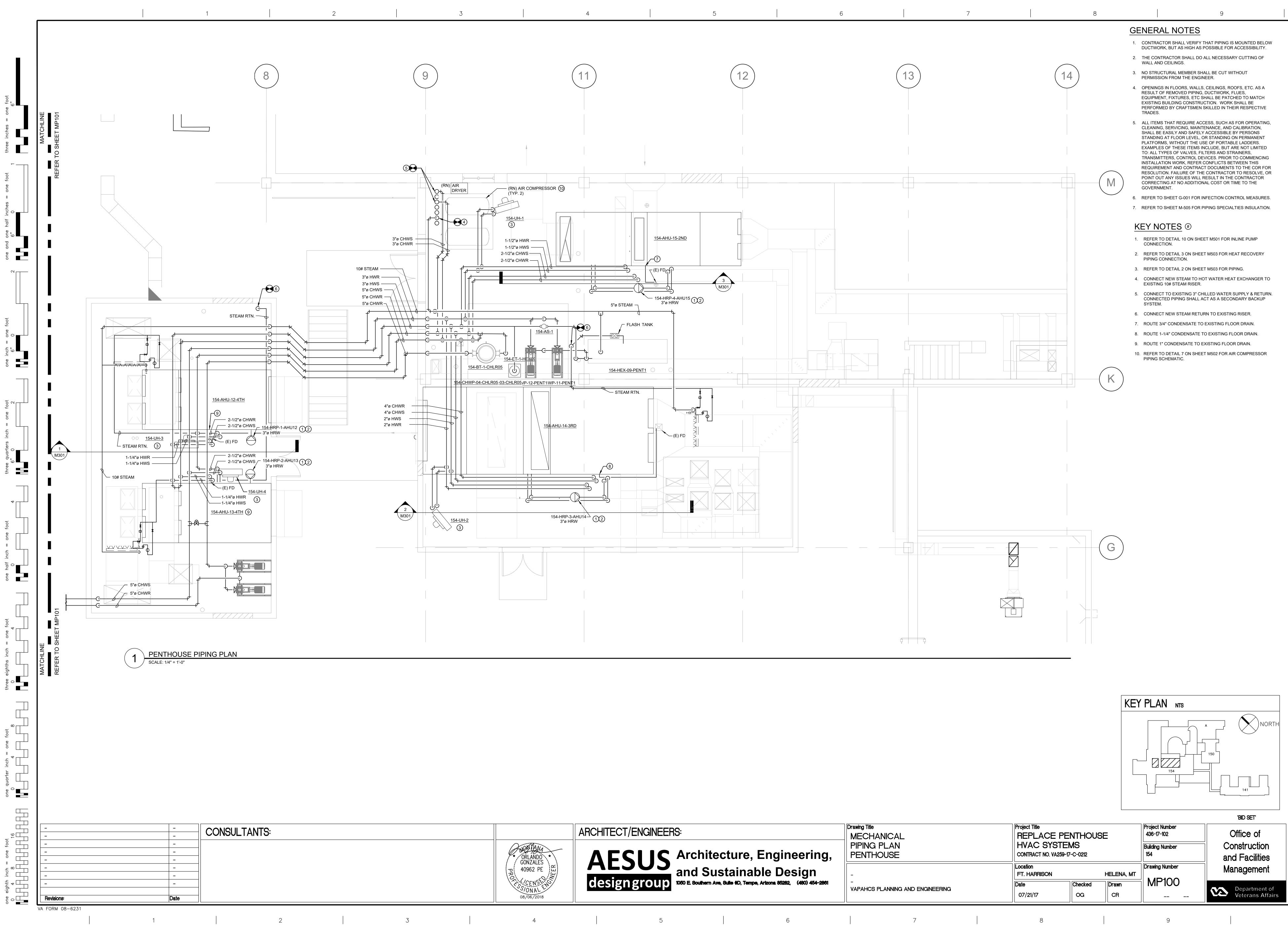


| ngineering, e Design | Drawing Title MECHANICAL HVAC PLAN SECOND FLOOR | HVAC SYS | Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212 | | Project Number 436-17-102 Building Numb 154 |
|---------------------------|--|-------------------------------------|--|-------------|--|
| | _ | Location FT. HARRISON HELENA, MT | | | Drawing Numb |
| ona 85282, (480) 454-2861 | - VAPAHCS PLANNING AND ENGINEERING | Date 07/21/17 | Checked OG | Drawn CR | MH1C |
| | | | | | |

