test Method for Compressive Strength
of Cylindrical Concrete Specimens
C94/C94M-19a.....Standard Specification for Ready Mixed Concrete
C143/C143M-20.....Standard Test Method for Slump of Hydraulic
Cement Concrete
C150C150M-20.....Standard Specification for Portland Cement
C171-16.....Standard Specification for Sheet Materials for
Curing Concrete
C172C172M-17.....Standard Practice for Sampling Freshly Mixed
Concrete
C173/C173M-16.....Standard Test Method for Air Content of Freshly
Mixed Concrete by the Volumetric Method
C192/C192M-19.....Standard Practice for Making and Curing
Concrete Test Specimens in the Laboratory

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

12/18/2023

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

C231/C231M-17a.....Standard Test Method for Air Content of Freshly
Mixed Concrete by the Pressure Method
C260/C260M-10a(2016)....Standard Specification for Air Entraining
Admixtures for Concrete
C309-19.....Standard Specification for Liquid Membrane
Forming Compounds for Curing Concrete
C330/C330M-17a.....Standard Specification for Lightweight
Aggregates for Structural Concrete
C494/C494M-19.....Standard Specification for Chemical Admixtures
for Concrete
C618-19.....Standard Specification for Coal Fly Ash and Raw
or Calcined Natural Pozzolan for Use in
Concrete
C666/C666M-15.....Standard Test Method for Resistance of Concrete
to Rapid Freezing and Thawing
C881/C881M-20.....Standard Specification for Epoxy Resin Base
Bonding Systems for Concrete
C1107/1107M-20.....Standard Specification for Packaged Dry,
Hydraulic-Cement Grout (Non-shrink)
C1315-19.....Standard Specification for Liquid Membrane
Forming Compounds Having Special Properties for
Curing and Sealing Concrete
D6/D6M-95(2018).....Standard Test Method for Loss on Heating of Oil
and Asphaltic Compounds
D297-15(2019).....Standard Test Methods for Rubber Products
Chemical Analysis
D412-16.....Standard Test Methods for Vulcanized Rubber and
Thermoplastic Elastomers - Tension
D1751-18.....Standard Specification for Preformed Expansion
Joint Filler for Concrete Paving and Structural
Construction (Non-extruding and Resilient
Bituminous Types)
D4263-83(2018).....Standard Test Method for Indicating Moisture in
Concrete by the Plastic Sheet Method.
E1155-20.....Standard Test Method for Determining F_F Floor
Flatness and F_L Floor Levelness Numbers

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

12/18/2023

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

F1249-20.....Standard Test Method for Water Vapor
Transmission Rate Through Plastic Film and
Sheeting Using a Modulated Infrared Sensor

F1869-16a.....Standard Test Method for Measuring Moisture
Vapor Emission Rate of Concrete Subfloor Using
Anhydrous Calcium Chloride.

E. American Welding Society (AWS):

D1.4/D1.4M-18.....Structural Welding Code - Steel Reinforcing
Bars

F. Concrete Reinforcing Steel Institute (CRSI):

Handbook 2008

G. National Cooperative Highway Research Program (NCHRP):

Report On.....Concrete Sealers for the Protection of Bridge
Structures

H. U. S. Department of Commerce Product Standard (PS):

PS 1-07.....Structural Plywood

PS 20-20.....American Softwood Lumber Standard

I. U. S. Army Corps of Engineers Handbook for Concrete and Cement:

CRD C513.....Rubber Waterstops

CRD C572.....Polyvinyl Chloride Waterstops

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. Metal for Concrete Rib-Type Construction: Steel (removal type) of
suitable weight and form to provide required rigidity.

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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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. 1. Hardboard: ANSI/AHA A135.4, Class 2 with one (S1S) smooth side)~~
- ~~2. 2. Plywood: Grade B-B Exterior (concrete-form) not less than 6 mm (1/4 inch) thick.~~
- ~~3. 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 alkalies, and loss on ignition (LOI) not to exceed 5 percent. Do not exceed more than 25 percent total cementitious content by weight.
- C. Coarse Aggregate:** ASTM C33.
1. Size 67 or Size 467 may be used for footings and walls over 300 mm (12 inches) thick.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

2. Coarse aggregate for interior slabs on grade shall conform to the following:
 - a. Dense or well graded aggregate.
 - 1) Percent retained on each sieve below the top size and above the No. 100 sieve:
 - a) 8 to 18 percent for 1-1/2 inches (38 mm) top size.
 - b) 8 to 22 percent for 3/4 or 1 inch (19 or 25 mm) top size.
 - 2) The above requirements may be deviated from based on locally available material.
 - a) One or two non-adjacent sieves sizes may fall outside of the limits set above.
 - b) Percent retained on two adjacent sieves sizes shall not be less than 5 percent of the above required.
 - c) Percent retained on three adjacent sieve sizes shall not be less than 8 percent of the above required.
 - d) When the percent retained on each of two adjacent sieve sizes is less than 8 percent the total percent retained on either of these sieves and the adjacent outside sieve should be at least 13 percent (for example, if both the No. 4 and No. 8 (4.75 and 2.36 mm) sieves have 6 percent retained on each item then: 1. the total retained on the 3/8 inch and No. 4 (9.5 and 4.75 mm) sieves should be at least 13 percent, and 2. the total retained on the No. 8 and No. 16 (2.36 and 1.18 mm) sieves should be at least 13 percent.
3. Coarse aggregate for applied topping, encasement of steel columns, and metal pan stair fill shall be Size 7.
4. 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.
- D. Lightweight Aggregates for Structural Concrete: ASTM C330, Table 1. Maximum size of aggregate not larger than one-fifth of narrowest dimension between forms, nor three-fourth of minimum clear distance between reinforcing bars. Contractor to furnish certified report to verify that aggregate is sound and durable, and has a durability factor

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

of not less than 80 based on 300 cycles of freezing and thawing when tested in accordance with ASTM C666.

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. Use of superplasticizer requires COR approval.
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. Microsilica: Use only with prior review and acceptance of the COR. Use only in conjunction with high range water reducer.
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 F1249, 0.38 mm (15 mil) WVT 0.007 foot/hour.

I. Reinforcing Steel: ASTM A615, or ASTM A996, deformed, grade as shown.

J. Reinforcing Bar: Glass Fiber Reinforced Polymer (GFRP), ASTM D 7957.

K. Welded Wire Fabric: ASTM A185.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- L. Reinforcing Bars to be Welded: ASTM A706.
- M. Galvanized Reinforcing Bars: ASTM A767.
- N. Epoxy Coated Reinforcing Bars: ASTM A775.
- O. Cold Drawn Steel Wire: ASTM A1064.
- P. Reinforcement for Metal Pan Stair Fill: 50 mm (2 inch) wire mesh, either hexagonal mesh at .8Kg/m² (1.5 pounds per square yard), or square mesh at .6Kg/m² (1.17 pounds per square yard).
- 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. Liquid Hardener and Dustproofer: Fluosilicate solution of magnesium fluosilicate or zinc fluosilicate. Magnesium and zinc may be used separately or in combination as recommended by manufacturer. Use only on exposed slab. Do not use where floor is covered with resilient flooring, paint or other finish coating.
- W. Moisture Vapor Emissions & Alkalinity Control Sealer: 100 percent 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 percent 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:

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

12/18/2023

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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 contaminants 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 contaminants.
- X. Penetrating Sealer: For use on parking garage ramps and decks. High penetration silane sealer providing minimum 95 percent screening per National Cooperative Highway Research Program (NCHRP) No. 244 standards for chloride ion penetration resistance. Requires moist (non-membrane) curing of slab.
- 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. Waterstops:
1. Polyvinyl Chloride Waterstop: CRD C572.
 2. Rubber Waterstops: CRD C513.
 3. Bentonite Waterstop: Flexible strip of bentonite 25 mm x 20 mm (1 inch by 3/4 inch), weighing 8.7 kg/m (5.85 pounds per foot) composed of Butyl Rubber Hydrocarbon (ASTM D297), Bentonite (SS-S-210-A) and Volatile Matter (ASTM D6).
 4. Non-Metallic Hydrophilic: Swellable strip type compound of polymer modified chloroprene rubber that swells upon contact with water

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

shall conform to ASTM D412 as follows: Tensile strength 420 psi minimum; ultimate elongation 600 percent minimum. Hardness shall be 50 minimum on the type A durometer and the volumetric expansion ratio in in 70 deg water shall be 3 to 1 minimum.

BB. Porous Backfill: Crushed stone or gravel graded from 25 mm to 20 mm (1 inch to 3/4 inch).

CC. Fibers:

1. Synthetic Fibers: Monofilament or fibrillated polypropylene fibers for secondary reinforcing of concrete members. Use appropriate length and 0.9 kg/m³ (1.5 lb. per cubic yard). Product shall have a UL rating.
2. Steel Fibers: ASTM A820, Type I cold drawn, high tensile steel wire for use as primary reinforcing in slab-on-grade. Minimum dosage rate 18 kg/m³ (30 lb. per cubic yard).

DD. Epoxy Joint Filler: Two component, 100 percent solids compound, with a minimum shore D hardness of 50.

EE. Bonding Admixture: Non-rewettable, polymer modified, bonding compound.

FF. Architectural Concrete: For areas designated as architectural concrete on the Contract Documents, use colored cements and specially selected aggregates as necessary to produce a concrete of a color and finish which exactly matches the designated sample panel.

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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 the COR 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 the COR 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. The COR 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 maximum of 25 percent replacement by weight in all structural work. Increase this replacement to 40 percent for mass concrete, and reduce it to 10 percent for drilled piers and caissons. Fly ash shall not be used in high-early mix design.

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/m3 (lbs/c. yd)	Max. Water Cement Ratio	Min. Cement kg/m3 (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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

25 (3000)1,2	300 (500)	See 4 below	310 (520)	See 4 below

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. Lightweight Structural Concrete. Pump mixes may require higher cement values.
 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 or ACI 211.2 for lightweight structural 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), and 75 mm to 100 mm (3 inches to 4 inches) for lightweight concrete. 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. Air-entrainment of lightweight structural

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

concrete shall conform with Table IV. 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	

**TABLE IV
AIR CONTENT OF LIGHTWEIGHT STRUCTURAL CONCRETE**

Nominal Maximum size of Total Air Content	Coarse Aggregate, mm's (Inches) Percentage by Volume
Greater than 10 mm (3/8 in) 4 to 8	10 mm (3/8 in) or less 5 to 9

- H. High early strength concrete, made with Type III cement or Type I cement plus non-corrosive accelerator, shall have a 7-day compressive strength equal to specified minimum 28-day compressive strength for concrete type specified made with standard Portland cement.
- I. Lightweight structural concrete shall not weigh more than air-dry unit weight shown. Air-dry unit weight determined on 150 mm by 300 mm (6 inch by 12 inch) test cylinders after seven days standard moist curing followed by 21 days drying at 23 degrees C $\pm$ 1.7 degrees C (73.4 $\pm$ 3 degrees Fahrenheit), and 50 (plus or minus 7) percent relative humidity. Use wet unit weight of fresh concrete as basis of control in field.
- 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, synthetic fiber concrete, architectural concrete, concrete required to be watertight, 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.

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

12/18/2023

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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, the COR 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, the COR 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, the COR 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, except as specified. Batch mixing at the site is permitted. Mixing process and equipment must be approved by the COR. 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 degrees C (100 degrees Fahrenheit).

Minimum delivery temperature as follows:

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

12/18/2023

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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. Services of aggregate manufacturer's representative shall be furnished during the design of trial mixes and as requested by the COR for consultation during batching, mixing, and placing operations of lightweight structural concrete. Services will be required until field controls indicate that concrete of required quality is being furnished. Representative shall be thoroughly familiar with the structural lightweight aggregate, adjustment and control of mixes to produce concrete of required quality. Representative shall assist and advise the COR.

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, shores, and reshores.
 1. Form boards and plywood forms may be reused for contact surfaces of exposed concrete only if thoroughly cleaned, patched, and repaired and the COR approves their reuse.
 2. Provide forms for concrete footings unless the COR 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.

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

12/18/2023

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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 blue shingle or similar nails with thin flatheads.
- F. Architectural Liner: Attach liner as recommended by the manufacturer with tight joints to prevent leakage.
- 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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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. Locate inserts or hanger wires for furred and suspended ceilings only in bottom of concrete joists, or similar concrete member of overhead concrete joist construction.
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. Do not install sleeves in beams, joists or columns except where shown or permitted by the COR. Install sleeves in beams, joists, or columns that are not shown, but are permitted by the COR, and require no structural changes, at no additional cost to the Government.
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. Splice column steel at no points other than at footings and floor levels unless otherwise shown.
- 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. Welded splices: Splicing by butt-welding of reinforcement permitted providing the weld develops in tension at least 125 percent of the yield strength (fy) for the bars. Welding conform to the requirements of AWS D1.4. Welded reinforcing steel conform to the chemical analysis requirements of AWS D1.4.
 - a. Submit test reports indicating the chemical analysis to establish weldability of reinforcing steel.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- b. Submit a field quality control procedure to insure proper inspection, materials and welding procedure for welded splices.
 - c. Department of Veterans Affairs retained testing agency shall test a minimum of three splices, for compliance, locations selected by the COR.
3. Mechanical Splices: Develop in tension and compression at least 125 percent of the yield strength (fy) of the bars. Stresses of transition splices between two reinforcing bar sizes based on area of smaller bar. Provide mechanical splices at locations indicated. Use approved exothermic, tapered threaded coupling, or swaged and threaded sleeve. Exposed threads and swaging in the field not permitted.
- a. Initial qualification: In the presence of the COR, make three test mechanical splices of each bar size proposed to be spliced. Department of Veterans Affairs retained testing laboratory will perform load test.
 - b. During installation: Furnish, at no additional cost to the Government, one companion (sister) splice for every 50 splices for load testing. Department of Veterans Affairs retained testing laboratory will perform the load test.
- E. Bending: Bend bars cold, unless otherwise approved. Do not field bend bars partially embedded in concrete, except when approved by the 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.

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

12/18/2023

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 the COR.
- B. Locate construction joints in suspended floors near the quarter-point of spans for slabs, beams or girders, unless a beam intersects a girder at center, in which case joint in girder shall be offset a distance

01-01-21

equal to twice width of beam. Provide keys and inclined dowels as shown. Provide longitudinal keys as shown.

- C. Place concrete for columns slowly and in one operation between joints. Install joints in concrete columns at underside of deepest beam or girder framing into column.
- D. Allow 2 hours to elapse after column is cast before concrete of supported beam, girder or slab is placed. Place girders, beams, grade beams, column capitals, brackets, and haunches at the same time as slab unless otherwise shown.

3.6 EXPANSION JOINTS AND CONTRACTION JOINTS

- A. Clean expansion joint surfaces before installing premolded filler and placing adjacent concrete.
- B. 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.

1.11 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 the COR 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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 the COR.
- 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

01-01-21

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

A. 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 the COR.

3.9 COLD WEATHER

A. 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 the 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, except wet curing period for high-early-strength concrete shall be not less than 3 days. 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 the COR.

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.

01-01-21

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. Reshoring: Reshoring is required if superimposed load plus dead load of the floor exceeds the capacity of the floor at the time of loading. Reshoring accomplished in accordance with ACI 347 at no additional cost to the Government.

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 the 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 μ m (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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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 m² (2 square feet) in each 93 m² (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. Determine elevations of cast-in-place slab soffits prior to removal of shores. Provide information to the COR 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 the COR 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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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, future floor roof slabs, 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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 the 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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 the 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 the 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 percent 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 APPLIED TOPPING

- A. Separate concrete topping on floor base slab of thickness and strength shown. Topping mix shall have a maximum slump of 200 mm (8 inches) for concrete containing a high-range water-reducing admixture (superplasticizer) and 100 mm (4 inches) for conventional mix. Neatly bevel or slope at door openings and at slabs adjoining spaces not receiving an applied finish.
- B. Placing: Place continuously until entire section is complete, struck off with straightedge, leveled with a highway straightedge or highway bull float, floated and troweled by machine to a hard dense finish. Slope to floor drains as required. Do not start floating until free water has disappeared and no water sheen is visible. Allow drying of surface moisture naturally. Do not hasten by "dusting" with cement or sand.

3.16 RESURFACING FLOORS

- A. Remove existing flooring areas to receive resurfacing to expose existing structural slab and extend not less than 25 mm (1 inch) below new finished floor level. Prepare exposed structural slab surface by roughening, broom cleaning, and dampening. Apply specified bonding grout. Place topping while the bonding grout is still tacky.

3.17 RETAINING WALLS

- A. Use air-entrained concrete.
- B. Expansion and contraction joints, waterstops, weep holes, reinforcement and railing sleeves installed and constructed as shown.
- C. Exposed surfaces finished to match adjacent concrete surfaces, new or existing.
- D. Place porous backfill as shown.

3.18 PRECAST CONCRETE ITEMS

- A. 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.

DIVISION 04

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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.

1.2 RELATED WORK

- A. Section 01 45 29, Testing Laboratory Services: Testing mortar type to match existing.
- B. Section 04 05 13, MASONRY MORTARING: Mortars for new masonry.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
- C67/C67M-20.....Sampling and Testing Brick and Structural Clay Tile.
 - C144-18.....Aggregate for Masonry Mortar.
 - C150/C150M-20.....Specification for Portland Cement.
 - C207-18 - Hydrated Lime for Masonry Purposes
 - C216-19 - Facing Brick (Solid Masonry Units Made from Clay or Shale)
 - C270-19a1.....Mortar for Unit Masonry
 - C295/C295M-19.....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:

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

04 01 00-1
Maintenance of Masonry

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

1. Pointing Mortar: Molded, 150 mm (6 inches) long for each type, texture, and color.

D. Test reports:

1. Preconstruction test results of existing masonry mortar and units.
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. Preconstruction Testing:

1. Existing Brick: according to ASTM C67.
2. Existing Mortar: according to ASTM C295/C295M.
 - a. Recommend mortar mix compatible with existing and mortar material sources required to match existing color and texture.

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).

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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. Mortar to match texture, color and profile of existing.
- B. Provide each product from one manufacturer and from one production run.

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.

2.4 MIXES

- A. Tuck Pointing Mortar: ASTM C270; Use Appendix X3 as appropriate to meet industry standard.
- B. Existing mortar to be tested to determine Type. Where recommended by industry standard select type to be softer than existing. Otherwise, match existing.

2.5 ACCESSORIES

- A. Cleaning Agent: Soapless, non-acidic, detergent, specially prepared for cleaning brick masonry.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

3.5 JOINT TOOLING

- A. Tool repointed and replaced masonry joints when mortar becomes slightly hardened.
- B. Produce smooth, compacted, 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.

- - E N D - -

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

04 01 00-5
Maintenance of Masonry

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

SECTION 04 05 13
MASONRY MORTARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Masonry mortar installed by other masonry sections.

1.2 RELATED REQUIREMENTS

A. Mortar used in Section:

1. Section 04 01 00, MAINTENANCE OF MASONRY.

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. Samples: Provide for approval of color and texture minimum (3) samples of mortar to be use for each location of new building construction and for each location where a window opening is to be infilled with face brick.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

- D. Test Reports: Certify each product complies with specifications.
 - 1. Mortar.
 - 2. Admixtures.
- E. 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.
- F. 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.
 - 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

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: 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 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

2.2 PRODUCTS - GENERAL

- A. Provide each product from one manufacturer and from one production run. Mortar shall match existing adjacent mortar unless indicated otherwise on the drawings.

2.3 MIXES

- A. Pointing Mortar for New Work:
1. Proportion by volume; one part white Portland cement, two parts white sand, and 1/5 part hydrated lime.
- 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
 3. Alteration Work Mortar Color: Match existing mortar unless specified otherwise.
- E. Color Admixtures:
1. Proportion as specified by manufacturer.
 2. Match existing mortar unless specified otherwise.

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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

- 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 S Mortar: Use for setting cast stone and engineered reinforced unit masonry work.
- B. Type N Mortar: Use for other masonry work.
- C. 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.

- - E N D - -

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-16

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:

Section 04 20 00, UNIT MASONRY.

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. Test Reports: Certify each product complies with specifications.

1. Grout, each type.
2. Cement.
3. Aggregate.

D. Certificates: Certify each product complies with specifications.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

04 05 16-1
Masonry Grouting

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-16

1. Blended hydraulic cement.
2. Portland cement.
3. Grout.
4. Hydrated lime.
5. Aggregate.

1.5 QUALITY ASSURANCE (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, 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: 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. Water: Potable, free of substances that are detrimental to grout, masonry, and metal.

2.2 PRODUCTS - GENERAL

- A. Provide each product from one manufacturer and from one production run

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

02-01-16

2.3 MIXES

- A. Grout: ASTM C476; fine grout and coarse grout.
- 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 - -

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

04 05 16-3
Masonry Grouting

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

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.
- B. Face Brick masonry unit assemblies for exterior walls.

1.2 RELATED REQUIREMENTS

- A. Sealants and Sealant Installation: Section 07 92 00, JOINT SEALANTS.
- B. Color and Texture of Masonry Units: Face brick to match existing adjacent units in all cases.
 - 1. Face Brick Basis of Design: Acme Ochs - Harvard Blend or VA-Approved equivalent.
 - 2. Base course feature Basis of Design: Arriscraft International Model REN 1158, color: White Monotone, texture: Dressed/Sandblasted, nominal size: 12"x24"x4" or VA-Approved equivalent.

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-15a1 - 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. C90-14 - Load-Bearing Concrete Masonry Units.
 - 5. C216-15 - Facing Brick (Solid Masonry Units Made From Clay or Shale).
- D. American Welding Society (AWS):
 - 1. D1.4/D1.4M-11 - Structural Welding Code - Reinforcing Steel.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

04 20 00-1
Unit Masonry

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

- E. Brick Industry Association (BIA):
 - 1. TN 11B-88 - Guide Specifications for Brick Masonry, Part 3.
- F. 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. Concrete masonry units, when exposed in finish work.
 - 3. Anchors and Ties: Each type.
 - 4. Joint Reinforcing: 1200 mm (48 inches) long each type.
- E. Test reports: Certify products comply with specifications.
- F. 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 (For Building Additions As Part of Scope of Work):

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

04 20 00-2
Unit Masonry

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

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 representing range of blended color 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: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE (NOT USED)

2.2 PRODUCTS - GENERAL

- A. Basis of Design: Match existing adjacent masonry units in all cases.
- B. Provide each product from one manufacturer and from one production run.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

04 20 00-3
Unit Masonry

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

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) Modular.

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. Where matches existing adjacent use bullnose concrete masonry units at corners exposed in finished work with 25 mm (1 inch) minimum radius rounded vertical exterior corners (bullnose units).

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 4 mm (0.16 inch)

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

04 20 00-4
Unit Masonry

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

- b. Cross wires 2.6 mm (0.10 inch)
- 9. 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. 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.
- D. 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.

2.5 ACCESSORIES

A. Weeps:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

04 20 00-5
Unit Masonry

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

1. Weep Hole: Flexible PVC louvered configuration with rectangular closure strip at top.
- B. Cavity Drain Material: Open mesh polyester sheets or strips to prevent mortar droppings from clogging the cavity.
- C. 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.
- D. 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.
- E. 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.
- F. 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.
- G. 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 and approved submittal drawings
 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

04 20 00-6
Unit Masonry

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

- 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. Lintels:
1. Lintels are not required for openings less than 1000 mm (40 inches) wide that have hollow metal frames.
 2. Openings 1025 mm (41 inches) wide 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. Use steel lintels, for openings greater than 1600 mm (63 inches) wide, brick masonry openings, and elevator openings unless shown otherwise.
 4. Lintel Bearing Length: Minimum 100 mm (4 inches) at both ends.
 5. Build masonry openings or arches over wood or metal centering and supports when steel lintels are not used.
- F. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

04 20 00-7
Unit Masonry

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

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. Use minimum 100 mm (4 inches) nominal thick masonry for free standing furring, unless indicated otherwise.
- G. Before connecting new masonry with previously laid masonry, remove loosened masonry or mortar, and clean and wet work in place as specified under wetting.
- H. Wetting and Wetting Test:
 1. Test and wet brick and clay tile according to BIA TN 11B.
 2. Do not wet concrete masonry units or glazed structural facing tile before laying.
- I. Temporary Formwork: Provide formwork and shores as required for temporary support of reinforced masonry elements.
- J. 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.
- K. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other reasonable temporary construction loads.
- L. 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. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

04 20 00-8
Unit Masonry

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

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.

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.