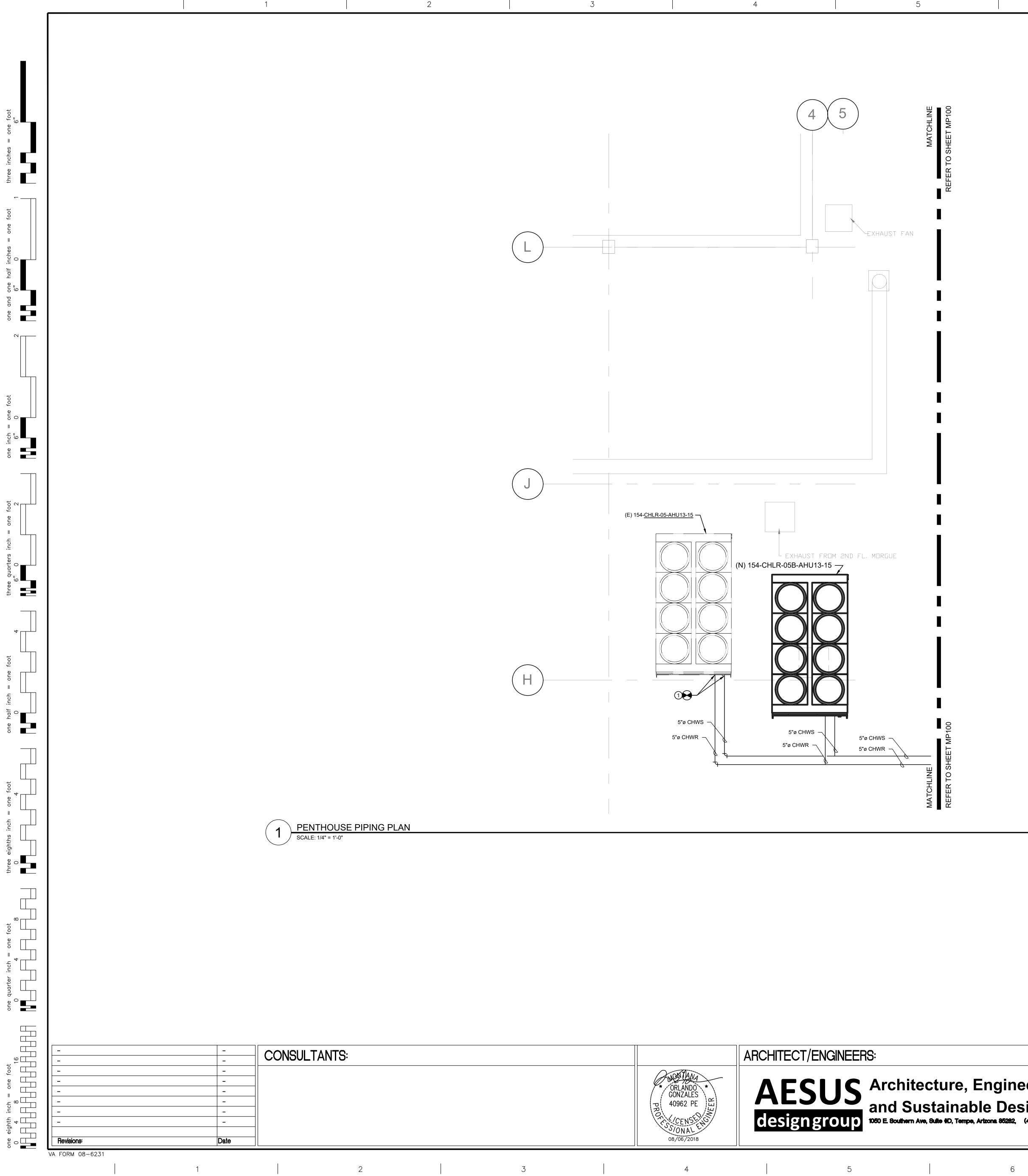
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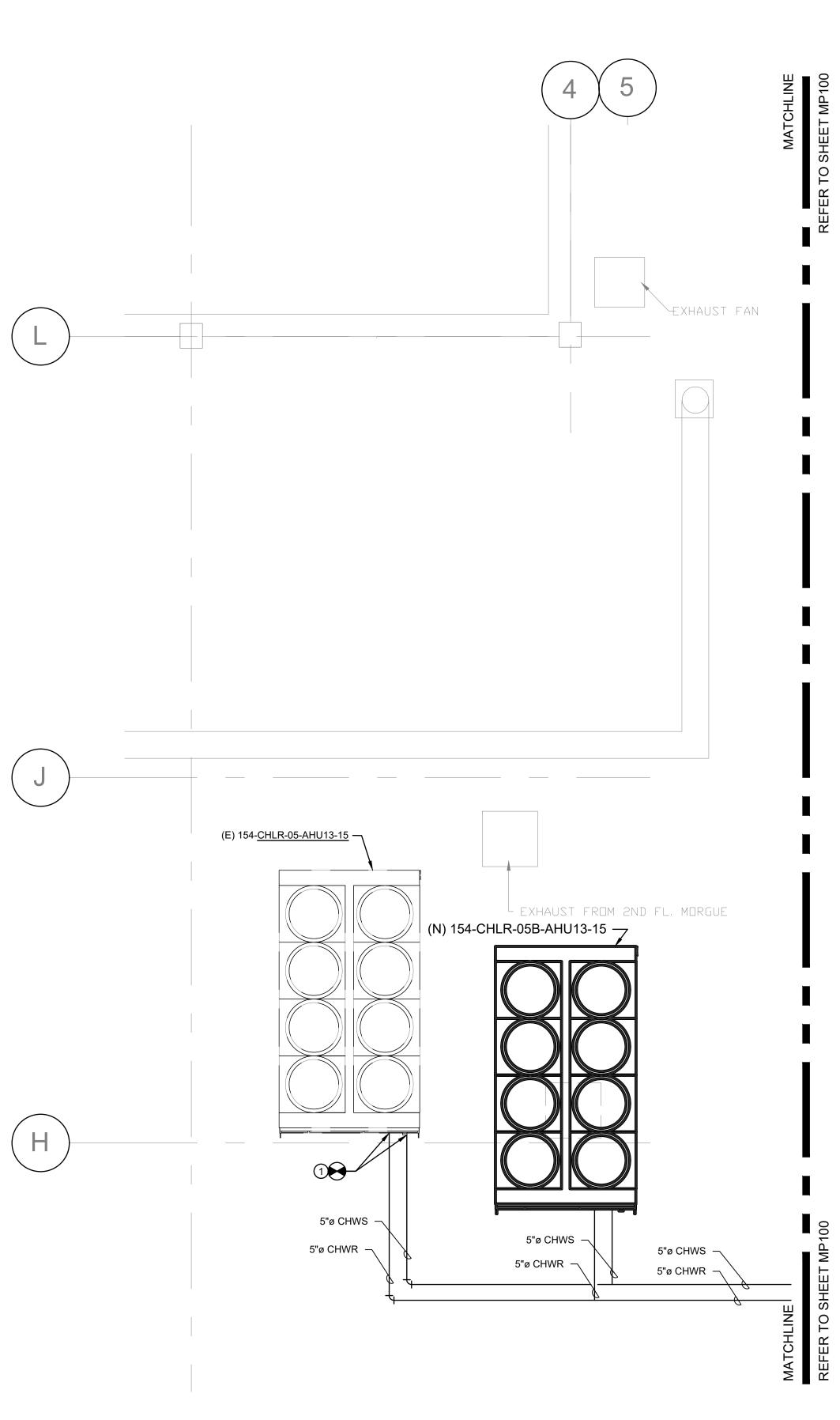
| D SPRINKLER HEADS TAKE PRECEDENCE OV OCATION. CONTRACTOR SHALL MAKE NECESS T TO DIFFUSERS TO AVOID ANY CONFLICT WI YOUT AND SPRINKLER HEADS. |
|---|
| TS SHALL BE MOUNTED PER ADA REQUIREME EIGHT FOR FRONT ACCESS SHALL BE 48" AFF. ABOVE FIXED COUNTER UNLESS KNEE HOLE ROVIDED. |