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

04 20 00-9
Unit Masonry

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

3. (NOT USED)
4. 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 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 where indicated in drawings.
 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 - BUILDING EXPANSION AND SEISMIC JOINTS

- A. Keep expansion and seismic joints open and free of mortar. Remove mortar and other debris.
- B. Install non-combustible, compressible type joint filler to fill space completely except where sealant is shown on joints in exposed finish work.
- C. Fill opening in exposed face of expansion and seismic joints with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.6 INSTALLATION - ISOLATION JOINT (NOT USED)

3.7 INSTALLATION - BRICKWORK

- A. Lay clay brick according to BIA TN 11B.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

04 20 00-10
Unit Masonry

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

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.

E. Solid Exterior Walls:

1. Build with 100 mm (4 inches) of nominal thick facing brick, backed up with concrete masonry units 100 mm (4 inches) nominal thick face brick .

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

04 20 00-11
Unit Masonry

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

2. Construct solid brick jambs minimum 20 mm (0.81 inches) wide at exterior wall openings and at recesses, except where exposed concrete unit backup is shown.
3. Do not install full bonding headers.

F. Cavity Walls:

1. Keep air space clean of mortar accumulations and debris.
2. Lay the interior wythe of the masonry wall full height where dampproofing and/or air barrier is required on cavity face. Coordinate to install dampproofing and/or air barrier 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.

3.8 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:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

04 20 00-12
Unit Masonry

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

04 20 00-13
Unit Masonry

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

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.

3.9 INSTALLATION - GLAZED STRUCTURAL FACING TILE (NOT USED)

3.10 POINTING (NOT USED)

3.11 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:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

04 20 00-14
Unit Masonry

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

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.

3.12 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

04 20 00-15
Unit Masonry

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

- E. 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.
- F. 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.
- G. Anchoring: Anchor reinforced masonry work to supporting structure as indicated on drawings.
- H. Anchor reinforced masonry walls at intersections with non-reinforced masonry.

3.13 INSTALLATION OF REINFORCED BRICK MASONRY (NOT USED)

3.14 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

04 20 00-16
Unit Masonry

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

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:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

04 20 00-17
Unit Masonry

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

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.

3.15 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 prepared opening dimensions:
 1. Accurate to minus 0 mm (0 inch).
 2. Plus 6 mm (1/4 inch).

3.16 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

04 20 00-18
Unit Masonry

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades- Tier 2

Bancroft Architects + Engineers

08-01-17

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.

3.17 FIELD QUALITY CONTROL (NOT USED)

- - E N D - -

DIVISION 05

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. ~~Roof Decks Framing: Section 03 51 16, GYPSUM CONCRETE ROOF DECKS.~~
- C. ~~Floor Decks Framing: Section 03 55 11, GYPSUM CONCRETE FLOOR DECKS.~~
- D. ~~Steel Joist: Section 05 21 00, STEEL JOIST FRAMING.~~
- E. Steel Decking: Section 05 31 00, STEEL DECKING.
- F. Fireproofing: Section 07 81 00, APPLIED FIREPROOFING.
- G. Steel Framing: Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS
- H. ~~Steel Finishes: Section 09 06 00, SCHEDULE FOR FINISHES.~~
- I. ~~Steel Support: Section 10 13 00, DIRECTORIES.~~
- J. Painting: Section 09 91 00, PAINTING.
- K. ~~Steel Piles: Section 31 62 00, DRIVEN PILES.~~

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

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. A242/A242M-13 - High-Strength Low-Alloy Structural Steel.
6. A283/A283M-13 - Low and Intermediate Tensile Strength Carbon Steel Plates.
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. A501/A501M-14 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing and Rounds and Shapes.
10. A572/A572M-15 - High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
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.

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

05 12 00 - 2

1/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

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. Delegated Design Drawings and Calculations: Signed and sealed by responsible Architect/Engineer.

1. Connection calculations.

H. 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

- 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: FAR clause 52.246-21, "Warranty of Construction."

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 project is located.
- B. Design structural steel framing connections complying with specified performance:
 - 1. Load Capacity: Resist loads indicated on drawings. Account for connection and member loads and eccentricities.
 - a. Request additional design criteria when necessary to complete connection design.
 - 2. Configuration: Design and detail all connections for each member size, steel grade and connection type to resist the loads and reactions indicated on the drawings or specified herein. Use details consistent with details shown on drawings, supplementing where necessary. The details shown on drawings are conceptual and do not indicate the required weld sizes or number of bolts unless specifically noted. Use rational engineering design and standard practice in detailing, accounting for all loads and eccentricities in both the connection and the members. Promptly notify the

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

Contracting Officer Representative of any location where the connection design criteria is not clearly indicated. The design of all connections is subject to the review and acceptance of the Contracting Officer's Representative. Submit structural calculations prepared and sealed by a qualified engineer registered in the state where the project is located. Submit calculations for review before preparation of detail drawings.

~~C. Design cooling tower supports meeting specified performance:~~

- ~~1. Coordinate design criteria with cooling tower specified in Section 23 65 00, COOLING TOWERS.~~
- ~~2. Design Loads: Support operating cooling tower maximum dead load and minimum dead load when combined with lateral loads. Resist wind, snow, loads indicated on drawings and supplied by Cooling Tower manufacturer.~~
- ~~3. Configuration: Design framing member sizes, dimensions, and locations to suit cooling tower load, size, and configuration. Submit detailed drawings and design calculations, prepared by a registered Professional Engineer, for approval before members are fabricated.~~

2.2 MATERIALS

A. W-Shapes:

1. ASTM A992/A992M.
2. ASTM A572/A572M; Grade 50 .
3. ASTM A529; Grade 50 .

B. S -Shapes:

1. ASTM A36/A36M.
2. ASTM A572/A572M; Grade 50.
3. ASTM A529; Grade 50.

C. Channel and Angles:

1. ASTM A36/A36M.
2. ASTM A572/A572M; Grade 50.
3. ASTM A529; Grade 50.

D. Plates and Bars:

1. ASTM A36/A36M.
2. ASTM A572/A572M; Grade 50.

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

1/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

- 3. ASTM A529; Grade 50.
- E. Hollow Structural Sections:
 - 1. ASTM A500/A500M.
 - 2. ASTM A501/A501M.
- F. Structural Pipe: ASTM A53/A53M, Grade B.
- G. Bolts, Nuts and Washers: Galvanized for galvanized 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.
- H. 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 bolt tension minimum 70 percent of their minimum tensile strength. Tightening done with properly calibrated wrenches, by turn-of-nut method or by use of direct tension indicators (bolts or washers). Tighten bolts in connections identified as slip-critical using Direct Tension Indicators. Twist-off torque bolts are not an acceptable alternate fastener for slip critical connections.

11-01-18

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

11-01-18

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.

- - E N D - -

SECTION 05 31 00
STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single pan fluted metal form deck supporting concrete fill as roof substrate.
2. Corrugated metal form deck supporting concrete fill as roof substrate.
3. Single pan fluted metal roof deck as roof substrate.
4. Acoustic metal roof deck as roof substrate.

1.2 RELATED WORK

- A. Section 01 81 13. SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Section 05 21 00, STRUCTURAL STEEL FRAMING: Structural Steel Shapes.
- C. Section 09 06 00, SCHEDULE FOR FINISHES: Color.
- D. Section 09 91 00, PAINTING: Finish Painting.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. AISI - American Iron and Steel Institute.
S100-16.....Specification for the Design of Cold-formed
Steel Structural Members.
- C. American Welding Society (AWS):
D1.1/D1.1M-20.....Structural Welding Code - Steel.
1.3/D1.3M-18..... Structural Welding Code - Sheet Steel.
- D. ASTM International (ASTM):
A36/A36M-19.....Standard Specification for Carbon Structural
Steel.
A653/A653M-20.....Standard Specification for Steel Sheet,
Zinc-Coated (Galvanized) or Zinc-Iron
Alloy-Coated (Galvannealed) by the Hot-Dip
Process.
A1008/A1008M-20.....Standard Specification for Steel, Sheet,
Cold-Rolled, Carbon, Structural, High-Strength
Low-Alloy, High-Strength Low-Alloy with

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

Improved Formability, Solution Hardened, and
Baked Hardenable.

C423-17.....Standard Test Method for Sound Absorption and
Sound Absorption Coefficients by the
Reverberation Room Method.

E119-20.....Standard Test Methods for Fire Tests of
Building Construction and Materials.

E. FM Global (FM):

1-28-15.....Wind Design.
Factory Mutual Research Approval Guide.

F. Master Painters Institute (MPI):

No. 18.....Primer, Zinc Rich, Organic.

G. Military Specifications (Mil. Spec.):

MIL-P-21035B..... Paint, High Zinc Dust Content, Galvanizing
Repair.

H. Steel Deck Institute (SDI):

No. 31-07.....Design Manual for Composite Deck, Form Decks,
and Roof Decks.

I. UL LLC (UL):

Listed Online Certifications Directory.
580.....Tests for Uplift Resistance of Roof Assemblies.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA,
AND SAMPLES. All items indicated below are required submittals
requiring Contracting Officer's Representative (COR) review and
approval.

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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: 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.
Contract No. 36C26319D0044
Station Project No. 473-210
Bancroft-AE Project No. 22-113

1/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

1. Wind Uplift Resistance and Corner Conditions:
 - a. Eave Overhang: 2.1 kPa (45 per square foot), minimum.
 - b. Other Roof Areas: 1.4 kPa (30 per square foot), minimum.
2. Wind Uplift Resistance and Corner Conditions: UL 580, Class 90 or higher UL Class required by wind loading in the location of the project.
3. Wind Uplift Resistance and Corner Conditions: FM 1-28; Class 1-90 or higher UL Class required by wind loading in the location of the project.
4. Fire Resistance: ASTM E119; as component of 1 hour rated roof assembly.
5. Noise Reduction Coefficient (NRC): Minimum 0.90 when tested according to ASTM C423.
6. Design side and end closures and attachment to supporting steel to safely support wet weight of concrete and construction loads.
7. Cantilever Closure Deflection: 3 mm (1/8 inch), maximum.

2.2 MATERIALS

- A. Galvanized Steel Sheet: ASTM A653/A653M; G90 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.
- E. Acoustic Deck: Cellular deck profile, SDI Publication No. 31.
- F. Acoustic Insulation: Manufacturer's standard mineral fiber type, profile matching deck flute profile.

2.3 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Sustainable Construction Requirements:

Contract No. 36C26319D0044
Station Project No. 473-210
Bancroft-AE Project No. 22-113

1/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

1. Steel Recycled Content: 30 percent total recycled content, minimum.

2.4 METAL ROOF DECK

- A. Metal Roof Deck: UL Listed as metal roof deck panels.
 1. Steel decking of the type, depth, thickness, and section properties as shown.
- B. Metal Form Deck - Type 1: Single pan fluted units as permanent form for reinforced concrete slabs.
 1. Depth and Thickness: As indicated on drawings.
 2. Material: Galvanized sheet steel.
- C. Metal Form Deck - Type 2: Corrugated deck units as permanent form for reinforced concrete slabs.
 1. Depth and Thickness: As indicated on drawings.
 2. Material: Galvanized sheet steel.
- D. 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.
 - b. Intermediate Rib (Type F) deck.
 - c. Narrow Rib (Type A) deck.
 - d. Deep Rib (Type N) deck.
 2. Depth and Thickness: As indicated on drawings.
 3. Material: Galvanized sheet steel.
- E. Acoustic Metal Roof Deck Units: Single-pan fluted units with perforated vertical webs.
 1. Depth and Thickness: As indicated on drawings.
 2. Material: Galvanized sheet steel.
 3. Provide acoustical insulation to fill roof deck flutes.
- F. 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.
- G. Include integral system for steel decking units used for interstitial levels.

Contract No. 36C26319D0044
Station Project No. 473-210
Bancroft-AE Project No. 22-113

1/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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.

Contract No. 36C26319D0044
Station Project No. 473-210
Bancroft-AE Project No. 22-113

1/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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 contaminates 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.

Contract No. 36C26319D0044
Station Project No. 473-210
Bancroft-AE Project No. 22-113

1/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

D. Fluted Form Deck Fastening:

1. Fasten form deck 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 with minimum two welds per unit at each support.
 - c. Where two units abut, fasten each unit individually to supporting steel framework.
2. End Closure Fastening: Tack weld or self-tapping No. 8 or larger machine screws at 900 mm (3 feet) on center.
 - a. Longitudinal End Closure Fastening: Tack weld only.
3. Weld side laps of adjacent decking units.
 - a. Fastener Locations: Mid-span and maximum 900 mm (3 feet) on center.

E. Corrugated Form Deck Fastening:

1. Weld end laps of corrugated form deck units in valley of side lap and at middle of sheet.
 - a. Weld Spacing: Maximum 380 mm (15 inches) on center.
2. Weld corrugated deck to intermediate supports in X-pattern. Weld in valley of side laps on every other support and in valley of center corrugation on remaining support.
 - a. Weld Spacing: Maximum 760 mm (30 inches) on center.

F. 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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 for specified performance.

G. Cutting and Fitting:

- 1. Field cut steel decking to accommodate columns and other penetrating items.
- 2. Cut openings located and dimensioned on Structural Drawings.
- 3. Coordinate openings for other penetrations shown on approved submittal drawings but not shown on Structural Drawings.
 - a. Cut and reinforce required opening.
- 4. Make cuts neat and trim using metal saw, drill or punch-out device. Cutting with torches is prohibited.
- 5. 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.
- 6. Opening Reinforcement: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work.

H. Touch up damaged factory finishes.

- 1. Apply galvanizing repair paint to damaged galvanized surfaces.

Contract No. 36C26319D0044

Station Project No. 473-210

Bancroft-AE Project No. 22-113

1/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

2. Apply touch up paint to damaged shop painted surfaces.

- - E N D - -

DIVISION 06

Fargo VA Health Care System
Fargo, ND 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies wood blocking, plywood backboards and rough hardware.

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. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

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-15.....National Design Specification for Wood Construction
 - WCD1-01.....Details for Conventional Wood Frame Construction
- C. American Institute of Timber Construction (AITC):
 - A190.1-07.....Structural Glued Laminated Timber
- D. American Society of Mechanical Engineers (ASME):
 - B18.2.1-12 (R2013).....Square and Hex Bolts and Screws
 - B18.2.2-10.....Square and Hex Nuts
 - B18.6.1-81 (R2008).....Wood Screws

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

E. American Plywood Association (APA):

E30-11.....Engineered Wood Construction Guide

F. ASTM International (ASTM):

A653/A653M-13.....Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process

C954-11.....Steel 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

C1002-14.....Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Metal Studs

D198-14.....Test Methods of Static Tests of Lumber in Structural Sizes

D2344/D2344M-13.....Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates

D2559-12a.....Adhesives 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

D6108-13.....Test Method for Compressive Properties of Plastic Lumber and Shapes

D6109-13.....Test Methods for Flexural Properties of Unreinforced and Reinforced Plastic Lumber and Related Products

D6111-13a.....Test Method for Bulk Density and Specific Gravity of Plastic Lumber and Shapes by Displacement

D6112-13.....Test 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

F1667-13.....Nails, Spikes, and Staples

G. American Wood Protection Association (AWPA):

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

AWPA Book of Standards

H. Commercial Item Description (CID):

A-A-55615.....Shield, 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-19140E.....Lumber 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-85.....Metal Plate Connected Wood Trusses

M. U.S. Department of Commerce Product Standard (PS)

PS 1-95.....Construction and Industrial Plywood

PS 20-10.....American Softwood Lumber Standard

N. ICC Evaluation Service (ICC ES):

AC09.....Quality Control of Wood Shakes and Shingles

AC174.....Deck 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. Lumber Other Than Structural:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

1. Unless otherwise specified, species graded under the grading rules of an inspection agency approved by Board of Review, American Lumber Standards Committee.

1. 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.

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

2.2 PLASTIC LUMBER: (NOT USED)

2.3 PLYWOOD:

- A. Comply with PS 1.
- B. All plywood shall be fire retardant.
- C. 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.
- D. Wall backboards:
 - 1. Minimum thickness as shown on drawings.

2.4 STRUCTURAL-USE PANELS: (NOT USED)

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

- 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 WCD1 for nailing and framing unless specified otherwise.
 - 2. APA for installation of plywood panels.
- 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.
 - 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

06 10 00 - 7
Rough Carpentry

Fargo VA Health Care System
Fargo, ND 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

- 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.
- C. Set sills or plates level in full bed of mortar on masonry or concrete walls.
 - 1. Space anchor bolts 1219 mm (4 feet) on centers between ends and within 152 mm (6 inches) of end. Stagger bolts from side to side on plates over 178 mm (7 inches) in width.
 - 2. Provide shims of slate, tile or similar approved material to level wood members resting on concrete or masonry. Do not use wood shims or wedges.
 - 3. Closely fit, and set to required lines.
- D. Cut notch, or bore in accordance with AFPA WCD1 passage of ducts wires, bolts, pipes, conduits and to accommodate other work. Repair or replace miscut, misfit or damaged work.
- 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.

- - - E N D - - -

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

06 10 00 - 8
Rough Carpentry

DIVISION 07

SECTION 07 01 50.19
PREPARATION FOR RE-ROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Partial roof removal for new roof system installation.
 - 2. Existing roofing membrane preparation for new roofing membrane installation.
- B. Existing Roofing System: EPDM. Basis of Design system components include:
 - 1. Roofing membrane.
 - 2. Cover board.
 - 3. Roof insulation.
 - 4. Vapor retarder.
 - 5. Substrate board.

1.2 RELATED WORK

- A. Section 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING: New Roofing System.
- B. Section 07 60 00, FLASHING AND SHEET METAL: Sheet Metal Counterflashing.

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):
 - FX-1 (R2016).....Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
- C. American Society for Nondestructive Testing (ASNT):
 - SNT-TC-1A (2019).....Personnel Qualification and Certification for Nondestructive Testing.
- D. ASTM International (ASTM):
 - C208-12(2017)e2.....Cellulosic Fiber Insulating Board.
 - C578-19.....Rigid, Cellular Polystyrene Thermal Insulation.
 - C728-17a.....Perlite Thermal Insulation Board.
 - C1177/C1177M-17.....Glass Mat Gypsum Substrate for Use as Sheathing.

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades
Bancroft Architects + Engineers

01-01-21

C1153-10(2015).....Location of Wet Insulation in Roofing Systems
Using Infrared Imaging.

C1278/C1278M-17.....Standard Specification Fiber-Reinforced Gypsum
Panel.

D4263-83(2018).....Indicating Moisture in Concrete by the Plastic
Sheet Method.

E. U.S. Department of Commerce National Institute of Standards and
Technology (NIST):

DOC PS 1-19.....Structural Plywood.

DOC PS 2-18.....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. Manufacturer's field representative.
- e. 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.
- i. Other items affecting successful completion.

3. Document and distribute meeting minutes to participants to record
decisions affecting installation.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

07 01 50.19-2
Preparation For Reroofing

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades
Bancroft Architects + Engineers

01-01-21

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. Temporary roofing installation instructions and removal instructions.
 - 4. Preparation instructions to receive new roofing.
 - 5. 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.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Same installer as Section 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING .
 - 2. Licensed to perform asbestos abatement in Project jurisdiction when removal of asbestos-containing material is required.

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 roof above occupied areas.
 - 2. Provide notice minimum 14 days unless otherwise directed by the COR before beginning activities affecting normal building operations.
 - 3. Examine available information before beginning work of this section.
- B. 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 (EPDM) ROOFING .
 - 1. Remove only as much roofing in one day as can be made watertight in same day.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades
Bancroft Architects + Engineers

01-01-21

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. Metal Flashing: See Section 07 60 00, FLASHING AND SHEET METAL.
- C. Temporary Protection Materials:
 - 1. Expanded Polystyrene (EPS) Insulation: ASTM C578-19.
- D. Temporary Roofing System Materials.
- E. Insulation: See Section 07 22 00, ROOF AND DECK INSULATION.
- F. Fasteners: Type and size required by roof membrane manufacturer to resist wind uplift.
- G. Caulking: See Section 07 92 00, JOINT SEALANTS.

PART 3 - EXECUTION

3.1 EXAMINATION (NOT USED)

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. Coordinate use of rooftop fresh air intakes with Contracting Officer's Representative to minimize effect on indoor air quality.
- F. Ensure temporary protection materials are available for immediate use in case of unexpected rain.
- G. Ensure roof drainage remains functional.
 - 1. Keep drainage systems clear of debris.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

2. Prevent water from entering building.

H. Coordinate rooftop utilities remaining active during roofing work with Contacting Officer's Representative.

3.3 RE-ROOFING PREPARATION - GENERAL

A. Notify Contacting 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 aggregate ballast.

1. Store aggregate ballast for reuse.

B. Remove loose aggregate from membrane surface.

C. Remove pavers and paver support.

1. Store undamaged pavers and paver supports for reuse.

2. Dispose of damaged pavers.

3.5 COMPLETE ROOFING SYSTEM REMOVAL (NOT USED)

3.6 PARTIAL ROOFING SYSTEM REMOVAL (NOT USED)

3.7 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 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.

3.8 DECK PREPARATION

A. Inspect structural roof deck after roofing system removal.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

07 01 50.19-5

Preparation For Reroofing

B. Concrete Roof Decks:

1. Visually confirm concrete roof deck is dry.
2. Perform moisture test according to ASTM D4263-83(2018) 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.

3.9 SECURE ROOF DECK WITH ADDITIONAL FASTENINGS AS REQUIRED TO MEET STRUCTURAL AND CODE REQUIREMENTS. ROOFING SEQUENCING

- A. Roof work shall be limited to the work that can be performed in a single work shift to provide a continuous water-tight system. The contractor shall keep sufficient materials available on the project site to cover work in progress in the event of an unanticipated rain event.

3.10 EXISTING MEMBRANE PREPARATION FOR NEW ROOFING

- A. Remove existing roofing surface projections and irregularities. Produce smooth surface to receive recover boards.
1. Broom clean existing surface.

3.11 BASE FLASHING REMOVAL

- A. Remove existing base flashings.
1. Clean substrates to receive new flashings.

3.12 RECOVER BOARD INSTALLATION (NOT USED)

3.13 FIELD QUALITY CONTROL

- A. Refer to Section 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING.

3.14 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 21 13
THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical insulation.
 - a. Batt and blanket insulation at interior framed partitions and ceilings.

1.2 RELATED WORK

- A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Adhesives VOC Limits.
- B. Section 07 84 00, FIRESTOPPING: Safing Insulation.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 - C516-19.....Vermiculite Loose Fill Thermal Insulation.
 - C549-18.....Perlite Loose Fill Insulation.
 - C552-17e1 Cellular Glass Thermal Insulation.
 - C553-13(2019).....Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - C578-19.....Rigid, Cellular Polystyrene Thermal Insulation.
 - C591-20.....Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
 - C612-14(2019).....Mineral Fiber Block and Board Thermal Insulation.
 - C665-17.....Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - C728-17a.....Perlite Thermal Insulation Board.
 - C954-18.....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.
 - C1002-18.....Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

D312/D312M-16a.....Asphalt Used in Roofing.

E84-20.....Surface Burning Characteristics of Building
Materials.

F1667-18a.....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: 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.

1.7 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 INSULATION - GENERAL

- A. Insulation Types:
 - 1. Provide one insulation type for each application.

- B. Sustainable Construction Requirements:

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

1. Insulation Recycled Content:
 - a. 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 (NOT USED)

2.3 ACOUSTICAL INSULATION

- A. Semi Rigid, Batts and Blankets:
 1. Widths and lengths to fit tight against framing.
 2. Mineral Fiber boards: ASTM C553, Type II, flexible, or Type III, semi rigid unfaced.
 - a. Density: nominal 4.5 pound.
 3. Mineral Fiber Batt or Blankets: ASTM C665 unfaced.
 4. Maximum Surface Burning Characteristics: ASTM E84.
 - a. Flame Spread Rating: 25.
 - b. Smoke Developed Rating: 450.

2.4 ACCESSORIES

- A. Insulation Adhesive: Nonflammable type recommended by insulation manufacturer to suit application.
- B. Tape: 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- C. 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.
- D. Fit insulation tight against adjoining construction and penetrations, unless indicated otherwise.

3.3 THERMAL INSULATION (NOT USED)

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. 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 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

3.6 PROTECTION

- A. Protect insulation from construction operations.
- B. Repair damage.

- - E N D - -

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

07 21 13 - 5
Thermal Insulation

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

SECTION 07 22 00
ROOF AND DECK INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
- B. Roof and deck insulation, vapor retarder, and cover board on existing substrates ready to receive roofing or waterproofing membrane.
- C. Repairs and alteration work to existing roof insulation.

1.2 RELATED WORK

- A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Non-Flooring Adhesives and Sealants VOC Limits.
- B. Section 06 10 00, ROUGH CARPENTRY: Wood Cants, Blocking, and Edge Strips.
- C. Section 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American Society of Civil Engineers
ASCE 7-16.....Minimum Design Loads and Associated Criteria
for Buildings and Other Structures
- C. American Society of Heating, Refrigeration and Air Conditioning
(ASHRAE):
Standard 90.1-13.....Energy Standard for Buildings Except Low-Rise
Residential Buildings.
- D. ASTM International (ASTM):
C208-12(2017)e2.....Cellulosic Fiber Insulating Board.
C552-17e1.....Cellular Glass Thermal Insulation.
C726-17.....Mineral Fiber Roof Insulation Board.
C728-17a.....Perlite Thermal Insulation Board.
C1177/C1177M-17.....Glass Mat Gypsum Substrate for Use as
Sheathing.
C1278/C1278M-17.....Fiber-Reinforced Gypsum Panel.
C1289-19.....Faced Rigid Cellular Polyisocyanurate Thermal
Insulation Board.
C1396/C1396M-17.....Gypsum Board.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113
01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- D41/D41M-11 (2016).....Asphalt Primer Used in Roofing, Dampproofing,
and Waterproofing.
- D312/D312M-16a.....Asphalt Used in Roofing.
- D1970/D1970M-20.....Self-Adhering Polymer Modified Bituminous Sheet
Materials Used as Steep Roofing Underlayment
for Ice Dam Protection.
- D2178/D2178M-15a.....Asphalt Glass Felt Used in Roofing and
Waterproofing.
- D2822/D2822M-05(2011)e1.Asphalt Roof Cement, Asbestos Containing.
- D4586/D4586M-07(2018)...Asphalt Roof Cement, Asbestos-Free.
- E84-20.....Surface Burning Characteristics of Building
Materials.
- F1667-18a.....Driven Fasteners: Nails, Spikes, and Staples.
- E. National Roofing Contractors Association (NRCA):
Manual-15.....The NRCA Roofing Manual: Membrane Roof Systems-
2019.
- F. UL LLC (UL):
Listed Online Certifications Directory.
- G. U.S. Department of Agriculture (USDA):
USDA BioPreferred Program Catalog.
- H. U.S. Department of Commerce National Institute of Standards and
Technology (NIST):
DOC PS 1-19.....Structural Plywood.
DOC PS 2-18.....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:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113
01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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: Install products when existing and forecasted weather permit installation according to manufacturer's instructions.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113
01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

1.9 WARRANTY

- A. Construction 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. not used
- B. Insulation Thermal Performance:
 - 1. Overall Average R-Value: RSI-57 (R-33), minimum.
 - 2. Any Location R-Value: RSI-17 (R-10), minimum.
- C. Fire and Wind Uplift Resistance: Provide roof insulation complying with requirements specified in Division 07 roofing section.

2.2 PRODUCTS - GENERAL

- A. Provide each product from one manufacturer.
- B. Sustainable Construction Requirements:
 - 1. Insulation Recycled Content:
 - a. Mineral Fiber: 75 percent total recycled content, minimum.
 - b. Fiberglass: 20 percent total recycled content, minimum.
 - c. Cellulose: 75 percent post-consumer recycled content, minimum.
 - d. Perlite Composite Board: 23 percent post-consumer recycled content, minimum.
 - e. Rigid Foam: 9 percent total recycled content, minimum.
 - f. 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113
01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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. 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.

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 mineral fiberboard, polyisocyanurate, perlite board, or cellular glass. 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).

2.5 INSULATION ACCESSORIES

- A. Glass (Felt): ASTM D2178/D2178M, Type VI, heavy duty ply sheet.
- B. Cants and Tapered Edge Strips:
 - 1. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113
01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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. Cover Board:

1. Glass-Mat, Water-Resistant Gypsum Roof Board: ASTM C1177/C1177M, 1/2 inch thick, factory primed.

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 (NOT USED)

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113
01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

3. Seal penetrations through vapor retarder with roof cement to prevent moisture entry from below.

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. 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:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113
01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

1. Mechanically Fastened and Adhered Insulation:

- a. Fasten first layer of insulation according to "Mechanically Fastened Insulation" requirements.
- b. Fasten each subsequent layer of insulation according to "Adhered Insulation" requirements.

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 "Mechanically Fastened Insulation" requirements.

- - E N D - -

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113
01/16/2024

07 22 00 - 8
Roof and Deck Insulation

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 mechanically fastened to insulated metal roof deck or other existing roof substrate. Repairs and/or replacement of existing EPDM roofing due to construction activity
2. Fire rated roof system.

1.2 RELATED WORK

- A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Non-Flooring Adhesives and Sealants VOC Limits.
- B. Section 07 01 50.19, PREPARATION FOR REROOFING: Preparation of Existing Membrane Roofs and Repair Areas.
- C. Section 07 22 00, ROOF AND DECK INSULATION: Substrate Board, Vapor Retarder, Roof Insulation, and Cover Board.

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):
FX-1-16.....Standard Field Test Procedure for Determining
the Withdrawal Resistance of Roofing Fasteners.
RP-4 2019.....Wind Design Standard for Ballasted Single-ply
Roofing Systems.
- C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):
7-16.....Minimum Design Loads For Buildings and Other
Structures.
- D. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):
90.1-13.....Energy Standard for Buildings Except Low-Rise
Residential Buildings.
- E. ASTM International (ASTM):
A276/A276M-17.....Stainless Steel Bars and Shapes.
B209-14.....Aluminum and Aluminum-Alloy Sheet and Plate.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

B209M-14.....Aluminum and Aluminum-Alloy Sheet and Plate
(Metric).
C67-20.....Sampling and Testing Brick and Structural Clay
Tile.
C140/C140M-20a.....Sampling and Testing Concrete Masonry Units and
Related Units.
C936/C936M-20.....Solid Concrete Interlocking Paving Units.
C1371-15.....Determination of Emittance of Materials Near
Room Temperature Using Portable Emissometers.
C1549-16.....Determination of Solar Reflectance Near Ambient
Temperature Using a Portable Solar
Reflectometer.
D751-19.....Standard Test Methods for Coated Fabrics.
D1248-16.....Polyethylene Plastics Extrusion Materials for
Wire and Cable.
D1876-08(2015)e1.....Peel Resistance of Adhesives (T-Peel Test).
D2103-15.....Polyethylene Film and Sheeting.
D2240-15e1.....Rubber Property-Durometer Hardness.
D3884-09(2017).....Abrasion Resistance of Textile Fabrics (Rotary
Platform, Double-Head Method).
D4263-83(2018).....Indicating Moisture in Concrete by the Plastic
Sheet Method.
D4586/D4586M-07(2018)...Asphalt Roof Cement, Asbestos-Free.
D4637/D4637M-15.....EPDM Sheet Used In Single-Ply Roof Membrane.
E96/E96M-16.....Water Vapor Transmission of Materials.
E408-13(2019).....Total Normal Emittance of Surfaces Using
Inspection-Meter Techniques.
E1918-16.....Measuring Solar Reflectance of Horizontal and
Low-Sloped Surfaces in the Field.
E1980-11(2019).....Measuring Solar Reflectance of Horizontal and
Low-Sloped Surfaces in the Field.
G21-15.....Resistance of Synthetic Polymeric Materials to
Fungi.

F. Cool Roof Rating Council (CRRC):

1-20.....Product Rating Program.

G. Federal Specifications (Fed. Spec.):

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

07 53 23 - 2

Ethylene-Propylene-Diene-Monomer Roofing

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- UU-B-790A.....Building Paper, Vegetable Fiber: (Kraft,
Waterproofed, Water Repellent and Fire
Resistant).
- H. Florida Department of Business and Professional Regulation (FL):
Approved Product Approval.
- I. National Roofing Contractors Association (NRCA):
Manual-19.....The NRCA Roofing Manual: Membrane Roof Systems.
- J. U.S. Department of Agriculture (USDA): USDA BioPreferred Catalog.
- K. UL LLC (UL):
580-06..... Tests for Uplift Resistance of Roof
Assemblies.
1897-20.....Uplift Tests for Roof Covering Systems.
- L. U.S. Department of Commerce National Institute of Standards and
Technology (NIST):
DOC PS 1-19.....Structural Plywood.
DOC PS 2-18.....Performance Standard for Wood-Based
Structural-Use Panels.
- M. U.S. Environmental Protection Agency (EPA):
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. Inspection and Testing Agency.
 - c. Contractor.
 - d. Installer.
 - e. Manufacturer's field representative.
 - f. Other installers responsible for adjacent and intersecting work,
including roof deck, flashings, roof specialties, roof
accessories, utility penetrations, rooftop curbs and equipment.
2. Meeting Agenda: Distribute agenda to participants minimum 3 days
before meeting.
- a. Installation schedule.
 - b. Installation sequence.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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 fastener pattern and spacing.
 - 3. Roofing membrane seaming and joint details.
 - 4. Roof membrane penetration details.
 - 5. Base flashing and termination 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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. High wind zone design requirements.
 3. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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."
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: Mechanically fastened roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, copings, edge metal and walkway pads.

2.2 SYSTEM PERFORMANCE

- A. Design roofing system meeting specified performance:
1. Load Resistance: ASCE/SEI 7; Design criteria
2. Energy Performance:
a. EPA Energy Star Listed for low-slope roof products.
b. ASTM E1980; Minimum 78 Solar Reflectance Index (SRI).
c. CRRC-1; Minimum 0.70 initial solar reflectance and minimum 0.75 emissivity.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- d. 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.
- 1) Where tested aged values are not available:
- a) Calculate compliance adjusting initial solar reflectance according to ASHRAE 90.1.
- b) Provide roofing system with minimum 64 three-year aged Solar Reflectance Index calculated according to ASTM E1980 with 12 watts/square meter/degree K (2.1 BTU/hour/square foot) convection coefficient.

2.3 PRODUCTS - GENERAL

- A. Provide roof system components from one manufacturer.
- B. 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.
1. Thickness: 1.5 mm (60 mils).
2. Color: Match existing.
- 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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 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 (NOT USED)

2.7 SEPARATION SHEET

- A. Polyethylene Film: ASTM D2103, 0.2 mm (6 mils) thick.
Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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.

2.10 PROTECTION MAT OR SEPARATOR SHEET

- A. Protection Mat:
 1. Water pervious; either woven or non-woven sheet of long chain polymeric filaments or yarns such as polypropylene, black polyethylene, polyester, or polyamide; or, polyvinylidene-chloride formed into a pattern with distinct and measurable openings.
 2. Filter fabric equivalent opening size (EOS): Not finer than the U.S.A. Standard Sieve Number 120 and not coarser than the U.S.A. Standard Sieve Number 100. EOS is defined as the number of the U.S.A. Standard Sieve having openings closest in size to the filter cloth openings.
 3. Edges of fabric selvaged or otherwise finished to prevent raveling.
 4. Abrasion Resistance:
 - a. After being abraded in conformance with ASTM D3884 using rubber-hose abrasive wheels with one kg load per wheel and 1000 revolutions, perform tensile strength test as specified in ASTM D1682, paragraph.
 - b. Result: 25 kg (55 pounds) minimum in any principal direction.
 5. Puncture Strength:
 - a. ASTM D751 tension testing machine with ring clamp; steel ball replaced with an 8 mm (5/16 inch) diameter solid steel cylinder with a hemispherical tip centered within the ring clamp.
 - b. Result: 57 kg (125 pounds) minimum.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

6. Non-degrading under a wet or humid condition within minimum 4 degrees C (40 degrees F) to maximum 66 degrees C (150 degrees F) when exposed to ultraviolet light.
7. Minimum Sheet Width: 2400 mm (8 feet).

2.11 BALLAST (NOT USED)

2.12 ROOF PAVERS (NOT USED)

2.13 ACCESSORIES

- A. 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.

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.
 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

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 1897 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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. Mechanical Fastened System Installation:
- 1. Secure roofing membrane to structural deck with fasteners through battens to achieve specified wind uplift performance.
 - a. Drill pilot holes for fasteners installed into cast-in-place concrete. Drill hole minimum 10 mm (3/8 inch) deeper than fastener penetration.
 - 2. When fasteners are installed within membrane laps, locate battens minimum 13 mm (1/2 inch) from edge of sheets.
 - 3. Apply lap sealant under battens and anchor to deck while lap sealant is still fluid. Cover fastener head with fastener sealer.
 - 4. Where fasteners are installed over roofing membrane after seams are welded, cover fasteners with minimum 200 mm (8 inch) diameter EPDM membrane cap centered over fasteners. Where battens are used cover battens with minimum 200 mm (8 inch) wide EPDM strip cap centered over batten. Splice caps to roofing membrane and finish edges with lap sealant.

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:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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. Installing Building Expansion Joints:
1. Install base flashing on curbs as specified.
 2. Coordinate installation with roof expansion joint system.
 3. Install flexible tubing 1-1/2 times width of joint centered over joint. Cover tubing with flashing sheet adhered to base flashing and lapping base flashing roofing manufacturer's standard dimension. Finish edges of laps with lap sealant.
- E. 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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 BALLAST AND PAVER INSTALLATION (NOT USED)

3.9 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 square meter (2,500 square foot) 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:
 - 1) Repeat tests using different fastener type or use additional fasteners achieve pull out resistance required to meet specified wind uplift performance.
 - 2) 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 meter (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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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.

3.10 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Clean exposed roofing surfaces. Remove contaminants and stains to comply with specified solar reflectance performance.

3.11 PROTECTION

- A. Protect roofing system from 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 directed by Contacting Officer's Representative.
- D. Repair damage.

- - E N D - -

SECTION 07 60 00
FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Formed sheet metal work for wall and roof flashing, roof edge metal and drainage specialties are specified in this section

1.2 RELATED WORK

- A. Section 07 53 23 ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING Membrane base flashings and stripping.
- B. Section 07 92 00, JOINT SEALANTS: Joint Sealants.
- C. Section 09 91 00, PAINTING: Paint materials and application.
- D. Section 22 14 00, FACILITY STORM DRAINAGE: Flashing of Roof Drains.

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-C22A41.....Aluminum Chemically etched medium matte, with clear anodic coating, Class I Architectural, 0.7-mil thick
- AA-C22A42.....Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 0.7 mils thick
- AA-C22A44.....Chemically 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-1-11.....Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems
- D. American Architectural Manufacturers Association (AAMA):

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades
Bancroft Architects + Engineers

01-01-21

AAMA 620-02.....Voluntary Specification for High Performance
Organic Coatings on Coil Coated Architectural
Aluminum

AAMA 621-02.....Voluntary 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-20.....Standard Specification for Chromium and
Chromium-Nickel Stainless Steel Plate, Sheet
and Strip for Pressure Vessels and for General
Applications.

A653/A653M-20.....Steel Sheet Zinc-Coated (Galvanized) or Zinc
Alloy Coated (Galvanized) by the Hot- Dip
Process

B32-08(2014).....Solder Metal

B209-14.....Aluminum and Aluminum-Alloy Sheet and Plate

B370-12(2019).....Copper Sheet and Strip for Building
Construction

D173/D173M-03(2018).....Bitumen-Saturated Cotton Fabrics Used in
Roofing and Waterproofing

D412-16.....Vulcanized Rubber and Thermoplastic Elastomers-
Tension

D1187/D1187M-97(2018)...Asphalt Base Emulsions for Use as Protective
Coatings for Metal

D1784-20.....Rigid Poly (Vinyl Chloride) (PVC) Compounds and
Chlorinated Poly (Vinyl Chloride) (CPVC)
Compounds

D3656/D3656M-13.....Insect Screening and Louver Cloth Woven from
Vinyl-Coated Glass Yarns

D4586/D4586M-07(2018)...Asphalt 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 500-06.....Metal Finishes Manual

H. Federal Specification (Fed. Spec):
Contract No. 36C26319D0044
Station Project No. 437-21-205
Bancroft-AE Project No. 18-121

3/18/22

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades
Bancroft Architects + Engineers

01-01-21

A-A-1925A.....Shield, Expansion; (Nail Anchors)

UU-B-790A.....Building 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. Wind Zone 3: 2.20 to 4.98 kPa (46 to 104 pound force/square foot):
9.96-kPa (208 pound force/square foot) perimeter uplift force,
14.94-kPa (312 pound force/square foot) corner uplift force, and
4.98-kPa (104 pound force/square foot) outward force.

B. Wind Design Standard: Fabricate and install roof-edge flashings
tested per ANSI/SPRI/FM ES-1.

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. Manufacturer's Literature and Data: For all specified items,
including:
 - a. Two-piece counterflashing
 - b. Thru wall flashing

C. 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. Aluminum Sheet: ASTM B209, alloy 3003-H14.

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 pounds/100 square
feet).

C. Bituminous Paint: ASTM D1187, Type I.

D. Fasteners:

Contract No. 36C26319D0044
Station Project No. 437-21-205
Bancroft-AE Project No. 18-121

3/18/22

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades
Bancroft Architects + Engineers

01-01-21

1. Use stainless steel for stainless steel and aluminum alloy. Use galvanized steel or stainless steel for galvanized steel.
2. Nails:
 - a. Minimum diameter for aluminum nails 3 mm (0.105 inch).
 - b. Minimum diameter for stainless steel nails: 2 mm (0.095 inch) and annular threaded.
 - c. 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. Stainless steel: 0.25 mm (0.010 inch) thick.
- C. Exposed Locations:
 1. 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, stainless steel joints, except expansion and contraction joints, shall be locked and soldered.
 2. Jointing of stainless steel over 0.45 mm (0.018 inch) thick shall be done by lapping, riveting and soldering. Jointing of prefinished aluminum over 0.45 mm (0.018 inch) thick shall be done by lapping, riveting and soldering.
 3. (NOT USED)
 4. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-205
Bancroft-AE Project No. 18-121

3/18/22

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades
Bancroft Architects + Engineers

01-01-21

- c. Unsoldered lap joints shall finish not less than 100 mm (4 inches) wide.
- 5. Flat and lap joints shall be made in direction of flow.
- 6. Soldering:
 - a. Pre tin both mating surfaces with solder for a width not less than 38 mm (1 1/2 inches) of stainless steel,. For prefinished aluminum prepare both mating surfaces per manufacturer's recommendations for a width not less than 38 mm (1 1/2 inches).
 - b. (NOT USED)
 - 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 aluminum at intervals not exceeding 5400 mm (18 feet), except do not exceed 3000 mm (10 feet) for gravel stops and fascia-cant systems.
 - 4. Fabricate slip-type or loose locked joints and fill with sealant unless otherwise specified.
 - 5. 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:

Contract No. 36C26319D0044
Station Project No. 437-21-205
Bancroft-AE Project No. 18-121

3/18/22

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades
Bancroft Architects + Engineers

01-01-21

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 0.050 inch thick aluminum.
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 0.0625 inch thick aluminum.

E. Drips:

1. Form drips at lower edge of sheet metal counter-flashings (cap flashings), gravel stops, 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.
2. 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.
3. 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.
4. All metal roof edges shall meet requirements of IBC, current edition.

F. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-205
Bancroft-AE Project No. 18-121

3/18/22

2.5 FINISHES

- A. New materials shall be provided with finishes and profiles to match existing. 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. Aluminum:
 - a. Fluorocarbon Finish: AAMA 620, high performance organic coating. Color to match existing.
 - 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. 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.

2.7 BASE FLASHING

- A. Use metal base flashing at vertical surfaces intersecting built-up roofing without cant strips or where shown.
 - 1. Use stainless steel, thickness specified unless specified otherwise.
 - 2. When flashing is over 250 mm (10 inches) in vertical height or horizontal width use 0.5 mm (0.018 inch) stainless steel.
 - 3. Use stainless steel at aluminum roof curbs where flashing contacts the aluminum.
 - 4. Use 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. Stainless steel, unless specified otherwise.
- B. Fabricate to lap base flashing a minimum of 100 mm (4 inches) with drip:

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades
Bancroft Architects + Engineers

01-01-21

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 cannot 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.

Contract No. 36C26319D0044
Station Project No. 437-21-205
Bancroft-AE Project No. 18-121

3/18/22

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades
Bancroft Architects + Engineers

01-01-21

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) overlap at end. 0.33 mm (0.013 inch) thick stainless.
3. Use stainless steel bolt on draw band tightening assembly.
4. 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.

2.9 GRAVEL STOPS (NOT USED)

2.10 BITUMEN STOPS (NOT USED)

2.11 HANGING GUTTERS (NOT USED)

2.12 CONDUCTORS (DOWNSPOUTS) (NOT USED)

2.13 SPLASHPANS (NOT USED)

2.14 REGLETS

A. Fabricate reglets of one of the following materials:

1. (not used).
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. (not used)

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.

Contract No. 36C26319D0044
Station Project No. 437-21-205
Bancroft-AE Project No. 18-121

3/18/22

- F. Reglets for concrete may be formed to receive flashing and have a 10 mm (3/8 inch), 45 degree snap lock.

2.15 INSULATED EXPANSION JOINT COVERS (NOT USED)

2.16 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 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.

2.17 SCUPPERS (NOT USED)

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.

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades
Bancroft Architects + Engineers

01-01-21

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. 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.
 6. 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.
 7. Coordinate with roofing work for the installation of metal base flashings and other metal items having roof flanges for anchorage and watertight installation.

Contract No. 36C26319D0044
Station Project No. 437-21-205
Bancroft-AE Project No. 18-121

3/18/22

01-01-21

8. Nail continuous cleats on 75 mm (3 inch) on centers in two rows in a staggered position.
9. Nail individual cleats with two nails and bend end tab over nail heads. Lock other end of cleat into hemmed edge.
10. Install flashings in conjunction with other trades so that flashings are inserted in other materials and joined together to provide a water tight installation.
11. 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.
12. Isolate aluminum in contact with dissimilar metals other 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.
13. 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 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.

Contract No. 36C26319D0044
Station Project No. 437-21-205
Bancroft-AE Project No. 18-121

3/18/22

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades
Bancroft Architects + Engineers

01-01-21

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:
 15. Where flashing cannot be inserted in column reglet hold flashing vertical leg against column.
 16. 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).
 17. Verify details show flashing at masonry faced concrete walls and termination of back edge.
 18. Coordinate with waterproofing to define interface with metal flashing at joint.
 19. Show metal flashing to have not less than 200 mm (8 inch) high vertical portion and termination against or in concrete backup or into masonry backup mortar joint.
- 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.

Contract No. 36C26319D0044
Station Project No. 437-21-205
Bancroft-AE Project No. 18-121

3/18/22

01-01-21

- C. 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.
- D. 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.
- E. 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.

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.
- B. 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)_(NOT USED)

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.

Contract No. 36C26319D0044
Station Project No. 437-21-205
Bancroft-AE Project No. 18-121

3/18/22

Fargo VA Health Care System
Fargo, ND 58102
EHRM Infrastructure Upgrades
Bancroft Architects + Engineers

01-01-21

2. Coordinate reglets for masonry to locate horizontally into mortar joints.

3.6 GRAVEL STOPS (NOT USED)

3.7 COPINGS (NOT USED) SEE SECTION 07 71 00

3.8 EXPANSION JOINT COVERS, INSULATED (NOT USED)

3.9 (NOT USED)

3.10 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.

3.11 HANGING GUTTERS (NOT USED)

3.12 CONDUCTORS (DOWNSPOUTS) (NOT USED)

3.13 SPLASH PANS (NOT USED)

3.14 GOOSENECK ROOF VENTILATORS (NOT USED)

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Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

SECTION 07 71 00
ROOF SPECIALTIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies copings and scuppers.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Sustainable Design Requirements.