| gineering, | Drawing Title MECHANICAL PIPING PLAN PENTHOUSE | Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212 | | E | Project Numbe 436-17-102 Building Numbe 154 |
|--------------------------|---|--|---------------|-------------|--|
| Design | _ | Location FT. HARRISON | | HELENA, MT | Drawing Numb |
| na 85282, (480) 454-2861 | - VAPAHCS PLANNING AND ENGINEERING | Date 07/21/17 | Checked OG | Drawn CR | MP10 |
| | | | | 1 | |

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|--|----------|---|
| | <u>'</u> | |
| OR SHALL VERIFY THAT PIPING IS MOUNTED BELOW BUT AS HIGH AS POSSIBLE FOR ACCESSIBILITY. ACTOR SHALL DO ALL NECESSARY CUTTING OF | | |
| EILINGS. JRAL MEMBER SHALL BE CUT WITHOUT | | |
| I FROM THE ENGINEER. N FLOORS, WALLS, CEILINGS, ROOFS, ETC. AS A REMOVED PIPING, DUCTWORK, FLUES, , FIXTURES, ETC SHALL BE PATCHED TO MATCH JILDING CONSTRUCTION. WORK SHALL BE D BY CRAFTSMEN SKILLED IN THEIR RESPECTIVE | | |
| HAT REQUIRE ACCESS, SUCH AS FOR OPERATING, SERVICING, MAINTENANCE, AND CALIBRATION, ASILY AND SAFELY ACCESSIBLE BY PERSONS T FLOOR LEVEL, OR STANDING ON PERMANENT , WITHOUT THE USE OF PORTABLE LADDERS. OF THESE ITEMS INCLUDE, BUT ARE NOT LIMITED ES OF VALVES, FILTERS AND STRAINERS, ERS, CONTROL DEVICES. PRIOR TO COMMENCING ON WORK, REFER CONFLICTS BETWEEN THIS NT AND CONTRACT DOCUMENTS TO THE COR FOR N. FAILURE OF THE CONTRACTOR TO RESOLVE, OR ANY ISSUES WILL RESULT IN THE CONTRACTOR G AT NO ADDITIONAL COST OR TIME TO THE NT. | | A |
| HEET G-001 FOR INFECTION CONTROL MEASURES. HEET M-505 FOR PIPING SPECIALTIES INSULATION. | | |
| TES (#) | | |
| DETAIL 10 ON SHEET M501 FOR INLINE PUMP DN. | | В |
| DETAIL 3 ON SHEET M503 FOR HEAT RECOVERY INECTION. | | 5 |
| DETAIL 2 ON SHEET M503 FOR PIPING. NEW STEAM TO HOT WATER HEAT EXCHANGER TO 0# STEAM RISER. | | |
| TO EXISTING 3" CHILLED WATER SUPPLY & RETURN. D PIPING SHALL ACT AS A SECONDARY BACKUP | | |
| NEW STEAM RETURN TO EXISTING RISER. | | |
| CONDENSATE TO EXISTING FLOOR DRAIN. 4" CONDENSATE TO EXISTING FLOOR DRAIN. | | |
| ONDENSATE TO EXISTING FLOOR DRAIN. DETAIL 7 ON SHEET M502 FOR AIR COMPRESSOR | | |
| IEMATIC. | | |
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| | 1. | CONTRAC DUCTWOF |
| | 2. | THE CONT |
| | 3. | NO STRUO PERMISSI |
| | 4. | OPENING RESULT C EQUIPMEI EXISTING PERFORM TRADES. |
| | 5. | ALL ITEMS CLEANING SHALL BE |

GOVERNMENT.

KEY PLAN NTS

| ineering, | MECHANICAL PENTHOUSE | | Project Title REPLACE HVAC SYS CONTRACT NO. VA | Project Number 436-17-102 Building Number 154 | | | |
|---------------------------------------|--|---|--|--|---------------------------|-----------------------------|---|
|)esign 1282, (480) 454-2861 | - - VAPAHCS PLANNING AND ENGINEERING | Ì | Location FT. HARRISON Date 07/21/17 Checked OG | | HELENA, MT Drawn CR | Drawing Number MP101 | _ |
| 6 | 7 | | 8 | | | 9 | |

CTOR SHALL VERIFY THAT PIPING IS MOUNTED BELOW ORK, BUT AS HIGH AS POSSIBLE FOR ACCESSIBILITY. NTRACTOR SHALL DO ALL NECESSARY CUTTING OF ND CEILINGS.

RUCTURAL MEMBER SHALL BE CUT WITHOUT SSION FROM THE ENGINEER.