B. Section 07 21 13, THERMAL INSULATION: General Insulation.

C. Section 07 22 00, ROOF AND DECK INSULATION: Rigid Insulations for Roofing.

D. Section 07 92 00, JOINT SEALANTS: Sealant Material and Installation.

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 to meet the performance criteria of the following wind design data:

1. Basic Wind Speed = 125 MPH (ASCE 7)

2. Roughness Category = B

3. Exposure Category = B

4. Importance Factor = 1

C. Identify materials with FM Approval markings.

D. 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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-20.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - A653/A653M-20.....Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process
 - A666-15.....Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
 - B209-14.....Aluminum and Aluminum Alloy-Sheet and Plate

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- B209M-14.....Aluminum and Aluminum Alloy-Sheet and Plate
(Metric)
- B221-14.....Aluminum-Alloy Extruded Bars, Rods, Wire,
Shapes, and Tubes
- B221M-13.....Aluminum-Alloy Extruded Bars, Rods, Wire,
Shapes, and Tubes (Metric)
- B32-08 (2014).....Solder Metal
- B370-12 (2019).....Copper Sheet and Strip for Building
Construction
- B882-10 (2018).....Pre-Patinated Copper for Architectural
Applications
- C612-14 (2019).....Mineral Fiber Block and Board Thermal
Insulation
- D1187/D1187M-97 (2018)...Asphalt-Base Emulsions for Use as Protective
Coatings for Metal
- D1970/D1970M-20.....Self-Adhering Polymer Modified Bituminous Sheet
Materials Used as Steep Roofing Underlayment
for Ice Dam Protection
- D226/D226M-17.....Asphalt-Saturated Organic Felt Used in Roofing
and Waterproofing
- D4869/D4969M-16a.....Asphalt-Saturated Organic Felt Underlayment
Used In Steep Slope Roofing
- C. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06.....Metal Finishes Manual
- D. American Architectural Manufacturers Association (AAMA):
2605-11.....High Performance Organic Coatings on
Architectural Extrusions and Panels.
611-14.....Anodized Architectural Aluminum
- E. FM Global (FM):
RoofNav.....Approved Roofing Assemblies and Products

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum, Extruded: ASTM B221M (B221).
- B. Aluminum Sheet: ASTM B209M (B209).

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

07 71 00 - 3
Roof Specialties

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- C. Recycled Content of Metal Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 30 percent.
- D. Insulation: ASTM C612, Class 1 or 2.
- E. 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 (NOT USED)

2.4 COPINGS

- A. Fabricate of aluminum sheet not less than 1.6 mm (0.063 inch) thick.
- 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

underside of joint. Use galvanized steel anchor plate providing compression spring anchoring of coping cover.

H. Finish: Two-coat fluoropolymer or Three-coat fluoropolymer as required to match existing coats.

2.5 EXTRUDED ALUMINUM GRAVEL STOPS AND FASCIAS (NOT USED)

2.6 EXTRUDED ALUMINUM FASCIA-CANT SYSTEM (NOT USED)

2.7 EXTRUDED ALUMINUM ROOF EXPANSION JOINT COVERS (NOT USED)

2.8 FINISH:

A. In accordance with NAAMM AMP 500-505.

B. 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.

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 where required to match existing:

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- g. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.
- 2. Felt Underlayment where required to match existing:
 - a. Install with 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).
- 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. Coordinate to install insulation where shown; see Section 07 21 13, THERMAL INSULATION and Section 07 22 00, ROOF AND DECK INSULATION.
- G. Comply with section 07 92 00, JOINT SEALANTS to install sealants where required by manufactures installation instructions.
- H. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.
- I. 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.
 - 4. Two piece assembly where required to match existing:
 - a. Install curb section with screws allowing 6 mm (1/4 inch) space at end joints with splice plate at joint.
 - b. After completion of base flashing bend down cap flashing flange and secure to blocking with screws.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- c. Install expansion joint cover with 6 mm (1/4 inch) wide space at end joints and tension bars at 610 mm (24 inches) on center.
- d. Install cover plates with formed aluminum flashing concealed and centered on joint. Flashing to lap cover not less than 101 mm (4 inches).

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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10-01-17

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.
- B. This section specifies patching, repair and replacement of any existing spray-on fireproofing disturbed in the course of construction.

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:

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

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 Contracting Officer's Representative, for approval by the representative of the fireproofing material manufacturer and the Contracting Officer's Representative.
 - 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

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

C847-14.....Metal Lath

E84-14.....Surface Burning Characteristics of Building
Materials

E119-12a.....Fire 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.

G21-13.....Determining 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 Guide.....Latest Edition including Supplements

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

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	ASTM E84	Flame spread 25 or less smoke developed 50 or less

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

	to be used		
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. Non-flat 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 fireproofing 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

- 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

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. Provide materials with higher density of 640 kg per cubic metric (40 lb. per cubic feet) in mechanical rooms.
- F. Complete application is to be completed in one area. Inspection and approval by Contracting Officer's Representative is required before removal of application equipment and proceeding with further work.

3.3 FIELD TESTS:

- A. The applied fireproofing is to be field inspected by a licensed and certified inspector paid for by the Contractor.
- B. The inspector is to observe installation of a minimum of ten percent of the work.
- C. The inspector is to review final installations of all work before work is enclosed or covered by the work of other trades.
- D. Any work that is rejected by the inspector shall be corrected or replaced as requested by the inspector and reinspected.
- E. Contractor shall patch and repair any adjacent surfaces that are damaged by required replacement work.
- F. The inspector shall document and certify that final assemblies are code compliant.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

10-01-17

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 on all components scheduled below that are uncovered as a result of demolition of existing conditions as part of the work.
- B. 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.
 - 5. Refer to drawings for rating, location and UL reference; when not specifically indicated, the following schedule shall be followed:

	Columns supporting Roof only	1 hour

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
 Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
 Bancroft Architects + Engineers

10-01-17

	Columns supporting Roof only		1 hour
	Columns supporting one floor		2 hours
	Columns supporting more than one floor		2 hours
	Floor decks		2 hours
	Roof decks		1 hour
	Beams supporting floor or roof deck		2 hours

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Contract No. 36C26319D0044
 Station Project No. 437-21-210
 Bancroft-AE Project No. 22-113

01/16/2024

07 81 00 - 10
 Applied Fireproofing

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. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Sustainable Design Requirements.
- B. Section 07 81 00, APPLIED FIREPROOFING: Spray applied fireproofing.
- C. Section 07 92 00, JOINT SEALANTS: Sealants and application.
- D. Section 23 31 00, HVAC DUCTS AND CASINGS: Fire and smoke damper assemblies in ductwork.

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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):
- E84-20.....Surface Burning Characteristics of Building Materials
- E699-16.....Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components
- E814-13a(2017).....Fire Tests of Penetration Firestop Systems
- E2174-20a.....Standard Practice for On-Site Inspection of Installed Firestop Systems
- E2393-20.....Standard 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

4991-13.....Approval of Firestop Contractors
Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- D. Underwriters Laboratories, Inc. (UL):
Annual Issue Building Materials Directory
- E. Annual Issue Fire Resistance Directory
723-Edition 11(2018).....Standard for Test for Surface Burning
Characteristics of Building Materials
1479-04(2015).....Fire Tests of Penetration Firestops
- F. Intertek Testing Services - Warnock Hersey (ITS-WH):
Annual Issue Certification Listings
- G. 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 re-enterable factory-built (Firestop Devices) as defined in the Contract Drawings or field erected (through-Penetration Firestop Systems) where defined in the drawings to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke. Where not clearly defined in the drawings, use re-enterable factory-built devices, unless otherwise approved by the COR. Firestop systems are 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. Penetrations of fire-resistance rated floor assemblies shall be protected with approved through penetration fire-stop systems in accordance with the IBC penetrations section for horizontal assemblies with the following exception: "T" ratings are not required for penetrations smaller than or equal to 101 mm (4 inches) nominal pipe or 0.01 square meter (16 square inches) in overall cross sectional area.
- C. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

07 84 00 - 3
Firestopping

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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.
- D. 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.
- E. 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.
- F. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.
- G. 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.
- H. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

07 84 00 - 4
Firestopping

01-01-21

2. For floor penetrations with annular spaces exceeding 101 mm (4 inches) 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.

01-01-21

- 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 FIELD INSPECTION

- A. The firestopping installations are to be field inspected by a licensed and certified inspector paid for by the Contractor.
- B. The inspector is to observe installation of a minimum of ten percent of the work.
- C. The inspector is to review final installations of all work before work is enclosed or covered by the work of all trades.
- D. Any work that is rejected by the inspector shall be corrected or replaced as requested by the inspector and reinspected.
- E. Contractor shall patch and repair any adjacent surfaces that are damaged by required replacement work.
- F. The inspector shall document and certify that rated assemblies are code compliant.
 - 1. This shall include certification of rated wall assemblies.

3.5 CLEAN-UP

- A. As work on each floor is completed, remove materials, litter, and debris.
- B. Clean up spills of liquid type materials.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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.

3.6 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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Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

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.
- 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.

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

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 and the Contracting Officer's Representative 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 Contracting Officer's Representative (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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

07 92 00 - 2
Joint Sealants

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

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. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections and to demonstrate aesthetic effects and qualities of materials and execution:

1. Joints in mockups of assemblies that are indicated to receive elastomeric joint sealants.

1.4 CERTIFICATION:

A. Contractor is to submit to the Contracting Officer's Representative 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:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

07 92 00 - 3
Joint Sealants

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

07 92 00 - 4
Joint Sealants

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

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):

C509-06.....Elastomeric Cellular Preformed Gasket and
Sealing Material
C612-14.....Mineral Fiber Block and Board Thermal
Insulation
C717-14a.....Standard Terminology of Building Seals and
Sealants
C734-06 (R2012).....Test Method for Low-Temperature Flexibility of
Latex Sealants after Artificial Weathering
C794-10.....Test Method for Adhesion-in-Peel of Elastomeric
Joint Sealants
C919-12.....Use of Sealants in Acoustical Applications.
C920-14a.....Elastomeric Joint Sealants.
C1021-08 (R2014).....Laboratories Engaged in Testing of Building
Sealants
C1193-13.....Standard 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
C1521-13.....Standard Practice for Evaluating Adhesion of
Installed Weatherproofing Sealant Joints
D217-10.....Test Methods for Cone Penetration of
Lubricating Grease
D1056-14.....Specification for Flexible Cellular Materials—
Sponge or Expanded Rubber
E84-09.....Surface Burning Characteristics of Building
Materials

C. Sealant, Waterproofing and Restoration Institute (SWRI).
The Professionals' Guide

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

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:
 - a. Joints formed where frames and 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.
 - d. Masonry expansion and control joints.
 - e. Masonry joints where shelf angles occur.
 - f. Voids where items penetrate exterior walls.g. 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.

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

- 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. 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. Perimeter of lead faced control windows and plaster or gypsum wallboard walls.
 - f. Exposed isolation joints at top of full height walls.
 - g. Joints between bathtubs and ceramic tile; joints between shower receptors and ceramic tile; joints formed where nonplanar tile surfaces meet.
 - h. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.
 - i. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.
- 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

07 92 00 - 7
Joint Sealants

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

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 masonry veneer.

2.5 FILLER:

- A. Mineral fiberboard: ASTM C612, Class 1.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

- 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

- 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

07 92 00 - 10
Joint Sealants

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

- 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:

- 1. At widths up to 6 mm (1/4 inch), sealant depth equal to width.
- 2. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

07 92 00 - 12
Joint Sealants

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

07 92 00 - 13
Joint Sealants

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

10-01-17

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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DIVISION 08

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 locations.
2. Insulated hollow metal doors hung in thermally-broken hollow metal frames at exterior locations.
3. Hollow metal door frames for wood doors and borrowed lights at interior locations.

1.2 RELATED WORK

- A. Section 08 71 00, DOOR HARDWARE: Door Hardware:
- B. Card Readers: Section 28 13 00, PHYSICAL ACCESS CONTROL SYSTEM.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American National Standard Institute (ANSI):
- A250.8-2014.....Standard Steel Doors and Frames
- C. ASTM International (ASTM):
- A240/A240M-15b.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
- A653/A653M-15.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip
- 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
- B209-14.....Aluminum and Aluminum-Alloy Sheet and Plate
- B209M-14.....Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
- B221-14.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- B221M-13.....Aluminum and Aluminum-Alloy Extruded Bars,
Rods, Wire, Profiles, and Tubes (Metric)
- D3656/D3656M-13.....Insect Screening and Louver Cloth Woven from
Vinyl Coated Glass Yarns
- E90-09.....Laboratory Measurement of Airborne Sound
Transmission Loss of Building Partitions and
Elements
- D. Federal Specifications (Fed. Spec.):
- L-S-125B.....Screening, Insect, Nonmetallic
- E. Master Painters Institute (MPI):
- No. 18.....Primer, Zinc Rich, Organic
- F. National Association of Architectural Metal Manufacturers (NAAMM):
- AMP 500-06.....Metal Finishes Manual
- G. National Fire Protection Association (NFPA):
- 80-16.....Fire Doors and Other Opening Protectives
- H. UL LLC (UL):
- 10C-09.....Positive Pressure Fire Tests of Door Assemblies
- 1784-15.....Air Leakage Tests of Door Assemblies and Other
Opening Protectives
- I. Department of Veterans Affairs
- VA Physical Security and Resiliency Design Manual October 1, 2020

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. 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 each product complies with specifications.
Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01-01-21

F. Qualifications: Substantiate qualifications comply with specifications.

1. Manufacturer with project experience list.

G. Blast Design Calculations.

1. Submit calculations for review and approval prepared by qualified blast consultant, with a minimum of 5 years of experience in design of blast resistant window systems, verifying door assembly including anchors comply with specified blast resistance performance. The magnitudes of the design threats W1, W2 and GP1, GP2 are defined in the Physical Security and Resiliency Design Standards Data Definitions which is a document separate from the referenced VA Security and Resiliency Design Manual. The Physical Security and Resiliency Design Standards Data Definitions are provided on a need-to-know basis by the structural blast specialist performing the blast design on VA projects. It is the responsibility of the delegated engineer responsible for the design of blast resistant doors to request and obtain the Physical Security and Resiliency Design Data Standard Data Definitions from the VA Office of Construction and Facilities Management (CFM). Any associated delays or increased costs due to failure to obtain this information will be borne by the contractor.

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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

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: 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 Frames: UL 1784; NFPA 80 labeled, maximum 0.15424 cubic meter/second/square meter (3.0 cubic feet/minute/square foot) at 24.9 Pa (0.10 inches water gauge) pressure differential.
 - 4. Sound Rated Frames: Minimum 45 sound transmission class (STC) when tested according to ASTM E90.
 - 5. Thermal Transmittance: 0.37 U-value), maximum at exterior doors.
 - 6. Blast Resistant Doors: Door, Frame and Anchorage:
 - a. Standoff Distance: 50 feet (Mission Critical Protected).
 - b. Design Threat W1 at the standoff distance not to exceed pressure and impulse associated with GP2 threat for Mission Critical Protected buildings.
 - c. Frame Rotation not to exceed L/20 (Life Safety Protected), L/40 (Mission Critical Protected) while experiencing design level pressure and impulse.
 - d. Minimum gauge of metal used on blast resistant doors shall be 14 gauge.

2.2 MATERIALS

- A. Sheet Steel: ASTM A1008/A1008M, cold-rolled.
- B. Galvanized Sheet Steel: ASTM A653.

2.3 PRODUCTS - GENERAL

- A. Basis of Design: See Room Finish Legend as part of the Drawings for painted 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.

2.4 HOLLOW METAL DOORS

- A. Hollow Metal Doors: ANSI A250.8; 44 mm (1-3/4 inches) thick. See drawings for sizes and designs.
 - 1. Interior Doors: Level 2 and Physical Performance Level B, heavy duty; Model 2, seamless at all locations scheduled to be hollow metal.
 - 2. Exterior Doors: Level 3 and Physical Performance Level A, extra-heavy duty; Model 2, seamless
- B. Door Faces:
 - 1. Exterior Doors: Galvanized sheet steel minimum ZF180 (G60 or A60) coating.
- C. Door Cores:
 - 1. Exterior Doors: Polystyrene or polyurethane .

2.5 HOLLOW METAL FRAMES

- A. Hollow Metal Frames: ANSI A250.8; Knock-down. See drawings for sizes and designs.
 - 1. Interior Frames:
 - a. Level 1 Hollow Metal Doors: 1.0 mm (0.042 inch) thick.
 - b. Level 2 and Level 3 Hollow Metal Doors: 1.3 mm (0.053 inch) thick.
- B. Frame Materials:
 - 1. Interior Frames: Sheet steel.
 - 2. Exterior Frames: Galvanized sheet steel minimum Z180 or ZF180 (G60 or A60) coating, thermally-broken.

2.6 LOUVERS

- A. Louver Style: Sight-proof permitting free ventilation.
 - 1. Interior Door Louvers: 0.8 mm (0.032 inch) thick.

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. Sound Rated Doors:
 - 1. Seals: Integral spring type automatic door bottom seal.
 - 2. Fabricate vision panel cutouts and frames to receive double glazing as shown on drawings.
- E. Hollow Metal Frame Fabrication:
 - 1. Fasten mortar guards to back of hardware reinforcements.
 - 2. Concealed Closers in Head Frame: Provide 1 mm (0.042 inch) thick steel removable stop sections for access to concealed face plates and control valves, except when cover plates are furnished with closer.
 - 3. Terminated Stops: ANSI A250.8.
 - 4. 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 50 mm by 50 mm by 9 mm (2 inch by 2 inch by 3/8 inch) clip angle for lead lined frames, drilled for floor fasteners.
 - 4) Provide mullion 2.3 mm (0.093 inch) thick steel channel anchors, drilled for two floor fasteners and frame anchor screws.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 5) 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 the 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.
 - c) Two piece frames: Subframe or rough buck drilled for 6 mm (1/4 inch) bolts.
 - 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.

F. Sound Rated Door Frames:
Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

1. Seals: Integral continuous gaskets on frames.
- G. 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. Steel: ANSI A250.8; shop primed.
- B. Finish exposed surfaces after fabrication.

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: stainless steel.
 1. Metal Framing: Steel drill screws.
 2. Masonry and Concrete: Expansion bolts and power actuated drive pins.
- F. Anchors: stainless steel.
- G. Insulation: Unfaced mineral wool where noted for interior doors, polystyrene or polyurethane for exterior doors.

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 frames according to NFPA 105.

01-01-21

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. Lead Lined Frames: Use 9 mm (3/8 inch) diameter bolts.
 - b. 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.
 - c. Secure two-piece frames to subframe or rough buck with machine screws on both faces.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01-01-21

- E. Frames for Sound Rated Doors: Fill frames with insulation.
- F. Frames for Exterior Doors: Fill frames with insulation.
- G. 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.

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01/16/2024

SECTION 08 14 00
INTERIOR WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior flush wood doors transparent finish.

1.2 RELATED WORK

- A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Paints and Coatings and Composite Wood and Agrifiber VOC Limits.
- B. Section 08 71 00, DOOR HARDWARE: Door Hardware including hardware location (height).
- C. Section 08 11 13, HOLLOW METAL DOORS AND FRAMES: Installation of Doors.
- D. Section 08 71 00, DOOR HARDWARE: Installation of Door Hardware.

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.
- C. ASTM International (ASTM):
 1. E90-09(2016) - Laboratory Measurements of Airborne Sound Transmission Loss of Building Partitions and Elements.
- D. National Fire Protection Association (NFPA):
 1. 80-16 - Fire Doors and Other Opening Protectives.
 2. 252-12 - Fire Tests of Door Assemblies.
- E. UL LLC (UL):
 1. 10C-09 - Positive Pressure Fire Tests of Door Assemblies.
- F. Window and Door Manufacturers Association (WDMA):
 1. TM 7-14 - Cycle-Slam Test.
 2. TM 8-14 - Hinge Loading Test.
 3. TM 10-14 - Screw Holding Capacity.

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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

2. Indicate project specific requirements not included in Manufacturer's Literature and Data submittal.
- C. Manufacturer's Literature and Data:
 1. Description of each product.
 2. Fire rated doors showing conformance with NFPA 80.
- D. 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. 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.
- E. Sustainable Construction Submittals:
 1. Low Pollutant-Emitting Materials:

Show volatile organic compound types and quantities.
- F. Test Reports: Indicate each product complies with specifications.
 1. Screw Holding Capacity Test.
 2. Cycle-Slam Test.
 3. Hinge-Loading Test.
- G. Operation and Maintenance Data:
 1. Care instructions for each exposed finish product.

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.

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. Retain packaging for door protection after installation.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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.
- Comply with door manufacturer's instructions for relative humidity.

1.9 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."
- B. Manufacturer's Warranty: Warrant interior factory finished flush wood doors against material and manufacturing defects.
 - 1. Warranty Period: Lifetime of original installation.

PART 2 - PRODUCTS

2.1 PRODUCTS - GENERAL

- A. Basis of Design: Match current Station Standard.
- 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:
 - 2. Paints and coatings.
 - 3. Composite wood and agrifiber.

2.2 FLUSH WOOD DOORS

- A. General:
 - 1. ANSI/WDMA I.S. 1A, Extra Heavy Duty.
 - 2. Adhesive: Type II.
 - 3. Core: Structural composite lumber, except when mineral core is required for fire rating.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

4. Thickness: 44 mm (1-3/4 inches) unless otherwise shown or specified.

B. Faces:

1. ANSI/WDMA I.S. 1A.
2. One species throughout project unless scheduled or otherwise shown.
3. Transparent Finished Faces: Premium Grade. AA Grade face veneer to match Station standard.
4. Match face veneers for doors for uniform effect of color and grain at joints.
5. Door Edges: Same species as door face veneer, except maple is acceptable for stile face veneer on birch doors.
6. In existing buildings, where doors are required to have transparent finish, use wood species, grade, and assembly of face veneers to match adjacent existing doors.
7. Painted Finishes: Custom Grade, mill option close grained hardwood, premium or medium density overlay.
8. Factory sand doors for finishing.

C. Wood For Stops, Louvers, Muntins and Moldings For Flush Doors Required to Have Transparent Finish:

1. Solid wood of same species as face veneer, except maple is acceptable on birch doors.
2. Glazing:
 - a. On non-fire-rated doors, use applied wood stops nailed tightly on room side and attached on opposite side with flathead, countersunk wood screws, spaced approximately 125 mm (5 inches) on center.

D. Fire-Rated Wood Doors:

1. Fire Resistance Rating:
 - a. B Label: 1-1/2 hours.
 - b. C Label: 3/4 hour.
2. Provide 20-minute smoke-rated doors in smoke-rated barriers.
3. Labels:
 - a. Comply with NFPA 252, UL 10C, and labeled by qualified testing and inspection agency showing fire resistance rating.
 - 1) Metal labels with raised or incised markings.
4. Performance Criteria for Stiles of Doors Utilizing Standard Mortise

Leaf Hinges:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- a. Hinge Loading: WDMA TM 8. Average of 10 test samples for Extra Heavy Duty doors.
 - b. Direct Screw Withdrawal: WDMA TM 10 for Extra Heavy Duty doors. Average of 10 test samples using a steel, fully threaded #12 wood screw.
 - c. Cycle-Slam: 1,000,000 cycles with no loose hinge screws or other visible signs of failure when tested according to WDMA TM 7.
5. Hardware Reinforcement:
- a. Provide fire and smoke rated doors with hardware reinforcement blocking.
 - b. Size of lock blocks as required to secure hardware specified.
 - c. Top, Bottom and Intermediate Rail Blocks: Minimum 125 mm (5 inches) by full core width.
 - d. Reinforcement blocking in compliance with labeling requirements. Mineral material similar to core is not acceptable.
6. Other Core Components: Manufacturer's standard as allowed by labeling requirements.
7. Glazed Vision Panel Frame: Steel approved for use in labeled doors.
8. Astragal: Steel type for pairs of doors.
- E. Smoke Barrier Doors:
1. Glazed Vision Panel Frame: Steel approved for use in labeled doors.
 2. Astragal: Steel type for pairs of doors, including double egress doors.
- F. Sound Rated Doors:
1. Fabricated as specified for flush wood doors with additional construction requirements to comply with specified sound transmission class (STC).
 2. STC Rating of door assembly in place when tested according to ASTM E90 by independent acoustical testing laboratory minimum 35.
 - a. Accessories:
 - 1) Frame Gaskets and Automatic Door Bottom Seal: As specified in Section 08 71 00, DOOR HARDWARE.
 3. Place shelf on top of lower section of door and support as shown with a pair of wood or wrought steel brackets.
 4. Prime steel brackets for finish painting.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01-01-21

2.3 STILE AND RAIL WOOD DOORS (NOT USED)

2.4 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.
- 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).
- 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.

2.5 FINISHES

- A. Field Finished Doors: Seal top and bottom edges of doors with two coats of catalyzed polyurethane or water resistant sealer.
- B. Factory Transparent Finish:
 - 1. Factory finish flush wood doors.
 - a. ANSI/WDMA I.S. 1A Section F-3 Finish System Descriptions for System 5, Conversion Varnish or System 7, Catalyzed Vinyl.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- b. Use stain when required to produce finish which matches Station
Standard or as otherwise approved by the VA.

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 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 - -

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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.