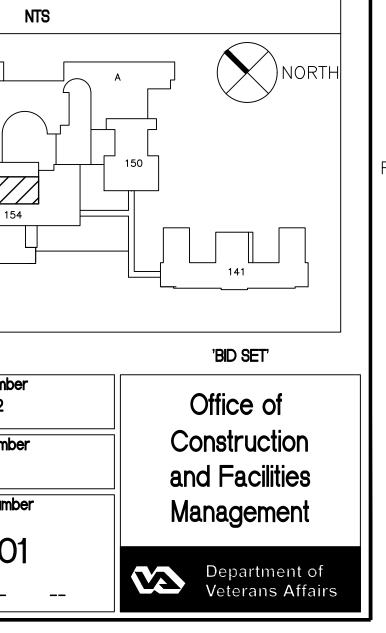
IGS IN FLOORS, WALLS, CEILINGS, ROOFS, ETC. AS A OF REMOVED PIPING, DUCTWORK, FLUES, IENT, FIXTURES, ETC SHALL BE PATCHED TO MATCH G BUILDING CONSTRUCTION. WORK SHALL BE RMED BY CRAFTSMEN SKILLED IN THEIR RESPECTIVE

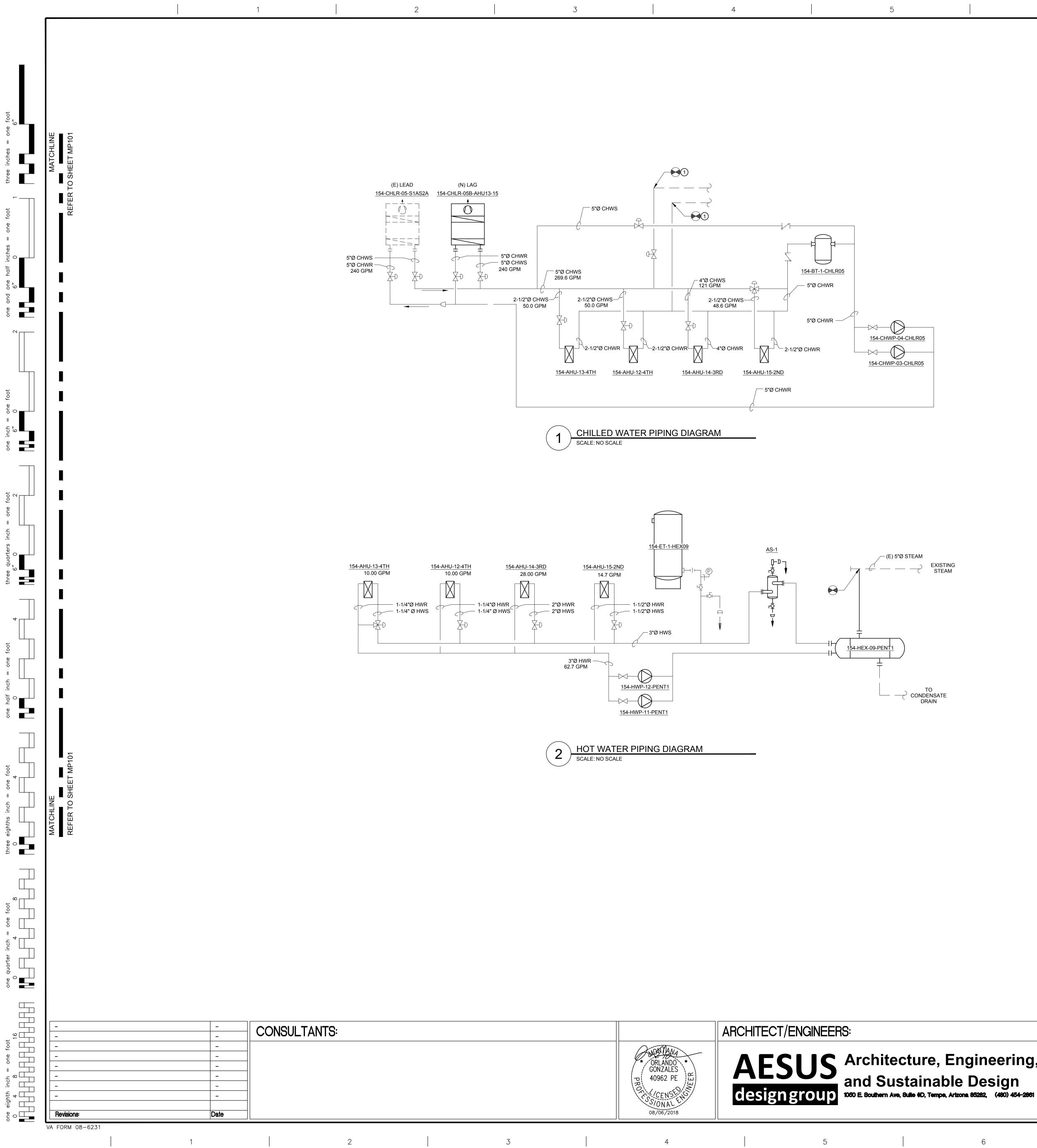
MS THAT REQUIRE ACCESS, SUCH AS FOR OPERATING, NG, SERVICING, MAINTENANCE, AND CALIBRATION, E EASILY AND SAFELY ACCESSIBLE BY PERSONS STANDING AT FLOOR LEVEL, OR STANDING ON PERMANENT PLATFORMS, WITHOUT THE USE OF PORTABLE LADDERS. EXAMPLES OF THESE ITEMS INCLUDE, BUT ARE NOT LIMITED TO: ALL TYPES OF VALVES, FILTERS AND STRAINERS, TRANSMITTERS, CONTROL DEVICES. PRIOR TO COMMENCING INSTALLATION WORK, REFER CONFLICTS BETWEEN THIS REQUIREMENT AND CONTRACT DOCUMENTS TO THE COR FOR RESOLUTION. FAILURE OF THE CONTRACTOR TO RESOLVE, OR POINT OUT ANY ISSUES WILL RESULT IN THE CONTRACTOR CORRECTING AT NO ADDITIONAL COST OR TIME TO THE