1.2 RELATED WORK

- A. Section 08 71 00, DOOR HARDWARE: Lock Cylinders.
- B. Section 09 91 00, PAINTING: Field Painting.
- C. Section 21 13 13, WET-PIPE SPRINKLER SYSTEMS: Access Doors for Control or Drain Valves.
- D. Section 23 31 00, HVAC DUCTS AND CASINGS: Locations of Access Doors for Ductwork Cleanouts.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American Welding Society (AWS):
D1.3/D1.3M-2018.....Structural Welding Code - Sheet Steel
(6th Edition.
- C. ASTM International (ASTM):
A653/A653M-20.....Steel Sheet, Zinc-Coated (Galvanized) or
Zinc-Iron Alloy-Coated (Galvannealed) by the
Hot-Sip Process.
A1008/A1008M-18.....Steel, Sheet, Cold-Rolled, Carbon, Structural,
High-Strength Low-Alloy, High-Strength
Low-Alloy with Improved Formability, Solution
Hardened, and Bake Hardenable.
A666-15.....Annealed or Cold-Worked Austenitic Stainless
Steel sheet, Strip, Plate, and Flat Bar.
E119-20.....Fire Test of Building Construction and
Materials.
- D. National Fire Protection Association (NFPA):
80-2019 Edition.....Fire Doors and Other Opening Protectives.
252-2017 Edition.....Fire Tests of Door Assemblies.
- E. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06.....Metal Finishes Manual.

F. UL LLC (UL):
Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

Listed.....Online Certifications Directory.
10B-08 (Edition 10).....Standard for Fire Tests of Door Assemblies.
263-11 (Edition 14).....Fire Tests of Building Construction and
Materials.

PART 2 - 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.

2.2 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.

2.3 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight facility.
- B. Protect products from damage during handling and construction operations.

2.4 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.

2.5 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

01-01-21

2.6 MATERIALS

- A. Steel Sheet: ASTM A1008/A1008M.
- B. Galvanized Steel: ASTM A653/A653M.
- C. Stainless Steel: ASTM A666; Type 302 or Type 304.

2.7 PRODUCTS - GENERAL

- A. Basis of Design: Room Finish Legend as part of the Drawings.
- 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.

2.8 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 with maximum temperature rise of 120 degrees C (216 degrees F).
- C. Door Panel: Minimum 0.9 mm (0.0359 inch) thick 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.
- 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.

01-01-21

2.9 ACCESS DOORS, FLUSH PANEL, NON-RATED

A. Door Panel:

1. 1.9 mm (0.07 inch) thick steel sheet.
2. Reinforce to maintain flat surface.

B. Frame:

1. 1.5 mm (0.06 inch) thick 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.

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.

2.10 ACCESS DOOR, RECESSED PANEL, NON-RATED (NOT USED)

2.11 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.
- D. 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.

2.12 FINISHES

- A. Steel Paint Finish:

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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: Match adjacent wall finish or as otherwise directed by the VA.

2.13 ACCESSORIES

- A. Fasteners: Type and size recommended by access door manufacturer, to suit application.

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.
- E. Install flush access panels in partitions.

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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. Secure frames to adjacent construction with fasteners.
- F. 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.
- G. 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 - -

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

SECTION 08 56 53
BLAST RESISTANT FAÇADE SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. The exterior façade systems and supporting substrates are required to provide specified resistances as indicated on Contract Drawings and as specified in this Section 08 56 53. This specification section is applicable to the louvers at the existing generator room and the doors accessing the above ground fuel and transformer enclosures.

1.2 RELATED REQUIREMENTS

A. Louvers and Vents: Section 08 90 00

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this Section.

B. American Welding Society (AWS):

- D1.1/D1.1M-15.....Structural Welding Code - Steel
- D1.3/D1.3M-08.....Structural Welding Code - Sheet Steel
- D1.6/D1.6M-07.....Structural Welding Code - Stainless Steel

C. ASTM International (ASTM):

- A36/A36M-19.....Carbon Structural Steel
- A123/A123M-17.....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- A320/A320M-18.....Alloy-Steel and Stainless Steel Bolting Materials for Low-Temperature Service
- A666-15.....Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
- B221-14.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
- B221M-13.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

D. National Association of Architectural Metal Manufacturers (NAAMM):

- AMP 500-06.....Metal Finishes Manual

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

E. Department of Veterans Affairs:

VA Physical Security and Resiliency Design Manual October 1, 2020,
Revised June 1, 2023

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.

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. Inspecting and testing.
- 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 dimensioned details of louvers and doors, including intended metal materials. 1: 20 (Three quarter inch equals 1 foot) scaled elevations showing interior and exterior. Shop drawings shall be submitted for review and approval prior to fabrication. The contractor is responsible for all field verification of existing conditions and dimensions for new construction that is being conducted adjacent to or integral with existing construction. The

Contract No. 36C26319D0044

Station Project No. 437-210

Bancroft-AE Project No. 22-113

01/16/2024

08 56 53 - 2

Blast Resistant Façade Systems

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

field verification shall be conducted and incorporated in the submitted shop drawings and calculations prior to submission. Blast calculations and or testing data shall be submitted with the shop drawings.

2. Show detailed sections at 1: 5 (3 inch equal 1 foot) scale for members; indicating construction, size, and thickness of components, together with connections, fasteners, and means of separating dissimilar metals.
3. Provide final submittal drawings as DWG AutoCAD files.

C. Manufacturer's Literature and Data:

1. Description of each product, metal, and alloy when applicable.
2. Indicate manufacturer's recommendations for fasteners, welding, applied finishes, hardware and accessories.
3. Installation instructions.
4. Standard color chart.

D. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

E. Certificates: Indicate each product complies with specifications.

Submit engineer's qualifications that meet or exceed Quality Assurance criteria. At a minimum, qualifications must list each project in which the Engineer performed analysis of blast resistant louver, doors, or other applicable systems, the effective start and end dates of performance of the analysis, and a reference.

F. Calculations: Submit calculations for review and approval prepared by qualified blast consultant, with a minimum of 5 years of experience in design of blast resistant façade systems, verifying louver or door assemblies including anchors comply with specified blast resistance performance given in Section 2.1.a of this specification.

The magnitudes of the design threats W1, W2 and GP1, GP2 are defined in the Physical Security and Resiliency Design Standards Data Definitions which is a document separate from the referenced VA Physical Security and Resiliency Design Manual. The Physical Security and Resiliency Design Standards Data Definitions are provided on a need-to-know basis

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

by the structural blast specialist performing the blast design on VA projects. It is the responsibility of the delegated engineer responsible for the design of blast resistant louvers to request and obtain the Physical Security and Resiliency Design Data Standard Data Definitions from the VA Office of Construction and Facilities Management (CFM). Any associated delays or increased costs due to failure to obtain this information will be borne by the contractor.

1. Prior to performing engineering calculations intended to address the blast loading identified, submit a description of the technique(s) that will be employed to calculate the response of the system to the defined dynamic loading.
2. Calculation package is to include a summary sheet briefly outlining the following:
 - a. Evaluation criteria
 - b. Calculation assumptions
 - c. Table of results by louver type/location
 - d. Statement of Conformance with specification requirements.
 - e. Blast calculations are to be submitted at the same time as the related shop drawings
3. Calculation submittal is to be stamped and signed by a registered Professional Engineer in the U.S. whose qualifications meet or exceed Quality Assurance criteria.
 - a. Louver/Door System: A clear load path shall be provided. Supporting analysis that illustrates the response to design loading shall be provided. Analysis shall consider both flexural and shear responses. Analysis shall verify the element's ability to develop its plastic flexural capacity without instability. Calculations must include, but may not be limited to, analysis of the following
 - i. Global Performance: Analysis shall verify that the plastic moment of the element can be attained under maximum calculated deflections.
 - ii. Lateral Torsional Buckling: Analysis shall verify the ability of the element to provide adequate resistance

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

against lateral torsional buckling under maximum calculated deflections.

iii. Local Buckling: Analysis shall verify the ability of the element to provide adequate resistance against localized buckling along the entire load path under maximum calculated deflections.

iv. Web Crippling: Analysis shall verify the ability of the element to provide adequate resistance against web crippling at the element supports.

b. Anchorage: Analyze the strength of entire anchorage assembly, including reaction forces shared with the building structure. Provide supplementary steel plates as required to impart loads onto the structure. Analyze the wall anchor, clip, inserts, fasteners and assemblies, including bolts and stiffeners, and any additional supplementary steel required to transfer the load back to the main structural framing system. Include exact loadings to be transferred to the building structure in the analysis.

c. Mechanical Anchors: Mechanical anchor capacities shall be developed from dynamic testing. An International Code Council (ICC-ES) evaluation report showing testing for dynamic loading (i.e. seismic or blast) is to be submitted with calculations.

d. Supporting Structure: Coordination of the supporting structure interaction shall be the contractors' responsibility. The contractor's engineer performing blast calculations for each facade system shall coordinate loading scenarios with the other facade contractor's engineer providing design for the other exterior facade system, where occurs.

G. Testing Requirements:

1. Testing of facade systems, as an alternative to providing calculations as stated in Section 1.5.F, shall include the entire louver system, including connections, and shall include but not be limited to the following:

a. A minimum of three (3) identical specimens should be tested for the design blast load summarized herein or higher. Those specimens should be similar to the configuration indicated in the project

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- documents with respect to geometry (within 10%), material properties, connections, etc.
- b. Test charge construction and the standoff distance from the center of the charge to the exterior face of the test specimen(s) shall be measured and documented for tests using explosives.
 - c. Blast source construction (compressed gas and/or explosives) shall be measured and documented for shock tube tests.
 - d. A minimum of two (2) pressure transducers shall be used on each test reaction structure to measure the pressure-time waveform acting on the exterior face of tested specimens. A minimum of one (1) interior pressure transducer shall be used in each test structure.
3. Test Reports: Evidence of testing shall be submitted in the form of a test report from an independent testing agency. The test report package shall include, but not be limited to, the following:
- a. Brief description of the test performed and the test apparatus
 - b. Table of comparison between test specimens and project configuration
 - c. Table of test results by system type/location
 - d. Summary of recorded air-blast pressure-time history from each pressure transducer
4. Testing shall be performed by an independent testing agency whose personnel meet or exceed Quality Assurance criteria.
- G. Qualifications: Substantiate qualifications comply with specifications.
- 1. Manufacturer with project experience list demonstrating a minimum of 5 years of experience manufacturing blast resistant louvers or other blast resistant façade systems.
 - 2. Installer with project experience list demonstrating a minimum of 5 years of experience installing blast resistant louvers or other blast resistant façade systems.
 - 3. Welders and welding procedures.

1.6 QUALITY ASSURANCE

- A. Manufacturer and Installer Qualifications:
- 1. Regularly manufactures and installs specified products.
 - 2. Manufactured and installed specified products with satisfactory service on five similar installations for minimum five years.

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- a. Provide contact names and addresses for completed projects when requested by Contracting Officer's Representative.
- B. Welders and Welding Procedures Qualifications:
 - 1. Stainless Steel: AWS D1.6/D1.6M.
 - 2. Steel: AWS D1.1/D1.1M.
 - 3. Sheet Steel: AWS D1.3/D1.3M.

1.7 DELIVERY

- A. Deliver prefabricated unit in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, unit type, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, wet, 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 louver fabrication and installation. The field verification shall be conducted and incorporated in the submitted shop drawings and calculations prior to submission. 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."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Fabricate and install blast resistant systems including but not limited to the louver and door systems to achieve indicated levels of resistance. Extend resistance to include anchorages, interfaces with adjoining substrates, and hardware.
- B. In conjunction with meeting aesthetic and performance requirements, the Contractor may propose alternate design methods for consideration.

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

C. General: Design exterior louver and door systems to meet the performance requirements for a 'Critical' facility with the applied GP2 blast loading as defined in the Physical Security and Resiliency Design Standards Data Definition for VA Facilities dated January 2021. Design can be performed using dynamic calculations or blast testing as described herein.

D. Exterior Door Design:

1. Exterior doors: Exterior doors shall be designed such that they seat within a continuous door stop, which is mechanically attached to a door frame. Doors are to be constructed of a minimum 14ga steel. Mullions and frames serving to support doors shall be designed for the GP2 blast loading as defined in the Physical Security and Resiliency Design Standards Data Definitions Document applied over the effective width of the element and tributary width of the door opening. Mullions and frames serving to support the door shall also meet the following requirements:

a. Supporting Mullions & Frames Design:

- 1) Mullion Threat-based Support Rotation (Θ): Provide a maximum support rotation of $\Theta \leq L/40$ (2.8) degrees for steel or aluminum.
- 2) Any supplemental support framing that supports the door shall be designed to meet the "Moderate Damage" limits as for the applicable material as described in the ASCE 59-11.

b. Connection Design:

- 1) Design connections to the lesser of the following:
 - a) Sum all mullion reaction forces framing into a connection joint based on each element's flexural yield capacity.
 - b) Connections shall be designed with dynamic and static material strength increase factors of 1.0 and applicable material design codes and applicable strength reduction factors. When using proprietary fasteners, a safety factor of 1.5 shall be used to any manufacturers published ultimate load capacities or fastener design strengths can be taken from the International Code Council (ICC-ES) Evaluation report for Connection Safety Factors (SF).

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- E. Louver Design: Exterior louvers, air-intakes and exhausts shall be dynamically designed to minimize the blast over-pressure admitted into critical spaces.
1. Design louver elements to the GP2 blast loading as defined in the Physical Security and Resiliency Design Standard Data Definitions document.
 2. Performance Requirements: Louver elements shall be designed for:
 - a. End Rotation: 10 degrees for steel plate
 - b. Ductility: 12 for steel plate
 - c. Connection: Develop plastic flexural capacity of the louver fins (baffles) or mullions
 3. Louver Supporting Structure Design: Design supporting framings using structural steel sections, where required, to the GP2 blast loading as defined in the Physical Security and Resiliency Standard Data Definition document over the appropriate effective area of the supporting members. For structural steel framing sections, design shall be as follows:
 - a. Support Rotation (θ): Provide a maximum support rotation of $\theta \leq L/40$ (2.8 degrees) for steel or aluminum
 4. Louvers, supporting structure, and connections shall meet the performance requirements stated in this section in both the inbound and rebound directions.

2.2 MATERIALS

- A. Stainless Steel: ASTM A666, Type 304; formed stainless steel members.
- B. Aluminum Extrusions: ASTM B221.
 1. Framing Members: Alloy 6063-T5, -T6, or -T52, or alloy 6061-T6; 5 mm (3/16 inch) minimum thickness.
 2. Trim and Stops not exposed to forced entry attack: Alloy 6063-T5, -T6, or -T52; 1.5 mm (1/16 inch) minimum thickness.
- C. Steel Shapes/Plates/Bars: ASTM A36/A36M, except where another designation is indicated.
- D. Bolts and Fasteners: ASTM A320/A320M; Type 300-series stainless steel screws, bolts, nuts, and washers. Non-removable type where accessible from attack side.

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

2.3 PRODUCTS - GENERAL

- A. Provide blast resistant louvers from one manufacturer.
- B. 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 total recycled content, minimum.

2.4 FABRICATION

- A. Assemblies: Shop fabricate matching profiles indicated on Drawings.
Make welds that comply with AWS standards; exposed welds ground smooth.
Provide welded-in-place reinforcements and anchorage devices.
- B. Unit Anchorages: Fabricate metal anchorage system complying with performance requirements.

2.5 FINISHES

- A. General: Finish fabricated units including framing, sub-framing, hardware, and accessories.
 - 1. Color(s): Refer to Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Steel Surfaces: ASTM A123/A123M galvanized.
- C. Stainless Steel: NAAMM AMP 500; No. 4 polished finish, except retain manufacturer's standard mill finish on exposed fasteners and similar devices.
- D. Blend welds to match adjacent finish.
- E. 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.
- F. Aluminum Paint Finish:
 - 1. Fluorocarbon Finish: AAMA 2605; 70 percent fluoropolymer resin, 2-coat system.

2.6 ACCESSORIES

- A. Bituminous Paint: SSPC Paint 12 (cold-applied asphalt mastic).
- B. Welding Materials: Type to suit application for color match, strength and compatibility in fabricated item.

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

1. Stainless Steel: AWS D1.6/D1.6M, TIG using rods made from alloyed Type 308 stainless steel.
2. Steel: D1.1/D1.1M.
3. Steel Sheet: D1.3/D1.3M-08.

C. Galvanizing Repair Paint: MPI No. 18.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
 1. Verify opening is correctly sized and located.
 2. Verify substrate is prepared to receive frame anchors.
- B. Protect existing construction and completed work from damage.
- C. Apply bituminous coating approximately 30 mils dry film thickness, or other suitable permanent separator, on surfaces of dissimilar metals, and metal surfaces in contact with concrete.
 1. Where the metals are exposed to view, provide a plastic or neoprene separator between dissimilar metals.

3.2 INSTALLATION

- A. Install products according to manufacturer's instructions and approved submittal drawings.
- B. Install louver system according to manufacturer's installation instructions.
- C. Set units accurately, plumb, and level.
- D. Securely anchor to the supporting structure as shown on approved submittal drawings to withstand specified performance.
- E. Anchorage to Existing Building:
 1. Spacing: Maximum 300 mm (12 inch) on center through pre drilled bolt holes in structural frame, except where lesser spacing is deemed necessary by analysis. Install anchorage per reviewed and approved shop drawings.
 2. Anchor Diameter: 10 mm (3/8 inch) minimum.
 3. Minimum Embedment and Edge Distances:
 - a. Embedment in Concrete: 88 mm (3-1/2 inches).
 - b. Embedment in Solid Masonry: 150 mm (6 inches).
 - c. Edge Distance: 75 mm (3 inches).

Contract No. 36C26319D0044
Station Project No. 437-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

4. Do not cut rebar during concrete anchor installation without approval of the Contracting Officer's Representative (COR).

F. Touch up damaged factory finishes.

1. Repair galvanized surfaces with galvanized repair paint.

3.3 PROTECTION

A. Remove protective materials immediately before acceptance.

B. Repair damage.

- - 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 and Painting: Section 09 91 00, PAINTING.
- C. Card Readers: Section 28 13 10, PHYSICAL ACCESS CONTROL SYSTEMS.
- D. Electrical: Division 26, ELECTRICAL.

1.3 GENERAL

- A. All hardware shall comply with ABAAS, (Architectural Barriers Act Accessibility Standard) 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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 VAHCS Locksmith as record copies.
- B. Hardware Schedule: AHC certified hardware consultant to 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

08 71 00-2
DOOR HARDWARE

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- 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 the VA Station Locksmith for reference purposes. Tag shall identify items by Project Specification number and manufacturer's catalog number.

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, COR and VA Station 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- B. Provide removable core cylinders that are removable only with a special key or tool without disassembly of knob or lockset. Cylinders shall be Best Corp., Figure 8, TB key-way, 626 finish, 7-pin core or VA approved equal.
- C. Keying: At completion of construction General Contractor to provide all cores to VA Station Locksmith for configuring and installation.

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. ASTM International (ASTM):
- F883-13.....Padlocks
- E2180-18.....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):
- A156.1-06.....Butts and Hinges
- A156.2-03.....Bored and Pre-assembled Locks and Latches
- A156.3-08.....Exit Devices, Coordinators, and Auto Flush Bolts
- A156.4-08.....Door Controls (Closers)
- A156.5-14.....Cylinders and Input Devices for Locks.
- A156.6-05.....Architectural Door Trim
- A156.8-05.....Door Controls-Overhead Stops and Holders
- A156.11-14.....Cabinet Locks
- A156.12-05 Interconnected Locks and Latches
- A156.13-05.....Mortise Locks and Latches Series 1000
- A156.14-07 Sliding and Folding Door Hardware
- A156.15-06.....Release Devices-Closer Holder, Electromagnetic
and Electromechanical
- A156.16-08.....Auxiliary Hardware
- A156.17-04 Self-Closing Hinges and Pivots
- A156.18-06.....Materials and Finishes
- A156.20-06 Strap and Tee Hinges, and Hasps

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- A156.21-09.....Thresholds
- A156.22-05.....Door Gasketing and Edge Seal Systems
- A156.23-04.....Electromagnetic Locks
- A156.24-03.....Delayed Egress Locking Systems
- A156.25-07 Electrified Locking Devices
- A156.26-06.....Continuous Hinges
- A156.28-07 Master Keying Systems
- A156.29-07 Exit Locks and Alarms
- A156.30-03 High Security Cylinders
- A156.31-07 Electric Strikes and Frame Mounted Actuators
- A156.36-10.....Auxiliary Locks
- A250.8-03.....Standard Steel Doors and Frames
- D. National Fire Protection Association (NFPA):
 - 80-10.....Fire Doors and Other Opening Protectives
 - 101-09.....Life 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. 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.
- 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

08 71 00-5
DOOR HARDWARE

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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 pounds) 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.

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. Provide with non-removable pin (hospital tip option) at lockable outswing doors.
 3. Where required to clear adjacent casing, trim, and wall conditions and allow full door swing, provide wide throw hinges of minimum width required.
 4. Provide with manufacturer's cut-outs for separate mortised power transfers and/or mortised automatic door bottoms where they occur.
 5. Where thru-wire power transfers are integral to the hinge, provide hinge with easily removable portion to allow easy access to wiring connections.
 6. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

08 71 00-6
DOOR HARDWARE

01-01-21

2.3 DOOR CLOSING DEVICES

A. Closing devices shall be products of one manufacturer.

2.4 OVERHEAD CLOSERS

A. Conform to ANSI A156.4, Grade 1.

B. Closers shall conform to the following:

1. The closer shall have minimum 50 percent adjustable closing force over minimum value for that closer and have adjustable hydraulic back check effective between 60 degrees and 85 degrees of door opening.
2. Size Requirements: Provide multi-size closers, sizes 1 through 6, except where multi-size closer is not available for the required application.
3. Material of closer body shall be forged or cast.
4. Arm and brackets for closers shall be steel, malleable iron or high strength ductile cast iron.
5. Where closers are exposed to the exterior or are mounted in rooms that experience high humidity, provide closer body and arm assembly of stainless steel material.
6. Closers shall have full size metal cover; plastic covers will not be accepted.
7. Closers shall have adjustable hydraulic back-check, separate valves for closing and latching speed, adjustable back-check positioning valve, and adjustable delayed action valve.
8. Provide closers with any accessories required for the mounting application, including (but not limited to) drop plates, special soffit plates, spacers for heavy-duty parallel arm fifth screws, bull-nose or other regular arm brackets, longer or shorter arm assemblies, and special factory templating. Provide special arms, drop plates, and templating as needed to allow mounting at doors with overhead stops and/or holders.
9. Closer arms or backcheck valve shall not be used to stop the door from overswing, except in applications where a separate wall, floor, or overhead stop cannot be used.
10. Provide parallel arm closers with heavy duty rigid arm.
11. Where closers are to be installed on the push side of the door, provide parallel arm type except where conditions require use of top jamb arm.

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

12. Provide all surface closers with the same body attachment screw pattern for ease of replacement and maintenance.

13. All closers shall have a 1 ½" (38mm) minimum piston diameter.

2.5 FLOOR CLOSERS AND FLOOR PIVOT SETS (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.
- 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. Wall bumpers, where used, must be installed to impact the trim or the door within the leading half of its width.

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.

2.8 FLOOR DOOR HOLDERS (NOT USED)

2.9 LOCKS AND LATCHES

- A. Conform to ANSI A156.2. 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. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

08 71 00-8
DOOR HARDWARE

01-01-21

2.10 MORTISE LOCK AND LATCH SETS

- A. Conform to ANSI/BHMA A156.13. Mortise locksets shall be Sargent 8200 Series or VA approved equal. All locksets and latchsets shall have lever handles fabricated from cast stainless steel. 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. Lock function F02 shall be furnished with emergency tools/keys for emergency entrance.

2.11 PUSH-BUTTON COMBINATION LOCKS (NOT USED)

2.12 ELECTROMAGNETIC LOCKS (NOT USED)

2.13 ELECTRIC STRIKES (NOT USED)

2.14 KEYS

- A. Blank Keys are to be turned over to the VA Station Locksmith. Furnish keys in quantities as follows:

Locks/Keys	Quantity
Cylinder locks	2 keys each

2.15 KEY CABINET (NOT USED)

2.16 KICK PLATES

- A. Conform to ANSI Standard A156.6.
- B. Provide protective plates as specified below:
1. Kick plates of metal, Type J100 series.
 2. Provide kick plates where specified. Kick plates shall be 254 mm (10 inches) or 305 mm (12 inches) high. Both kick and mop plates shall be minimum 1.27 mm (0.050 inches) thick. Provide kick 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 plates to within 6 mm (1/4 inch) of each edge of doors. For jamb stop requirements, see specification sections pertaining to door frames.

2.17 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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.

2.18 EXIT DEVICES

- A. For fire doors shall comply with Underwriters Laboratories, Inc., requirements for Fire Exit Hardware. Submit proof of compliance.