6. REFER TO SHEET G-001 FOR INFECTION CONTROL MEASURES.

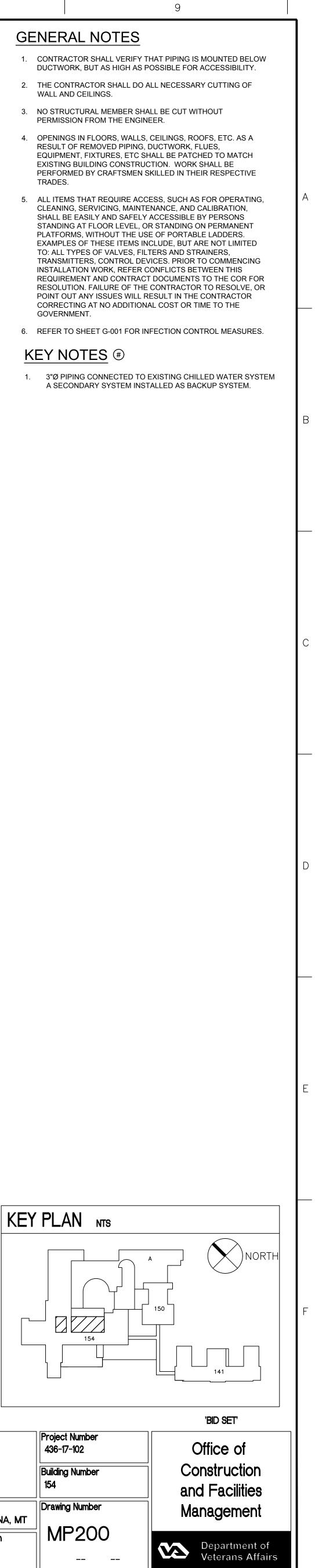
KEY NOTES