2.19 FLUSH BOLTS (LEVER EXTENSION) (NOT USED)

2.20 FLUSH BOLTS (AUTOMATIC) (NOT USED)

2.21 LIGATURE RESISTANT DOOR ALARM (NOT USED)

2.22 DOOR PULLS WITH PLATES (NOT USED)

2.23 PUSH PLATES (NOT USED)

2.24 COMBINATION PUSH AND PULL PLATES (NOT USED)

2.25 COORDINATORS (NOT USED)

2.26 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. At exterior doors and any interior doors exposed to moisture, provide threshold with non-slip abrasive finish.
- C. Provide with miter returns where threshold extends more than 12 mm (0.5 inch) beyond face of frame.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

**2.27 AUTOMATIC DOOR BOTTOM SEAL AND RUBBER GASKET FOR LIGHT PROOF OR SOUND
CONTROL DOORS**

- A. Conform to ANSI A156.22. Provide mortise or under-door type, except where not practical. For mortise automatic door bottoms, provide type specific for door construction (wood or metal).

2.28 WEATHERSTRIPS (FOR EXTERIOR DOORS)

- A. Conform to ANSI A156.22. Air leakage shall not to exceed 0.50 CFM per foot of crack length ($0.000774\text{m}^3/\text{s}/\text{m}$).

2.29 MISCELLANEOUS HARDWARE (NOT USED)

2.30 PADLOCKS FOR VARIOUS DOORS, GATES AND HATCHES (NOT USED)

2.31 THERMOSTATIC TEMPERATURE CONTROL VALVE CABINETS (NOT USED)

**2.32 HINGED WIRE GUARDS (FOR WINDOWS, DOORS AND TRANSOMS) AND WIRE PARTITION
DOORS (NOT USED)**

2.33 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.
- B. 626 or 630: All surfaces on exterior and interior of buildings, except where other finishes are specified.
- C. Miscellaneous Finishes (new doors in where no adjacent finishes exist to match:
1. Hinges --exterior doors: 626 or 630.
 2. Hinges --interior doors: 652 or 630.
 3. Door Closers: Factory applied paint finish. Dull or Satin Aluminum color.
 4. Thresholds: Mill finish aluminum.
 5. Other primed steel hardware: 600.
- D. Hardware Finishes for Existing Buildings: U.S. Standard finishes shall match finishes of hardware in (similar) existing spaces.

2.34 BASE METALS

- A. Apply specified U.S. Standard finishes on different base metals as following:

Finish	Base Metal
652	Steel
626	Brass or bronze

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

08 71 00-11
DOOR HARDWARE

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

Finish	Base Metal
630	Stainless steel

PART 3 - EXECUTION

3.1 HARDWARE HEIGHTS

- A. 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.Locate other hardware at standard commercial heights.

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. At exterior doors, closers shall be mounted on interior side. Where closers are mounted on doors they shall be mounted with hex 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
Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

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:

Door Description	Number butts
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

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. 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 and VA Station Locksmith that keys operate their respective locks in accordance with keying requirements. 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 and VA Station Locksmith 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

08 71 00-13
DOOR HARDWARE

01/16/2024

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.

ELECTRIC HARDWARE ABBREVIATIONS LEGEND:

ADO = Automatic Door Operator

EMCH = Electro-Mechanical Closer-Holder

MHO = Magnetic Hold-Open (wall- or floor-mounted)

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

C. INTERIOR SINGLE DOORS

HW-3G

<u>Each Door to Have:</u>	<u>NON-RATED</u>
Hinges	QUANTITY & TYPE AS REQUIRED
1 Office Lock	F04
1 Door Silencer/Stop	L03011
1 Coat Hook	L03121
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 - HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-4G

<u>Each Door to Have:</u>	<u>RATED/NON-RATED</u>
Hinges	QUANTITY & TYPE AS REQUIRED
1 Utility Lock	F09
1 Closer (@ Rated Doors)	C02011/C02021
1 Kick Plate	J102
1 1 Overhead Stop	COORDINATE WITH CLOSER
1 Set Self-Adhesive Seals	R0Y154

D. INTERIOR PAIRS OF DOORS (NOT USED)

E. EXTERIOR SINGLE DOORS

HW-E1

<u>Each Door to Have:</u>	<u>NON-RATED</u>
1 Continuous Hinge	
1 Passage Lock	
1 Closer	C02011/C02021
1 Kick Plate	J102
1 Overhead Stop	COORDINATE WITH CLOSER
1 Threshold (inswing door)	ALUMINUM, PER ARCHITECTURAL DETAIL
1 Door Sweep	R0Y416
1 Set Frame Seals	R0Y164
1 Drip	R0Y976

F. EXTERIOR PAIRS OF DOORS

G. EXTERIOR SINGLE GATES (NOT USED)

H. EXTERIOR PAIRS OF GATES (NOT USED)

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

01-01-21

- I. **RESIDENTIAL UNIT SINGLE DOORS (NOT USED)**
J. **RESIDENTIAL UNIT PAIRS OF DOORS (NOT USED)**
K. **INTERIOR SINGLE SECURITY DOORS**

HW-SH-3E

Each Access Control Door to Have: RATED

Hinges QUANTITY & TYPE AS REQUIRED
2 Full Mortise Hinge 4-WIRE TYPE AS REQUIRED, NRP
1 Electric Strike Faceplate
1 Electric Strike Mortise/Cylindrical Locksets
24V DC Power, Request to Exit or enter Signal
Switch, Deadbolt Monitor, Latchbolt Monitor
1 In-Line Power Controller
Utilize DC Power
1 Power Supply REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Closer C02011/C02021
1 Overhead Arm Stop Coordinated with Closer
1 Auto Door Bottom R0Y346 - HEAVY DUTY
2 Sets Self-Adhesive Seals R0Y154
1 Alarm Contact
INTERNAL DEADBOLT MONITOR SWITCH SHUNTS ACCESS CONTROL DEVICE WHEN
DEADBOLT IS THROWN.
120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.
CARD READER BY DIVISION 28.

- L. **INTERIOR PAIRS OF SECURITY DOORS (NOT USED)**
M. **EXTERIOR SINGLE SECURITY DOORS (NOT USED)**
N. **MENTAL HEALTH AREAS (NOT USED)**

- - - E N D - - -

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

08 71 00-16
DOOR HARDWARE

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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. Section 08 11 13, HOLLOW METAL DOORS AND FRAMES: Louvers in Steel Doors.
- B. Section 09 06 00, SCHEDULE FOR FINISHES: Color of finish.

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, operating devices, method of assembly, and installation and anchorage details.
- C. Manufacturer's Literature and Data:
 - 1. Each type of louver and vent.
- D. Color samples.
- E. Blast Design Calculations: Louver System and Anchorage
 - 1. Submit calculations for review and approval prepared by qualified blast consultant, with a minimum of 5 years experience in design of blast resistant window systems, verifying louver assembly including anchors comply with specified blast resistance performance. The magnitudes of the design threats W1, W2 and GP1,GP2 are defined in the Physical Security Design Standards Data Definitions which is a document separate from the referenced VA Security Design Manual. The Physical Security Design Standards Data Definitions are provided on a need to know basis by the blast/structural engineer performing the blast design on VA projects. It is the responsibility of the engineer of blast resistant windows to request and obtain the Physical Security Design Data Standard Data Definitions from the VA Office of Construction and Facilities Management (CFM). Any

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

associated delays or increased costs due to failure to obtain this
information will be borne by the contractor.

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-20.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - A653/A653M-20.....Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process
 - A1008/A1008M-20.....Steel, Sheet, Carbon, Cold Rolled, Structural, and High Strength Low-Alloy with Improved Formability
 - B209-14.....Aluminum and Aluminum Alloy, Sheet and Plate
 - B209M-14.....Aluminum and Aluminum Alloy, Sheet and Plate (Metric)
 - B221-14.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 - B221M-13.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)
 - D1187/D1187M-97(2018)...Asphalt-Base Emulsions for Use as Protective Coatings for Metal
- D. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06.....Metal Finishes Manual
- E. National Fire Protection Association (NFPA):
90A-15.....Installation of Air Conditioning and Ventilating Systems
- F. American Architectural Manufacturers Association (AAMA):
2605-13.....High Performance Organic Coatings on Architectural Extrusions and Panels

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

08 90 00 - 2
Louvers and Vents

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- G. Air Movement and Control Association, Inc. (AMCA):
500-L-07 Testing Louvers
- H Department of Veterans Affairs:
VA Physical Security Design Manual for Mission Critical Protected
Facilities January 2015
- I. Protective Design Center
PDC-TR-08 Single Degree of Freedom Structural Response Limits for
Antiterrorism Design

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Aluminum, Extruded: ASTM B221M (B221).
- B. Stainless Steel: ASTM A240/A240M, Type 302B.
- 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 operable type louvers of size and design shown.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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. Not used

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 (sliding interlocking type); 2 mm (0.078-inch) thick extruded 6063-T5 or -T52

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 pound per square foot.).
4. Louvers, operable: Louver frame opening sizes, single louver sizes and mullion requirements are to be as specified for fixed louvers.
 - a. Blades: Attach blades to frame with aluminum pivot pins through nylon bearings. Fasten each blade to stainless steel operation arms that are connected to minimum 3 mm (1/8-inch) thick stainless steel operating handle arranged for simultaneous operation of blades.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

2.3 CLOSURE ANGLES AND CLOSURE PLATES:

- A. Fabricate from 2 mm (0.078-inch) thick stainless steel or 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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 BLANK-OFF PANELS:

- A. Uninsulated panels attached with clips or screws as follows: Panel finish is to be same finish applied to louvers
 - 1. Aluminum sheet for aluminum louvers, 1.27 mm (0.050 inch) minimum thickness.
 - 2. Galvanized-steel sheet for galvanized-steel louvers, 1.02 mm (0.040 inch) minimum.
 - 3. Stainless-steel sheet for stainless-steel louvers, not less than 0.95 mm (0.038 inch) minimum.
- B. Insulated laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver with clips on screws and gasketed or sealant sealed perimeter. Panel finish is to be same finish applied to louvers.
 - 1. Thickness: 50 mm (2 inches).
 - 2. Aluminum sheet for aluminum louver 0.81 mm (0.032 inch) minimum.
 - 3. Galvanized-steel sheet for galvanized-steel louver 0.71 mm (0.028 inch) minimum.
 - 4. Stainless-steel sheet for stainless-steel louvers 0.79 mm (0.031 inch) minimum.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

5. Insulating Core: Rigid, glass-fiber-board insulation.

2.6 EXTERIOR DOOR LOUVERS:

- A. Fabricate of 1.6 mm (0.063-inch) thick extruded aluminum. Miter frames at corners and join by concealed corner brackets. Louvers are to be weather resistant type.
- B. Equip louvers on outside with wire guards, except omit wire guards for louvers in doors located completely below enclosed areaways.

2.7 INTERIOR DOOR LOUVERS:

- A. Fabricate louvers for interior doors 1.6 mm (0.063-inch) thick extruded aluminum.
- B. Make louvers sight-proof type with stationary blades.

2.8 WALL VENTS:

- A. Fabricate exterior wall vents from either 4.7 mm (0.185-inch) thick aluminum plate or 6 mm (1/4-inch) thick cast iron, perforated in diamond lattice pattern, with not over 19 mm (3/4-inch) openings.
- B. Vents are to have aluminum screen frame with aluminum alloy insect screening mounted on back of vent by means of 19 mm x 5 mm (3/4-inch by 3/16-inch) top and bottom bars screwed to grille.
- C. Vent Frames in Masonry: Fabricate of 45 mm x 30 mm x 5 mm (1-3/4 inch by 1-1/4 inch by 3/16-inch) steel angles bolted with 6 mm (1/4-inch) diameter expansion bolts at jambs.

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 0.8 mm (0.032-inch) thick aluminum sleeves in cavity walls.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

2.10 BRICK VENTS:

- A. Vents are to be of size shown formed of approximately 3 mm (0.125 inch) thick cast aluminum, or 3 mm (0.118 inch) extruded aluminum.
- B. Provide vents complete with aluminum screen frame with corrosion resistant insect screening mounted on back of vent.
- C. Provide vents with required anchors.

2.11 FINISH:

- A. In accordance with NAAMM Metal Finishes Manual: AMP 500-505
- B. Aluminum Louvers:
 - 1. Anodized finish
 - a. AA-M10C22A44, Chemically etched medium matte, with electronically deposited metallic compound, Class I Architectural, 0.17 mm (0.7 mils) thick color anodic coating. Dyes will not be accepted.
 - 2. Organic Finish: AAMA 2605 (Fluorocarbon coating) with total dry film thickness of not less than 0.03 mm (1.2 mil), color as indicated in Section 09 06 00, SCHEDULE FOR FINISHES.
- A. Aluminum Wall Vents: Sand blasted satin finish.
- B. Stainless Steel: Mechanical finish No. 4 in accordance with NAAMM Metal Finishes Manual.
- C. Galvanized Sheet Steel: Two-coat baked-enamel or powder-coat finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 0.05 mm (2 mils).
 - 1. Paint interior surfaces of lightproof louvers with two (2) additional finish shop coats of baked-on flat black enamel.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- D. Steel: Surfaces of steel work, for which no other finish is specified, are to be cleaned free from scale, rust, oil and grease, and then given a light colored prime paint after fabrication, except ferrous metals concealed in finished work. Paint all contact surfaces of assembled work (except welded contact surfaces) with an additional shop coat of similar paint.

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 colored 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 and vents 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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.

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DIVISION 09

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

SECTION 09 05 16
SUBSURFACE PREPARATION FOR FLOOR FINISHES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies subsurface preparation requirements for areas to receive the installation of applied flooring. This section includes removal of existing floor coverings and floor leveling and repair as required.

1.2 RELATED WORK

- A. Section 07 92 00, JOINT SEALANTS.
B. Section 09 65 19, RESILIENT TILE FLOORING

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. Underlayment Primer
2. Cementitious Self-Leveling Underlayment
3. 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. ASTM International (ASTM):

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

D638-14(2014).....Standard Test Method for Tensile Properties of
Plastics
D4259-18(2019).....Standard Practice for Preparation of Concrete
by Abrasion Prior to Coating Application.
C109/C109M-20b(2020)....Standard Test Method for Compressive Strength
of Hydraulic Cement Mortars (Using 2-in. or
[50-mm] Cube Specimens
7234-19(2020).....Standard Test Method for Pull-Off Adhesion
Strength of Coatings on Concrete Using Portable
Pull-Off Adhesion Testers
E96/E96M-16(2016).....Standard Test Methods for Water Vapor
Transmission of Materials
F710-1e1(2020).....Standard Practice for Preparing Concrete Floors
to Receive Resilient Flooring
F1869-16a.....Standard Test Method for Measuring Moisture
Vapor Emission Rate of Concrete Subfloor Using
Anhydrous Calcium Chloride
F2170-19a(2020).....Standard Test Method for Determining Relative
Humidity in Concrete Floor Slabs Using in situ
Probes
C348-20(2020).....Standard Test Method for Flexural Strength of
Hydraulic-Cement Mortars
C191-19(2020).....Standard Test Method for Time of Setting of
Hydraulic Cement by Vicat Needle

PART 2 - PRODUCTS

2.1 MOISTURE REMEDIATION COATING (NOT USED)

2.2 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.

- 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

09 05 16 - 2

Subsurface Preparation for Floor Finishes

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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 and 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.
- d. All puddles shall be removed, and material shall be allowed to dry, 1-2 hours at 70F/21C.
- e. 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 inch, require additional 3/8" aggregate to mix.

Property	Test	Value

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

09 05 16 - 3

Subsurface Preparation for Floor Finishes

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

J. Property	Test	Value
Compressive Strength	ASTM C109/C109M	2,200 psi @ 24 hrs 3,000 psi @ 7 days
Initial set time Final Set time	ASTM C191	30-45 min. 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

09 05 16 - 5

Subsurface Preparation for Floor Finishes

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

3.3 MOISTURE REMEDIATION COATING (NOT USED)

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.

- - - E N D - - -

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

09 05 16 - 6

Subsurface Preparation for Floor Finishes

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 or other building boards.

1.2 RELATED WORK

- A. Support for wall mounted items: Section 05 50 00, METAL FABRICATIONS.
- B. Ceiling suspension systems for acoustical tile: Section 09 51 00, ACOUSTICAL CEILINGS.
- C. 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 beams, 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:

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

06-01-18

1. Typical ceiling suspension system.
 2. Typical metal stud and furring construction system including details around openings and corner details.
 3. Typical shaftwall framing system including details.
 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)
- A641-09.....Zinc-Coated (Galvanized) Carbon Steel Wire
- A653/653M-11.....Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.
- C11-10.....Terminology Relating to Gypsum and Related Building Materials and Systems
- C635-07.....Manufacture, Performance, and Testing of Metal Suspension System for Acoustical Tile and Lay-in Panel Ceilings
- C636-08.....Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
- C645-09.....Non-Structural Steel Framing Members
- C754-11.....Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
- C841-03 (R2008).....Installation of Interior Lathing and Furring
- C954-10.....Steel 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

06-01-18

E580-11.....Application 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. Exception: Members that can show certified third party testing with gypsum board in accordance with ICC ES AC86 (Approved May 2012) need not meet the minimum thickness limitation or minimum section properties set forth in ASTM C 645. The submission of an evaluation report is acceptable to show conformance to this requirement. Use C 645 steel, 0.48mm (0.019 inch) minimum base-metal (19 mil).
- 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

06-01-18

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. Tie Wire and Hanger Wire:
1. ASTM A641, soft temper, Class 1 coating.
 2. Gage (diameter) as specified in ASTM C754 or ASTM C841.
- F. Attachments for Wall Furring:
1. Manufacturers standard items fabricated from zinc-coated (galvanized) steel sheet.
- G. Power Actuated Fasteners: Type and size as recommended by the manufacturer of the material being fastened.

2.5 SUSPENDED CEILING SYSTEM FOR GYPSUM BOARD (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.

06-01-18

- 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 16 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.

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).

06-01-18

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.

Direct attachment to masonry or concrete; rigid channels or "Z" channels: Install rigid (hat section) furring channels at 600 mm (24 inches) on center, horizontally or vertically.

Install "Z" furring channels vertically spaced not more than 600 mm (24 inches) on center.

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.
- C. 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, toilet stall partitions, urinal screens, chalkboards, tackboards, wall-hung casework, handrail brackets, recessed fire extinguisher cabinets and

06-01-18

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.
- C. Note where fire-rated or smoke rated assemblies are required, framing shall be installed to accommodate finishes needed to preserve such rated assemblies.

3.5 INSTALLING SHAFT WALL SYSTEM

- A. Conform to UL Design No. U438 for two-hour fire rating. Provide one hour fire rating Shaft wall as indicated on the drawings
- 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.
- F. Elevator Shafts:
 - 1. Frame elevator door frames with 0.87 mm (0.0341-inch) thick J strut or J stud jambs having 75 mm (three-inch) long legs on the shaft side.
 - 2. Protrusions including fasteners other than flange of shaft wall framing system or offsets from vertical alignments more than 3 mm (1/8-inch) are not permitted unless shown.

06-01-18

3. Align shaft walls for plumb vertical flush alignment from top to bottom of shaft.

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.
 1. Space framing at 600 mm (24-inch) centers for gypsum board anchorage.
- B. 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 attachment required.
- F. 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.
- G. 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 overhead 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

06-01-18

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.)

- - - E N D - - -

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

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, and soffits: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- B. 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:

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-20

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):

- C11-15.....Terminology Relating to Gypsum and Related
Building Materials and Systems
- C475-15.....Joint Compound and Joint Tape for Finishing
Gypsum Board
- C840-13.....Application and Finishing of Gypsum Board
- C919-12.....Sealants in Acoustical Applications
- C954-15.....Steel 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
- C1002-14.....Steel Self-Piercing Tapping Screws for the
Application of Gypsum Panel Products or Metal
Plaster Bases to Wood Studs or Steel Studs
- C1047-14.....Accessories for Gypsum Wallboard and Gypsum
Veneer Base
- C1177-13.....Glass Mat Gypsum Substrate for Use as Sheathing

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-20

C1178/C1178M-18.....Specification for Coated Glass Mat Water
Resistant Backing Panel

C1658-13.....Glass Mat Gypsum Panels

C1396-14.....Gypsum Board

C. Underwriters Laboratories Inc. (UL):

Latest Edition.....Fire Resistance Directory

D. Inchcape Testing Services (ITS):

Latest Editions.....Certification 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. Water Resistant Gypsum Backing Board: ASTM C1178, Type X, 16 mm (5/8 inch) thick.
- C. Paper facings shall contain 100 percent post-consumer recycled paper content.

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

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.

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. 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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-20

- 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.
 - G. 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.
 - H. Electrical and Telecommunications Boxes:
 1. Seal annular spaces between electrical and telecommunications receptacle boxes and gypsum board partitions.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-20

I. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

09 29 00 - 6
Gypsum Board

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

04-01-20

- 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.
- 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.
- F. Elevator Shafts:
1. Protrusions including fasteners other than flange of shaft wall framing system or offsets from vertical alignments more than 3 mm (1/8-inch) are not permitted unless shown.
 2. Align shaft walls for plumb vertical flush alignment from top to bottom of shaft.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

09 29 00 - 7
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 (NOT USED)

- - - E N D - - -

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

12-01-18

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.

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: Room Finish Legend as part of the Drawings.
- C. Ceiling Suspension System: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

12-01-18

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. VA Interior Designer.
- c. Contractor.
- d. Installer.
- e. Manufacturer's field representative.
- f. Other installers responsible for adjacent and intersecting work, including sprinkler, HVAC and lighting 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.

1.5 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

12-01-18

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

12-01-18

- 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: 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. Fire Resistance: ASTM E119; as component of 1 hour rated roof-ceiling assembly.
- C. Surface Burning Characteristics: When tested according to ASTM E84.
1. Flame Spread Rating: 25 maximum.
 2. Smoke Developed Rating: 450 maximum.

2.3 PRODUCTS - GENERAL

- A. Basis of Design: ROOM FINISH LEGEND as part of the Drawings.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

12-01-18

- B. Provide acoustical units from one manufacturer; Basis of Design:
Armstrong Fissured Lay-In 24"x24", color: white.
1. Provide each product exposed to view from one production run.
- C. Provide suspension system from same manufacturer. Basis of Design:
Armstrong Prelude XL Series 15/16" exposed tee, color: white.
- D. Sustainable Construction Requirements:
1. Mineral Base Recycled Content: 65 percent, post-consumer 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:
- B. Ceiling Panel and Tile: ASTM E1264, bio-based content according to USDA Bio-Preferred Product requirements; Basis of Design: Armstrong Fissured Lay-In 24"x24", color: white.
1.
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: 24 x 24 inch as indicated on Drawings, with square edges.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

12-01-18

2.5 METAL SUSPENSION SYSTEM

- A. General: ASTM C635, heavy-duty system, except as otherwise specified.
Basis of Design: Armstrong Prelude XL Series 15/16" exposed tee,
color: white.
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.
- C. Carrying Channels Secondary Framing: Cold-rolled or hot-rolled steel,
black asphaltic paint finish, rust free, or as otherwise required by
UL Design Number identified in the drawings.
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.
- 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).

12-01-18

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.

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.

12-01-18

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. 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.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

12-01-18

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. 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.

3.5 CEILING TREATMENT

A. Moldings:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2
Bancroft Architects + Engineers

12-01-18

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 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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Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes resilient base adhered to interior walls and partitions.
1. Design intent is that where any resilient base is altered or d as part of demolition at the telecommunications rooms (TRs) the adjacent finishes to remain shall be patched or replaced as required for a seamless finish appearance wherever possible.
 - a. Final locations of any required seams shall be coordinated with the COR prior to installation.
 2. General Contractor shall take extreme care to protect and minimize the impact of the demolition work to adjacent finishes.
 3. Resilient base will be installed in new rooms as indicated in the ROOM FINISH SCHEDULE as part of the drawings.

1.2 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
- F1344-15.....Rubber Floor Tile.
 - F1859-14e1.....Rubber Sheet Floor Covering without Backing.
 - F1860-14e1.....Rubber Sheet Floor Covering with Backing.
 - F1861-16.....Resilient Wall Base.
 - D4259-18.....Preparation of Concrete by Abrasion Prior to Coating Application.
- C. Federal Specifications (Fed. Spec.):
- RR-T-650E (1994).....Treads, Metallic and Non-Metallic, Skid-Resistant.
- D. International Concrete Repair Institute (ICRI):
- 310.2R-2013.....Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.3 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
- Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

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.

1.4 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.

1.5 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight facility.
- B. Protect products from damage when handling and during construction operations.

1.6 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.

1.7 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Basis of Design: ROOM FINISH LEGEND as part of the Drawings.
- B. Provide each product from one manufacturer and 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.

2.2 RESILIENT BASE

- A. As required to match existing.
- B. Where base is to be installed in new rooms:
 - 1. Resilient Base: 3 mm (1/8 inch) thick, 100 mm (4 inches) high.
 - a. Type: vinyl: Basis of Design - Johnsonite, color "FAWN 80"; use one type throughout.
- C. Applications:
 - 1. Carpet Flooring Locations: Style A - Straight.
 - 2. Other Locations: Style B - Cove.

2.3 RESILIENT STAIR TREADS (NOT USED)

2.4 SHEET RUBBER FLOORING (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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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. Factory 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

3.4 RESILIENT STAIR TREAD INSTALLATION (NOT USED)

3.5 SHEET RUBBER FLOORING INSTALLATION (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. Cover with reinforced kraft paper, and plywood or hardboard.
 - 2. 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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Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-01-18

SECTION 09 65 19
RESILIENT TILE FLOORING

PART 1 - GENERAL (UNDER REVIEW)

1.1 DESCRIPTION:

- A. This section specifies the installation of solid vinyl tile flooring, luxury vinyl tile and accessories required for a complete installation.
 - 1. Design intent is that where any solid vinyl tile, luxury vinyl tile and molding is altered or removed as part of demolition at the telecommunications rooms (TRs) the adjacent finishes to remain shall be patched or replaced as required for a seamless finish appearance wherever possible.
 - a. Final locations of any required seams shall be coordinated with the COR prior to installation.
 - 2. General Contractor shall take extreme care to protect and minimize the impact of the demolition work to adjacent finishes.

1.2 RELATED WORK:

- A. Resilient Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
- B. Subfloor Testing and Preparation: Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.
- C. Removal of Existing Construction Containing Asbestos:
Section 02 82 13.19, ASBESTOS FLOOR TILE AND MASTIC ABATEMENT.

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. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-01-18

2. Edge strip locations showing types and detail cross sections.

F. 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.
- C. Furnish product type materials from the same production run.

1.7 WARRANTY:

- A. Construction 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-01-18

B. ASTM International (ASTM):

D2047-11.....Test 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

E648-14c.....Critical Radiant Flux of Floor Covering Systems
Using a Radiant Energy Source

E662-14.....Specific Optical Density of Smoke Generated by
Solid Materials

E1155/E1155M-14.....Determining Floor Flatness and Floor Levelness
Numbers

F510/F510M-14.....Resistance to Abrasion of Resilient Floor
Coverings Using an Abrader with a Grit Feed
Method

F710-11.....Preparing Concrete Floors to Receive Resilient
Flooring

F925-13.....Test Method for Resistance to Chemicals of
Resilient Flooring

F1344-12 (R2013).....Rubber Floor Tile

F1700-13a.....Solid Vinyl Floor Tile

F1869-11.....Test Method for Measuring Moisture Vapor
Emission Rate of Concrete Subfloor Using
Anhydrous Calcium Chloride

F2170-11.....Test Method for Determining Relative Humidity
in Concrete Floor Slabs Using in Situ Probes

F2195-13.....Linoleum Floor Tile

C. Code of Federal Regulation (CFR):

40 CFR 59.....Determination of Volatile Matter Content, Water
Content, Density Volume Solids, and Weight
Solids of Surface Coating

D. International Standards and Training Alliance (INSTALL):

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-01-18

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.

2.4 SOLID VINYL-TILE:

- A. Tile Standard: ASTM F1700.
 - 1. Class: Class I, monolithic vinyl tile.
 - 2. Type: A, smooth surface.
- B. Thickness: Match existing.
- C. Size: Match existing.

2.2 LUXURY VINYL TILE:

- A. ASTM F1700, Class III, Printed Film Vinyl Tile, Type B.
- B. Thickness: Match existing.
- C. Size: Match existing.
- D. Provide products with recycled content with not less than 30 percent.
- E. Chemical Resistance: ASTM F925; pass.

2.3 ADHESIVES:

- A. Provide water resistant type adhesive for flooring, base and accessories as recommended by the manufacturer to suit substrate conditions. Submit manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics.

2.4 PRIMER FOR CONCRETE SUBFLOORS:

- A. Provide in accordance with Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

2.5 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-01-18

B. Polish: ASTM D4078.

2.10 MOULDING:

- A. Provide tapered mouldings of types as required to match existing, however 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 directly 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.

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-01-18

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. Match tile installation to approved mockup.

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-01-18

- 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.

- - - E N D - - -

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-01-18

SECTION 09 65 20
CONDUCTIVE ELECTRO-STATIC DISSIPATIVE RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies the installation of electro-static dissipative (ESD) solid vinyl tile flooring also referred to as conductive flooring and/or static dissipative tile (SDT) and accessories required for a complete installation. This section references ESD tile flooring as "ESD".
1. Design intent is that where any solid vinyl tile requiring electro-static dissipative properties is noted on the drawings at the telecommunications rooms (TRs) and Data Centers, the adjacent finishes to remain shall be patched or replaced as required for a seamless finish appearance wherever possible.
- a. Final locations of any required transitional seams between new floor finishes and existing floor finishes shall be coordinated with the COR prior to installation.
2. General Contractor shall take extreme care to protect and minimize the impact of the demolition work to adjacent finishes.

1.2 RELATED WORK:

- A. Resilient Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
- B. Subfloor Testing and Preparation: Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.
- C. Removal of Existing Construction Containing Asbestos: Section 02 82 13.19, ASBESTOS FLOOR TILE AND MASTIC ABATEMENT.
- D. See Electrical drawings and Specifications for grounding requirements.

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. Description of each product.
2. ESD Resilient tile material manufacturer's recommendations for grounding accessories, adhesives, underlayment, primers, and maintenance.
3. Application, installation, and maintenance instructions.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-01-18

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. 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 in addition to certification by the manufacturer of qualifications to perform installation of their products.
 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.
- C. Furnish product type materials from the same production run.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-01-18

1.7 WARRANTY:

- A. Construction 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):
- D2047-11.....Test 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
- E648-14c.....Critical Radiant Flux of Floor Covering Systems
Using a Radiant Energy Source
- E662-14.....Specific Optical Density of Smoke Generated by
Solid Materials
- ASTM F150-06 (2018) Standard Test Method for Electrical Resistance
of Conductive and Static dissipative resilient
Flooring
- E1155/E1155M-14.....Determining Floor Flatness and Floor Levelness
Numbers
- F510/F510M-14.....Resistance to Abrasion of Resilient Floor
Coverings Using an Abrader with a Grit Feed
Method
- F710-11.....Preparing Concrete Floors to Receive Resilient
Flooring
- F925-13.....Test Method for Resistance to Chemicals of
Resilient Flooring
- F1344-12 (R2013).....Rubber Floor Tile
- F1700-13a.....Solid Vinyl Floor Tile
- F1869-11.....Test Method for Measuring Moisture Vapor
Emission Rate of Concrete Subfloor Using
Anhydrous Calcium Chloride

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-01-18

F2170-11.....Test Method for Determining Relative Humidity
in Concrete Floor Slabs Using in Situ Probes

C. Code of Federal Regulation (CFR):

40 CFR 59.....Determination of Volatile Matter Content, Water
Content, Density Volume Solids, and Weight
Solids of Surface Coating

D. International Standards and Training Alliance (INSTALL).

E. NFPA 99

F. ANSI

ANSI/ESD S20.20-2014

ANSI/ESD 7.1

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.

2.4 SOLID VINYL-TILE:

- A. Tile Standard: Basis Of Design: American-Biltrite "Electrotile"
microground solid vinyl conductive floor tile, 24"x24", ASTM F 1700,
Class I, Type A monolithic or VA approved equal.

2.2 LUXURY VINYL TILE (NOT USED)

2.3 ADHESIVES:

- A. Provide water resistant type adhesive for flooring, base and accessories as recommended by the manufacturer to suit substrate conditions. Submit manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics.

2.4 PRIMER FOR CONCRETE SUBFLOORS:

- A. Provide in accordance with Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

09 65 20 - 4

Conductive Electro-Static Dissipative Resilient Tile Flooring

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-01-18

2.5 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: (NOT APPLICABLE).

2.10 MOULDING: (NOT USED)

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 directly 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.

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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-01-18

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. Match tile installation to approved mockup.
- D. Grounding: connect grounding leads to approved grounded outlets in accordance with manufacturer's requirements but not less than one grounded lead per 144 square feet of floor area.
- E. 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 or as otherwise indicated on the drawings.
 4. Roll tile floor with a minimum 45 kg (100 pound) roller unless otherwise required by manufacturer.
- F. Seal joints at pipes with sealants in accordance with Section 07 92 00, JOINT SEALANTS.
- G. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

05-01-18

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. Do not apply polish to ESD type flooring.
- 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, re-clean resilient materials.

3.5 LOCATION:

- A. Unless otherwise indicated in construction documents, install tile flooring, under areas where casework and furniture and other equipment occur.
- B. Extend tile flooring for room into adjacent closets and alcoves.

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Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

SECTION 09 91 00

PAINTING (IN DEVELOPMENT)

PART 1 - GENERAL (IN DEVELOPMENT)

1) DESCRIPTION

B. 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:

- a) Fire Retardant coatings of wood surfaces as noted on the drawings.
- b) Prime coats which may be applied in shop under other sections.
- c) Prime painting unprimed surfaces to be painted under this Section.
- d) 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.
- e) Painting ferrous metal (except stainless steel) exposed to view.
- f) Painting galvanized ferrous metals exposed to view.
- g) Painting gypsum drywall exposed to view.
- h) Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.
- i) Painting surfaces above, behind or below grilles, gratings, diffusers, louvers lighting fixtures, and the like, which are exposed to view through these items.
- j) Painting/coating exposed exterior concrete foundation walls. Basis of Design shall be "Loxon XP" waterproofing masonry coating as manufactured by Sherwin-Williams.
- k) Painting includes shellacs, stains, varnishes, coatings specified, and striping or markers and identity markings.
- l) Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- m) 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.

2) **RELATED WORK**

- C. Section 01 35 26, SAFETY REQUIREMENTS: Activity Hazard Analysis.
D. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Sustainable Design Requirements.
E. Section 04 05 13, MASONRY MORTARING: Masonry Repairs.
F. Section 04 05 16, MASONRY GROUTING: Masonry Repairs.
G. Division 05 METALS: Shop prime painting of steel and ferrous metals.
H. Division 08 OPENINGS: Shop prime painting of steel and ferrous metals.
I. Section 08 14 00, INTERIOR WOOD DOORS: Prefinished flush doors with transparent finishes.
J. ROOM FINISH LEGEND as part of the Drawings.
K. Division 21 FIRE SUPPRESSION: Shop prime painting of steel and ferrous metals.
L. Division 22 PLUMBING: Shop prime painting of steel and ferrous metals.
M. Division 23 HEATING; VENTILATION AND AIR-CONDITIONING: Shop prime painting of steel and ferrous metals.
N. Division 26 ELECTRICAL: Shop prime painting of steel and ferrous metals.
O. Division 27 COMMUNICATIONS: Shop prime painting of steel and ferrous metals.
P. Division 28 ELECTRONIC SAFETY AND SECURITY: Shop prime painting of steel and ferrous metals.
Q. Division 32 EXTERIOR IMPROVEMENTS: Shop prime painting of steel and ferrous metals.
R. Section 32 17 23, PAVEMENT MARKINGS: Asphalt and concrete pavement marking.

1) **SUBMITTALS**

- S. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
T. Sustainable Design Submittals as described below:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- a) Volatile organic compounds per volume as specified in
PART 2 - PRODUCTS.

U. Painter qualifications.

V. Manufacturer's Literature and Data:

- a) 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.

W. Sample Panels:

- a) After painters' materials have been approved and before work is started, submit sample panels showing each type of finish and color specified.
- b) Panels to Show Color: Composition board, 100 x 250 mm (4 x 10 inch).
- c) 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.

- d) Attach labels to panel stating the following:

- b. Federal Specification Number or manufacturer's name and product number of paints used.
- c. Product type and color.
- d. Name of project.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- a) Strips showing not less than 50 mm (2 inch) wide strips of undercoats and 100 mm (4 inch) wide strip of finish coat.

X. Sample of identity markers if used.

Y. Manufacturers' Certificates indicating compliance with specified requirements:

- a) Manufacturer's paint substituted for Federal Specification paints meets or exceeds performance of paint specified.
- b) High temperature aluminum paint.
- c) Epoxy coating.
- d) Intumescent clear coating or fire-retardant paint.
- e) Plastic floor coating.

2) **DELIVERY AND STORAGE**

Z. Deliver materials to site in manufacturer's sealed container marked to show following:

- a) Name of manufacturer.
- b) Product type.
- c) Batch number.
- d) Instructions for use.
- e) Safety precautions.

AA. In addition to manufacturer's label, provide a label legibly printed as following:

- a) Federal Specification Number, where applicable, and name of material.
- b) Surface upon which material is to be applied.
- c) Specify Coat Types: Prime; body; finish; etc.

BB. 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.

CC. 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) **QUALITY ASSURANCE**

DD. 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

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

preparation and application of coating on a minimum of three (3) similar projects within the past three (3) years.

EE. 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) **MOCK-UP PANEL (NOT USED)**

2) **REGULATORY REQUIREMENTS**

FF. Paint materials are to conform to the restrictions of the local Environmental and Toxic Control jurisdiction.

a) 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.

b) Lead-Base Paint:

b. 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.

c. 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.

d. Do not use coatings having a lead content over 0.06 percent by weight of non-volatile content.

e. For lead-paint removal, see Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL.

a) Asbestos: Provide materials that do not contain asbestos.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- b) Chromate, Cadmium, Mercury, and Silica: Provide materials that do not contain zinc-chromate, strontium-chromate, Cadmium, mercury or mercury compounds or free crystalline silica.
- c) Human Carcinogens: Provide materials that do not contain any of the ACGIH-BKLT and ACGHI-DOC confirmed or suspected human carcinogens.
- d) Use high performance acrylic paints in place of alkyd paints.

2) **SAFETY AND HEALTH**

GG. Apply paint materials using safety methods and equipment in accordance with the following:

- a) 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.

HH. Safety Methods Used During Paint Application: Comply with the requirements of SSPC PA Guide 10.

II. Toxic Materials: To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:

- a) The applicable manufacturer's Material Safety Data Sheets (MSDS) or local regulation.
- b) 29 CFR 1910.1000.
- c) ACHIH-BKLT and ACGHI-DOC, threshold limit values.

2) **APPLICABLE PUBLICATIONS**

JJ. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by basic designation only.

KK. American Conference of Governmental Industrial Hygienists (ACGIH):
ACGIH TLV-BKLT-2012.....Threshold Limit Values (TLV) for Chemical
Substances and Physical Agents and Biological
Exposure Indices (BEIs)
ACGIH TLV-DOC-2012.....Documentation of Threshold Limit Values and
Biological Exposure Indices, (Seventh Edition)

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

LL. ASME International (ASME):

A13.1-07(R2013).....Scheme for the Identification of Piping Systems

MM. Code of Federal Regulation (CFR):

40 CFR 59.....Determination of Volatile Matter Content, Water
Content, Density Volume Solids, and Weight Solids
of Surface Coating

NN. Commercial Item Description (CID):

A-A-1272A.....Plaster Gypsum (Spackling Compound)

OO. Federal Specifications (Fed Spec):

TT-P-1411A.....Paint, Copolymer-Resin, Cementitious (For
Waterproofing Concrete and Masonry Walls) (CEP)

PP. Master Painters Institute (MPI):

- 1 Aluminum Paint
- 3 Primer, Alkali Resistant, Water Based
- 4 Interior/ Exterior Latex Block Filler
- 5 Exterior Alkyd Wood Primer
- 6 Exterior, Latex for Exterior Wood Primer
- 7 Exterior Oil Wood Primer
- 8 Exterior Alkyd, Flat MPI Gloss Level 1
- 9 Exterior Alkyd Enamel MPI Gloss Level 6
- 10 Exterior Latex, Flat
- 11 Exterior Latex, Semi-Gloss
- 15 Exterior Latex, Low Sheen (MPI Gloss Level 3-4)
- 17 Primer, Bonding, Waterbased
- 18 Organic Zinc Rich Primer
- 22 Aluminum Paint, High Heat (up to 590° - 1100F)
- 23 Primer, Metal, Surface Tolerant
- 27 Exterior / Interior Alkyd Floor Enamel, Gloss
- 31 Polyurethane, Moisture Cured, Clear Gloss
- 36 Knot Sealer
- 39 Primer, Latex, for Interior Wood
- 40 Exterior, Latex High Build
- 42 Textured Coating, Latex, Flat
- 43 Interior Satin Latex, MPI Gloss Level 4
- 44 Interior Low Sheen Latex, MPI Gloss Level 2

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 45 Interior Primer Sealer
- 46 Interior Enamel Undercoat
- 47 Interior Alkyd, Semi-Gloss, MPI Gloss Level 5
- 48 Interior Alkyd, Gloss, MPI Gloss Level 6
- 50 Interior Latex Primer Sealer
- 51 Interior Alkyd, Eggshell, MPI Gloss Level 3
- 52 Interior Latex, MPI Gloss Level 3
- 53 Interior Latex, Flat, MPI Gloss Level 1
- 54 Interior Latex, Semi-Gloss, MPI Gloss Level 5
- 59 Interior/Exterior Alkyd Porch & Floor Enamel, Low Gloss
- 60 Interior/Exterior Latex Porch & Floor Paint, Low Gloss
- 66 Interior Alkyd Fire Retardant, Clear Top-Coat (ULC Approved)
- 67 Interior Latex Fire Retardant, Top-Coat (ULC Approved)
- 68 Interior/ Exterior Latex Porch & Floor Paint, Gloss
- 71 Polyurethane, Moisture Cured, Clear, Flat
- 77 Epoxy Cold Cured, Gloss
- 79 Marine Alkyd Metal Primer
- 90 Interior Wood Stain, Semi-Transparent
- 91 Wood Filler Paste
- 94 Exterior Alkyd, Semi-Gloss
- 95 Fast Drying Metal Primer
- 98 High Build Epoxy Coating
- 99 Sealer, Water-based, for Concrete Floors
- 101 Epoxy Anti-Corrosive Metal Primer
- 107 Primer, Rust-Inhibitive, Water-based
- 108 High Build Epoxy Coating, Low Gloss
- 113 Elastomeric, Pigmented, Exterior, Water-based, Flat
- 114 Interior Latex, Gloss
- 115 Epoxy-Modified Latex, Interior Gloss (MPI gloss level 6)
- 118 Dry Fall, Latex Flat
- 119 Exterior Latex, High Gloss (acrylic)
- 134 Galvanized Water Based Primer
- 135 Non-Cementitious Galvanized Primer
- 138 Interior High Performance Latex, MPI Gloss Level 2
- 139 Interior High Performance Latex, MPI Gloss Level 3

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 140 Interior High Performance Latex, MPI Gloss Level 4
- 141 Interior High Performance Latex (SG) MPI Gloss Level 5
- 144 Latex, Interior, Institutional Low Odor / VOC, (MPI Gloss Level 2)
- 145 Latex, Interior, Institutional Low Odor / VOC, (MPI Gloss Level 3)
- 146 Latex, Interior, Institutional Low Odor / VOC, (MPI Gloss Level 4)
- 151 Light Industrial Coating, Interior, Water-based, (MPI Gloss Level 3)
- 153 Light Industrial Coating, Interior, Water-based, (MPI Gloss Level 4)
- 163 Exterior Water Based Semi-Gloss Light Industrial Coating, MPI Gloss Level 5
- 164 Exterior, Water Based, Gloss, Light Industrial Coating, MPI Gloss Level 6

QQ. 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 10.....Guide to Safety and Health Requirements

RR. Maple Flooring Manufacturer's Association (MFMA):

SS. U.S. National Archives and Records Administration (NARA):

29 CFR 1910.1000.....Air Contaminants

TT. Underwriter's Laboratory (UL)

PART 2 - PRODUCTS

1) **MATERIALS:**

B. Conform to the coating specifications and standards referenced in PART 3.

Submit manufacturer's technical data sheets for specified coatings and solvents.

1) **PAINT PROPERTIES:**

C. Use ready-mixed (including colors), except two component epoxies, polyurethanes, polyesters, paints having metallic powders packaged separately and paints requiring specified additives.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- D. Where no requirements are given in the referenced specifications for primers, use primers with pigment and vehicle, compatible with substrate and finish coats specified.
- E. 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.
- F. 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:
- a) Flat Paints and Coatings: 50 gram/liter.
 - b) Non-flat Paints and Coatings: 150 gram/liter.
 - c) Dry-Fog Coatings: 400 gram/liter.
 - d) Primers, Sealers, and Undercoaters: 200 gram/liter.
 - e) Anticorrosive and Antirust Paints applied to Ferrous Metals: 250 gram/liter.
 - f) Zinc-Rich Industrial Maintenance Primers: 340 gram/liter.
 - g) Pretreatment Wash Primers: 420 gram/liter.
 - h) Shellacs, Clear: 730 gram/liter.
 - i) Shellacs, Pigmented: 550 gram/liter.
- G. 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.
- 1) **PLASTIC TAPE:**
- H. Pigmented vinyl plastic film in colors as specified.
- I. Pressure sensitive adhesive back.
- J. Snap on coil plastic markers.

1) **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	67 percent biobased material

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

Solvent Alkyd	
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

1) **JOB CONDITIONS:**

B. Safety: Observe required safety regulations and manufacturer's warning and instructions for storage, handling and application of painting materials.

- a) Take necessary precautions to protect personnel and property from hazards due to falls, injuries, toxic fumes, fire, explosion, or other harm.
- b) 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.

C. Atmospheric and Surface Conditions:

- a) Do not apply coating when air or substrate conditions are:
 - b. Less than 3 degrees C (5 degrees F) above dew point.
 - c. 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.
 - d. When the relative humidity exceeds 85 percent; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.
- a) Maintain interior temperatures until paint dries hard.
- b) Do no exterior painting when it is windy and dusty.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

c) Do not paint in direct sunlight or on surfaces that the sun will warm.

2) **APPLY ONLY ON CLEAN, DRY AND FROST-FREE SURFACES. INSPECTION:**

D. 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.

1) **GENERAL WORKMANSHIP REQUIREMENTS:**

- E. Application may be by brush or roller. Spray application only upon acceptance from the COR in writing.
- F. 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.
- G. 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.
- H. 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.
- I. 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.
- J. 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.
- K. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- L. All coats are to be dry to manufacturer's recommendations before applying succeeding coats.
- M. 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.
- N. Do not apply paint behind frameless mirrors that use mastic for adhering to wall surface.

1) **SURFACE PREPARATION:**

O. General:

- a) 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.
- b) See other sections of specifications for specified surface conditions and prime coat.
- c) Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.
- d) 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.
- e) Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

b. Gypsum Board: 12 percent.

P. Wood:

- a) Sand to a smooth even surface and then dust off.
- b) Sand surfaces showing raised grain smooth between each coat.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

Q. Wipe surface with a tack rag prior to applying finish. Surface painted with a fire-retardant coating shall be free of knots, sap and pitch streaks. Ferrous Metals:

- a) Remove oil, grease, soil, drawing and cutting compounds, flux and other detrimental foreign matter in accordance with SSPC-SP 1 (Solvent Cleaning).
- b) 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).
- c) Fill dents, holes and similar voids and depressions in flat exposed surfaces of hollow steel doors and frames, access panels, 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.

b. Fill flat head countersunk screws used for permanent anchors.

c. Do not fill screws of item intended for removal such as glazing beads.

- a) 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.
- b) Spot prime abraded and damaged areas which expose bare metal of factory finished items with paint as recommended by manufacturer of item.

R. Zinc-Coated (Galvanized) Metal Painted:

- a) Clean surfaces to remove grease, oil and other deterrents to paint adhesion in accordance with SSPC-SP 1 (Solvent Cleaning).
- b) 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.

2. Gypsum Board: Remove efflorescence, loose and chalking or finishing materials.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- a) Remove dust, dirt, and other deterrents to paint adhesion.
- b) 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.

S. Concrete:

- a) Remove efflorescence, loose and chalking or finishing materials.
- b) Remove dust, dirt, and other deterrents to paint adhesion.
- c) 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.

2) PAINT PREPARATION:

- T. Thoroughly mix painting materials to ensure uniformity of color, complete dispersion of pigment and uniform composition.
- U. 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.
- V. Remove paint skins, then strain paint through commercial paint strainer to remove lumps and other particles.
- W. 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.
- X. For tinting required to produce exact shades specified, use color pigment recommended by the paint manufacturer.

1) APPLICATION:

- Y. Start of surface preparation or painting will be construed as acceptance of the surface as satisfactory for the application of materials.
- Z. 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.

AA. Apply each coat evenly and cover substrate completely.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- BB. Allow not less than 48 hours between application of succeeding coats, except as allowed by manufacturer's printed instructions, and approved by COR.
- CC. Apply by brush or roller. Spray application for new or existing occupied spaces only upon approval by acceptance from COR in writing.
- a) Apply painting materials specifically required by manufacturer to be applied by spraying.
 - b) 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.
- DD. 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.
- EE. For fire retardant coatings, follow manufacturer's recommendations.
- 1) **PRIME PAINTING:**
- FF. After surface preparation, prime surfaces before application of body and finish coats, except as otherwise specified.
- GG. Spot prime and apply body coat to damaged and abraded painted surfaces before applying succeeding coats.
- HH. 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.
- II. Metals except boilers, incinerator stacks, and engine exhaust pipes:
- a) Steel and iron: Use MPI 101 (Cold Curing Epoxy Primer) where MPI 77 (Epoxy Cold Cured, Gloss finish is specified.
 - b) Zinc-coated steel and iron: MPI 134 (Waterborne Galvanized Primer).
 - c) Aluminum scheduled to be painted: MPI 95 (Fast Drying Metal Primer).

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- d) Copper and copper alloys scheduled to be painted: MPI 95 (Fast Drying Metal Primer).
- e) Machinery not factory finished: MPI 9 (Exterior Alkyd Enamel).

JJ. Gypsum Board:

- a) 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.
- b) Primer: MPI 50 (Interior Latex Primer Sealer) except use MPI 45 (Interior Primer Sealer) in bathrooms.

KK. Gypsum Plaster and Veneer Plaster:

- a) MPI 45 (Interior Primer Sealer), except use MPI 50 (Interior Latex Primer Sealer) when an alkyd flat finish is specified.

2) SURFACES SCHEDULED TO HAVE MPI 53 (INTERIOR LATEX, FLAT, MPI GLOSS LEVEL 1) FINISH:MPI 53 (INTERIOR LATEX, FLAT, MPI GLOSS LEVEL 1). EXTERIOR FINISHES:

Apply following finish coats where specified in the ROOM FINISH SCHEDULE as part of the drawings. B. Steel and ferrous Metal including hollow metal doors and frames:

- LL. Two (2) coats of MPI 94 (Exterior Alkyd, Semi-Gloss) on exposed surfaces, except on surfaces over 94 degrees C (201 degrees F).

1) INTERIOR FINISHES:

- MM. Apply following finish coats over prime coats in spaces or on surfaces specified in the ROOM FINISH SCHEDULE as part of the Drawings.

NN. Metal Work:

- a) Apply to exposed surfaces.
- b) Omit body and finish coats on surfaces concealed after installation except electrical conduit containing conductors over 600 volts.

c) Ferrous Metal, Galvanized Metal, and Other Metals Scheduled:

- b. Apply two (2) coats of MPI 47 (Interior Alkyd, Semi-Gloss) unless specified otherwise.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- c. Two (2) coats of MPI 51 (Interior Alkyd, Eggshell).
- OO. Gypsum Board:
- a) One (1) coat of PI 45 (Interior Primer Sealer) plus one (1) coat of MPI 139 (Interior High Performance Latex, MPI Gloss level 1).Level 5) MPI 114 (Interior Latex, Gloss).
- PP. Wood:
- a) Sanding:
 - b) Use 220-grit sandpaper.
 - 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. Comply with manufacturer's recommendations.Paint Finish:
 - d) Fire retardant coating per manufacturer's recommended application criteria.
- 2) **REFINISHING EXISTING PAINTED SURFACES:**
- QQ. 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.
- RR. Remove and reinstall items as specified under "General Workmanship Requirements".
- SS. Remove existing finishes or apply separation coats to prevent non compatible coatings from having contact.
- TT. 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.
- UU. Except where scheduled for complete painting apply finish coat over plane surface to nearest break in plane, such as corner, reveal, or frame.
- VV. Refinish areas as specified for new work to match adjoining work unless specified or scheduled otherwise.
- WW. Coat knots and pitch streaks showing through old finish with MPI 36 (Knot Sealer) before refinishing.
- XX. Sand or dull glossy surfaces prior to painting.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

YY. Sand existing coatings to a feather edge so that transition between new and existing finish will not show in finished work.

1) **PAINT COLOR:**

ZZ. Color and gloss of finish coats is specified in the ROOM FINISH LEGEND as part of the Drawings.

AAA. For additional requirements regarding color see Articles, "REFINISHING EXISTING PAINTED SURFACE" and "MECHANICAL AND ELECTRICAL FIELD PAINTING SCHEDULE".

BBB. Coat Colors:

- a) Color of priming coat: Lighter than body coat.
- b) Color of body coat: Lighter than finish coat.
- c) Color prime and body coats to not show through the finish coat and to mask surface imperfections or contrasts.

CCC. Painting, Caulking, Closures, and Fillers Adjacent to Casework:

- a) Paint to match color of casework where casework has a paint finish.
- b) Paint to match color of wall where casework is stainless steel, plastic laminate, or varnished wood.

2) **MECHANICAL AND ELECTRICAL WORK FIELD PAINTING SCHEDULE:**

DDD. 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.

EEE. 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.

FFF. Paint after tests have been completed.

GGG. Omit prime coat from factory prime-coated items.

HHH. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

III. Omit field painting of items specified in "BUILDING AND STRUCTURAL WORK FIELD PAINTING"; "Building and Structural Work not Painted".

JJJ. Color:

a) Paint items having no color specified in the ROOM FINISH LEGEND as part of the Drawings to match surrounding surfaces.

b) Paint colors as specified in the ROOM FINISH LEGEND as part of the Drawings except for following:

b. White: Exterior unfinished surfaces of enameled plumbing fixtures.

c. 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.

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.

KKK. Apply paint systems on properly prepared and primed surface as follows:

a) Interior Locations:

b. Apply two (2) coats of MPI 47 (Interior Alkyd, Semi-Gloss) to following items:

Metal under 94 degrees C (201 degrees F) of items such as bare piping, fittings, hangers and supports.

Equipment and systems such as hinged covers and frames for control cabinets and boxes, cast-iron radiators, electric conduits and panel boards.

Heating, ventilating, air conditioning, plumbing equipment, and machinery having shop prime coat and not factory finished.

c. Paint electrical conduits containing cables rated 600 volts or more using two (2) coats of MPI 94 (Exterior Alkyd, Semi-gloss) in the Federal Safety Orange color in exposed and concealed spaces full length of conduit.

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- a) Other exposed locations:
- d. Metal surfaces, except aluminum, of cooling towers exposed to view, including connected pipes, rails, and ladders: Two (2) coats of MPI 1 (Aluminum Paint).
- e. 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 119 (Exterior Latex, High Gloss (acrylic)).

1) **BUILDING AND STRUCTURAL WORK FIELD PAINTING:**

LLL. Painting and finishing of interior and exterior work except as specified here-in-after.

- a) Painting and finishing of new and existing work including colors and gloss of finish selected is specified in the ROOM FINISH LEGEND or otherwise noted as part of the Drawings.
- b) Painting of exposed exterior concrete foundation walls shall be in accordance with manufacturer's recommendations.
- c) Painting of disturbed, damaged and repaired or patched surfaces when entire space is not scheduled for complete repainting or refinishing.
- d) Painting of ferrous metal and galvanized metal.
- e) Identity painting and safety painting.

MMM. Building and Structural Work not Painted:

- a) Prefinished items:
- b. Casework, doors, elevator entrances and cabs, metal panels, wall covering, and similar items specified factory finished under other sections.
- c. Factory finished equipment.
 - a) Finished surfaces:
 - d. Hardware except ferrous metal.
 - e. Anodized aluminum, stainless steel, chromium plating, copper, and brass, except as otherwise specified.
 - f. Signs, fixtures, and other similar items integrally finished.
 - a) Concealed surfaces:
 - g. Inside duct shafts, interstitial spaces, crawl spaces, above ceilings, except as otherwise specified.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- h. Inside walls or other spaces behind access doors or panels.
- i. Surfaces concealed behind permanently installed casework and equipment.
 - a) Moving and operating parts:
- j. Shafts, chains, gears, mechanical and electrical operators, linkages, and sprinkler heads, and sensing devices.
 - a) Labels:
- k. Code required label, such as Underwriters Laboratories Inc., Intertek Testing Service or Factory Mutual Research Corporation.
- l. Identification plates, instruction plates, performance rating, and nomenclature.
 - a) Gaskets.
 - b) Structural steel to receive sprayed-on fire proofing.

2) IDENTITY PAINTING SCHEDULE:

- NNN. 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.
- a) Legend may be identified using snap-on coil plastic markers or by paint stencil applications.
 - b) 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.
 - c) Locate Legends clearly visible from operating position.
 - d) Use arrow to indicate direction of flow using black stencil paint.
 - e) 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:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- b. High Pressure - 414 kPa (60 psig) and above.
- c. Medium Pressure - 104 to 413 kPa (15 to 59 psig).
- d. Low Pressure - 103 kPa (14 psig) and below.
- e. Add Fuel oil grade numbers.

a) Legend name in full or in abbreviated form as follows:

PIPING	COLOR OF EXPOSED PIPING	COLOR OF BACKGROUND	COLOR OF LETTERS	LEGEND 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

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
 Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

(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

b) Electrical Conduits containing feeders over 600 volts, paint
 legends using 50 mm (2 inch) high black numbers and letters,

Contract No. 36C26319D0044
 Station Project No. 437-21-210
 Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.

- c) 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 28.33, CONDUITS AND BACKBOXES FOR ELECTRONIC SAFETY
AND SECURITY.

000. Fire and Smoke Partitions:

- a) Identify partitions above ceilings on both sides of partitions except within shafts in letters not less than 64 mm (2 1/2 inches) high.
- b) Stenciled message: "SMOKE BARRIER" or, "FIRE BARRIER" as applicable. Color: Red. Indicate rating (1HR OR 2HR) IN STENCILED MESSAGE.
- c) 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.
- d) Use semi-gloss paint of color that contrasts with color of substrate.

PPP. Identify columns in plenum space:

- a) Apply stenciled number and letters to correspond with grid numbering and lettering indicated on construction documents.
- b) Paint numbers and letters 101 mm (4 inches) high, locate 45 mm (18 inches) below overhead structural slab.
- c) Apply on four (4) sides of interior columns and on inside face only of exterior wall columns.
- d) Color:

b. Use black on concrete columns.

c. Use white or contrasting color on steel columns.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

09 91 00 - 25
Painting

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

1) **PROTECTION CLEAN UP, AND TOUCH-UP:**

- QQQ. Protect work from paint droppings and spattering by use of masking, drop cloths, removal of items or by other approved methods.
- RRR. Upon completion, clean paint from hardware, glass and other surfaces and items not required to be painted of paint drops or smears.
- SSS. 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.

- - - E N D - - -

DIVISION 10

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

SECTION 10 14 00

SIGNAGE

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies interior signage for room numbers, code required signs and temporary signs.

1. Design intent is that scheduled signs shall match existing adjacent signs within the immediate vicinity.

a. There is no campus sign standard. General Contractor shall be responsible for ensuring that all sign types as required to match existing adjacent signs are accounted for and scheduled.

1) Where existing signs cannot be matched, General Contractor shall coordinate with the COR for an approximate match.

a) General Contractor shall provide recommended match to the COR for approval.

b) Basis Of Design in the absence of the design criteria as listed above and with the COR's approval, shall be based upon the following sign system providers:

2/90 Sign Systems - Manufacturer

5356 Corporate Grove Blvd, SE

Grand Rapids, MI 49512

and

Architectural Sign Associates - Designer

PO 11716

Pittsburgh, PA 15228

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Sustainable Design Requirements.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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: As required to match existing adjacent, including all varied types throughout the campus.
 - 2. Color samples: As required to match existing adjacent, including all varied types throughout the campus.
 - 3. Sample of typeface, arrow and symbols in a typical full-size layout.
- D. 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.
 - 3. Manufacturer shall provide a comprehensive Standards Manual in both a paper and PDF format. The manual shall include all graphic standards, sign type descriptions, renderings showing color, pattern and finish, engineering drawings, location plans, plots, artwork, insert templates, mounting detail, and reorder information.
- E. Sign Location Plan, showing location, type and total number of signs required.
- F. Shop Drawings: Scaled for manufacture and fabrication of sign types. Identify materials, show joints, welds, anchorage, accessory items, mounting and finishes.
- G. Full size layout patterns for dimensional letters.
- 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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):
 - 611-14.....Anodized Architectural Aluminum
 - 2603-13.....Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels
- C. American National Standards Institute (ANSI):
 - A117.1-09.....Accessible and Usable Buildings and Facilities
- D. ASTM International (ASTM):
 - A36/A36M-19.....Carbon Structural Steel
 - A240/A240M-20.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - A666-15.....Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
 - A1011/A1011M-18a.....Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
 - B36/B36M-18.....Brass Plate, Sheet, Strip, and Rolled Bar
 - B152/B152M-19.....Copper Sheet, Strip, Plate, and Rolled Bar
 - B209-14.....Aluminum and Aluminum-Alloy Sheet and Plate

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- B209M-14.....Aluminum and Aluminum-Alloy Sheet and Plate
(Metric)
- B221-14.....Aluminum and Aluminum-Alloy Extruded Bars,
Rods, Wire, Shapes, and Tubes
- B221M-13.....Aluminum and Aluminum-Alloy Extruded Bars,
Rods, Wire, Shapes, and Tubes (Metric)
- C1036-16.....Flat Glass
- C1048-18.....Heat-Treated Flat Glass-Kind HS, Kind FT Coated
and Uncoated Glass
- C1349-17.....Architectural Flat Glass Clad Polycarbonate
- D1003-13.....Test Method for Haze and Luminous Transmittance
of Transparent Plastics
- D4802-16.....Poly(Methyl Methacrylate) Acrylic Plastic Sheet
- E. Code of Federal Regulation (CFR):
- 40 CFR 59.....Determination of Volatile Matter Content, Water
Content, Density Volume Solids, and Weight
Solids of Surface Coating
- F. Federal Specifications (Fed Spec):
- MIL-PRF-8184F.....Plastic Sheet, Acrylic, Modified.
- MIL-P-46144C.....Plastic Sheet, Polycarbonate
- G. National Fire Protection Association (NFPA):
- 70-14.....National Electrical Code
- H. Latest ADA Accessibility Guidelines

PART 2 - PRODUCTS

2.1 SIGNAGE GENERAL

- A. Basis of Design interior signage: Match adjacent signage for each building and each floor location.
- B. Provide signs of type as scheduled as part of the construction documents.
- C. Provide signs complete with lettering, framing and related components for a complete installation.
- D. Provide graphics items as completed units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- E. 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 (NOT USED)

2.3 INTERIOR SIGN MATERIALS

A. Aluminum:

1. Sheet and Plate: ASTM B209M (B209).
2. Extrusions and Tubing: ASTM B221M (B221).

B. Laminate:

1. 0.035" (nominal) standard grade, high pressure surface laminate. A painted sign face shall not be acceptable.
2. The sign shall incorporate balanced construction with the core sandwiched between laminates to prevent warping. Laminate on the sign face only shall not be acceptable.
3. The laminates (front and back) shall be pressure laminated and precision machined together to a 90-degree angle. Edges shall be smooth, void of chips, burrs, sharp edges and marks.

C. 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.

D. Polycarbonate: MIL-P-46144C; Type I, class 1.

E. Vinyl: Premium grade 0.1 mm (0.004 inch) thick machine cut, having a pressure sensitive adhesive and integral colors.

F. Adhesives:

1. Adhesives for Field Application: Mildew-resistant, non-staining 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).

G. Typography: Comply with VA Signage Design Manual.

1. Type Style: Helvetica Regular or Light Stroke. All caps, as indicated in Sign Schedule as part of the Drawings.
2. Arrow: Match existing.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

3. Letter spacing: Match existing - notify COR if at variance with the latest ADA requirements.
4. Letter spacing: Match existing - notify the COR if at variance with the latest ADA requirements.
5. Text for signs is listed in Sign Schedule as part of the Drawings.

2.4 EXTERIOR SIGN MATERIALS (NOT USED)

2.5 INTERIOR SIGN TYPES

- A. Provide component system to match adjacent signs for each building and floor location.
- B. Component System Signs:
 1. Provide interior sign system which allows:
 - a. Interchangeable system that allows for changes of graphic components of the installed sign, without changing sign in its entirety.
 - b. The signage shall, with the exception of directories and directionals, be a uniform width to facilitate inserts printed on standard width paper.
 - c. Insert components shall have a .080 thickness non-glare acrylic window and shall be inlaid flush to sign face for a smooth, seamless appearance.
 - d. The signage shall include modules allowing for inserts, notice holders, occupancy sliders, marker, magnetic, and cork boards. All modules shall be flush to sign face for a smooth, seamless appearance.
 - e. The laminates (front and back) shall be pressure laminated and precision machined together to a 90-degree angle. Edges shall be smooth, void of chips, burrs, sharp edges and marks.
 - f. The signage shall utilize an acrylic sphere for Grade II Braille inserted directly into a scratch resistant, high pressure laminate sign face. Braille dots are to be pressure fit in high tolerance drilled holes.
 - g. Braille dots shall be half hemispherical domed and protruding a minimum 0.025".
 - h. The signage shall utilize a pressure activated adhesive. The adhesive shall be nonhazardous and shall allow for flexing and

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

deflection of the adhered components due to changes in temperature and moisture without bond failure.

- i. All signs shall be provided with appropriate mounting hardware. Hardware shall be finished and architectural in appearance and suitable for the mounting surface.
- j. Some signs may be installed on glass. A blank backer is required to be placed on the opposite side of the glass to cover tape and adhesive. The backer shall match the sign in size and shape.
2. Provide copy panels that accept various forms of copy and graphics.
 - 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) 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.
 - 2) 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.
3. Typography:
 - a. All typefaces shall comply with the latest ADA requirements.
 - b. Vinyl First Surface Copy (non-tactile): Applied vinyl copy.
 - c. 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.
 - d. Integral Tactile Copy Inserts: Phenolic photopolymer etched with 2.3 mm (.0937 inches) raised copy.

C. Tactile Sign:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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.
- D. Provide cork or felt on bottom or mounting bracket when sign is mounted on counter or desk.
- E. For ceiling mounted signs, provide mounting hardware on the sign that allows for sign disconnection, removal, reinstallation, and reconnection.
- F. 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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 (NOT USED)

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. Miter 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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. In all cases, sign positioning shall comply with the latest ADA requirements.
- B. Where not otherwise indicated conform to the VA Signage Design Manual for installation requirements.
- C. Mount signs in proper alignment, level and plumb according to the dimensions given on the signage schedule as part of the Drawings. When exact position, angle, height or location is not clear, contact COR for resolution.
- D. 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.
- E. Touch up exposed fasteners and connecting hardware to match color and finish of surrounding surface.
- F. 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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Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

10 14 00 - 10
Signage

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies wall guards, handrails/wall guard combinations, and corner guards.

1.2 RELATED WORK

- A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Sustainable Design Requirements.
- B. Section 08 71 00, DOOR HARDWARE: Armor plates and kick plates not specified in this section.
- C. Color and texture of resilient material to match existing adjacent assemblies.

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. 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Shop Drawings: show design and installation details.
- D. Manufacturer's Literature and Data:
 - 1. Handrail/Wall Guard Combinations.
 - 2. Wall Guards.
 - 3. Corner Guards.
- 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.

Contract No. 36C26319D0044

Station Project No. 437-21-210

Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

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-20.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and For General Applications
 - B221-14.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
 - B221M-13.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
 - D256-10(2018).....Determining the Izod Pendulum Impact Resistance of Plastics
 - D635-18.....Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
 - E84-20.....Surface Burning Characteristics of Building Materials
- C. Aluminum Association (AA):
 - DAF 45-09.....Designation System for Aluminum Finishes

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- D. American Architectural Manufacturers Association (AAMA):
611-14.....Voluntary Specification for Anodized
Architectural Aluminum
- E. Code of Federal Regulation (CFR):
40 CFR 59(2020) Subpart D National Volatile Organic Compound
Emission Standards for Architectural Coatings
- F. The National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06.....Metal Finishes Manual
- G. National Fire Protection Association (NFPA):
80-2019.....Standard for Fire Doors and Other Opening
Protectives
- H. SAE International (SAE):
J 1545-2014-10.....Instrumental Color Difference Measurement for
Exterior Finishes, Textiles and Colored Trim.
- I. Underwriters Laboratories Inc. (UL):
Annual Issue.....Building Materials Directory

PART 2 - PRODUCTS

2.1 MATERIALS

- A. 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 feet-pounds/square inch) when tested in accordance with ASTM D256 (Izod impact, feet-pounds 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- 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.
- h. Color and texture shall match existing adjacent and/or approximate existing components unless otherwise indicated in the drawings.

2.2 CORNER GUARDS

A. Resilient, Shock-Absorbing Corner Guards: Surface mounted type.

- 1. Snap-on corner guard formed from resilient material, minimum 1.98 mm (0.078-inch) thick, free floating on a continuous 1.52 mm (0.060-inch) thick extruded aluminum retainer. Retainer used for flush mounted type to act as a stop for adjacent wall finish material. Provide appropriate mounting hardware, cushions and base plates as required.
- 2. Profile: Minimum 76 mm (3 inch) long leg and 6 mm (1/4 inch) corner radius
- 3. Height: 2.43 m (8 feet).
- 4. Retainer Clips: Provide manufacturer's standard impact-absorbing clips.
- 5. Provide factory fabricated end closure caps at top and bottom of surface mounted corner guards.
- 6. Flush mounted corner guards installed on any fire rated wall to be installed in a manner that maintains the fire rating of the wall. Provide fire test of proposed corner guard system to verify compliance.
 - a. Where insulating materials are an integral part of the corner guard system, provide insulating materials furnished by the manufacturer of the corner guard system.

2.3 WALL GUARDS AND HANDRAILS

A. Resilient Wall Guards and Handrails:

- 1. Handrail/Wall Guard Combination:

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

- a. Snap-on covers of resilient material, minimum 2 mm (0.078-inch) thick.
 - b. Free-floating on a continuous, extruded aluminum retainer, minimum 1.82 mm (0.072-inch) thick.
 - c. Anchor to wall at maximum 762 mm (30 inches) on center.
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 handrails 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.

2.4 DOOR AND DOOR FRAME PROTECTION (NOT USED)

2.5 HIGH IMPACT WALL COVERING (NOT USED)

2.6 FASTENERS AND ANCHORS

- A. Provide fasteners and anchors as required for each specific type of installation. Provide metal banding / backing / blocking in the wall to fasten to.
- 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

- A. Resilient Material: Embossed textures and color in accordance with SAE J1545.

PART 3 - INSTALLATION

3.1 RESILIENT CORNER GUARDS

- A. Install corner guards on walls in accordance with manufacturer's instructions.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

01-01-21

3.2 STAINLESS STEEL CORNER GUARDS (NOT USED)

3.3 RESILIENT, WALL GUARDS, HANDRAILS, WALL GUARD/HANDRAIL COMBINATION:

A. Secure guards to walls with mounting cushions, brackets and fasteners
in accordance with manufacturer's details and instructions.

3.4 ALUMINUM WALL GUARDS (NOT USED)

3.5 STAINLESS STEEL WALL GUARDS (NOT USED)

3.6 DOOR, DOOR FRAME PROTECTION AND HIGH IMPACT WALL COVERING (NOT USED)

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Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

10 26 00 - 6
Wall and Door Protection

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

08-01-18

SECTION 10 44 13
FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 DESCRIPTION

This section covers semi-recessed fire extinguisher cabinets.

1.2 RELATED WORK

A. 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):
D4802-15.....Poly (Methyl Methacrylate) Acrylic Plastic
Sheet

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHER CABINET

A. Semi-recessed type. Basis of design: J.L. Industries - Clear VU 2500 with acrylic bubble or VA approved equal. Factory or field paint white to match adjacent cabinets.

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 bubble, 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.

Contract No. 36C26319D0044
Station Project No. 437-21-210
Bancroft-AE Project No. 22-113

01/16/2024

Fargo VA Health Care System
Fargo, North Dakota 58102-2417
EHRM Infrastructure Upgrades - Tier 2

Bancroft Architects + Engineers

08-01-18

- 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

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