1. CONNECT NEW CWS/R TO EXISTING CHILLER.

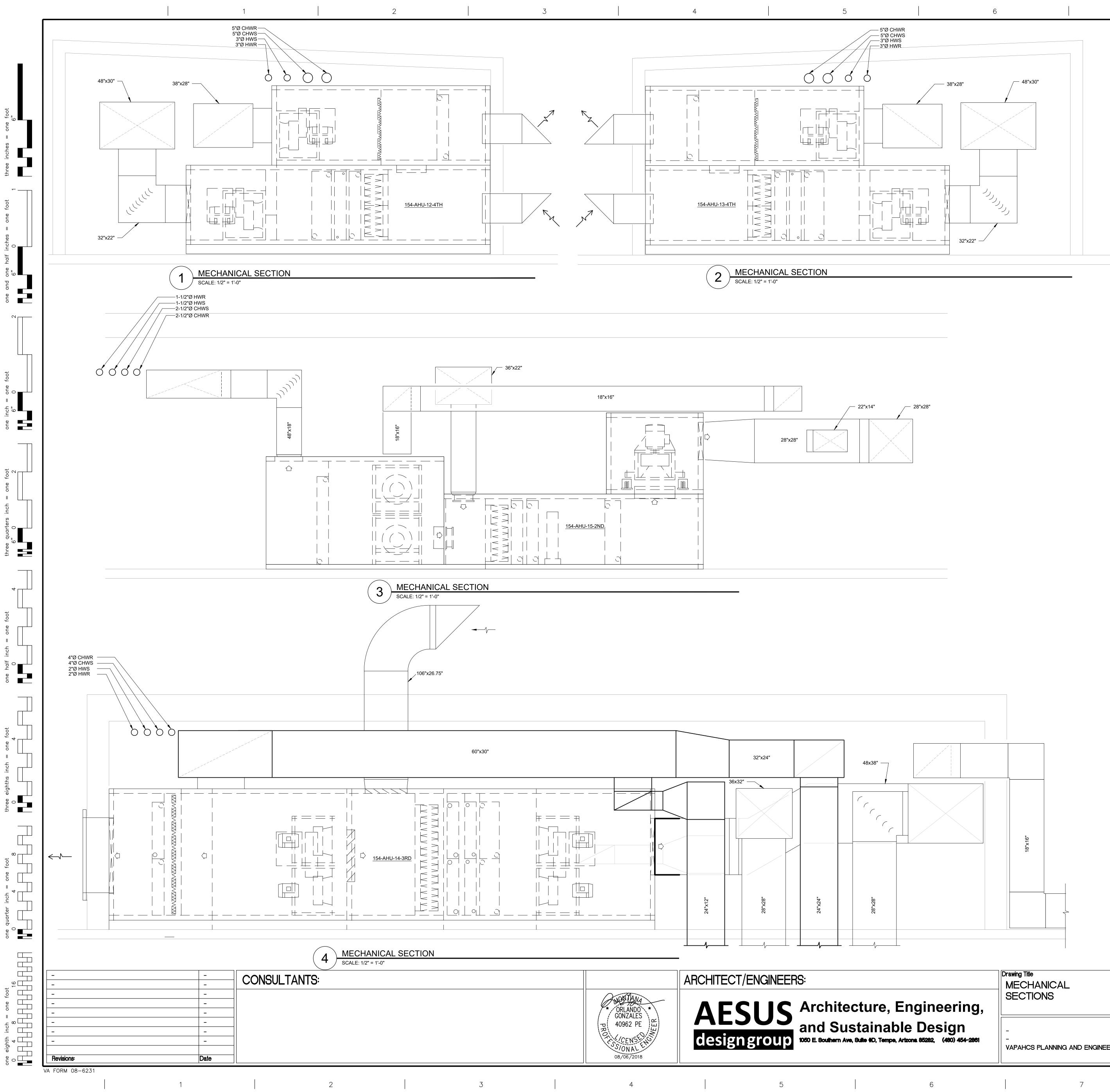




- - TRADES.

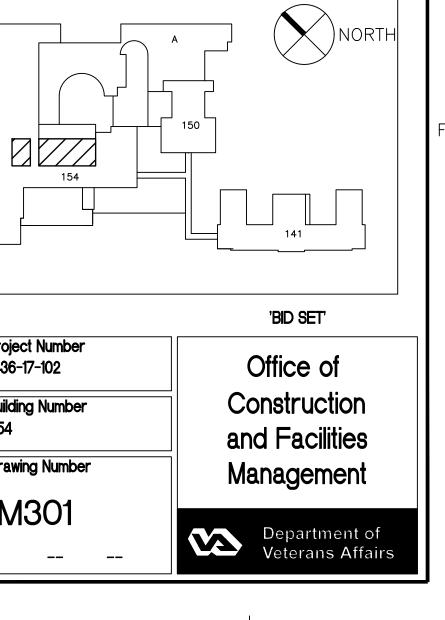


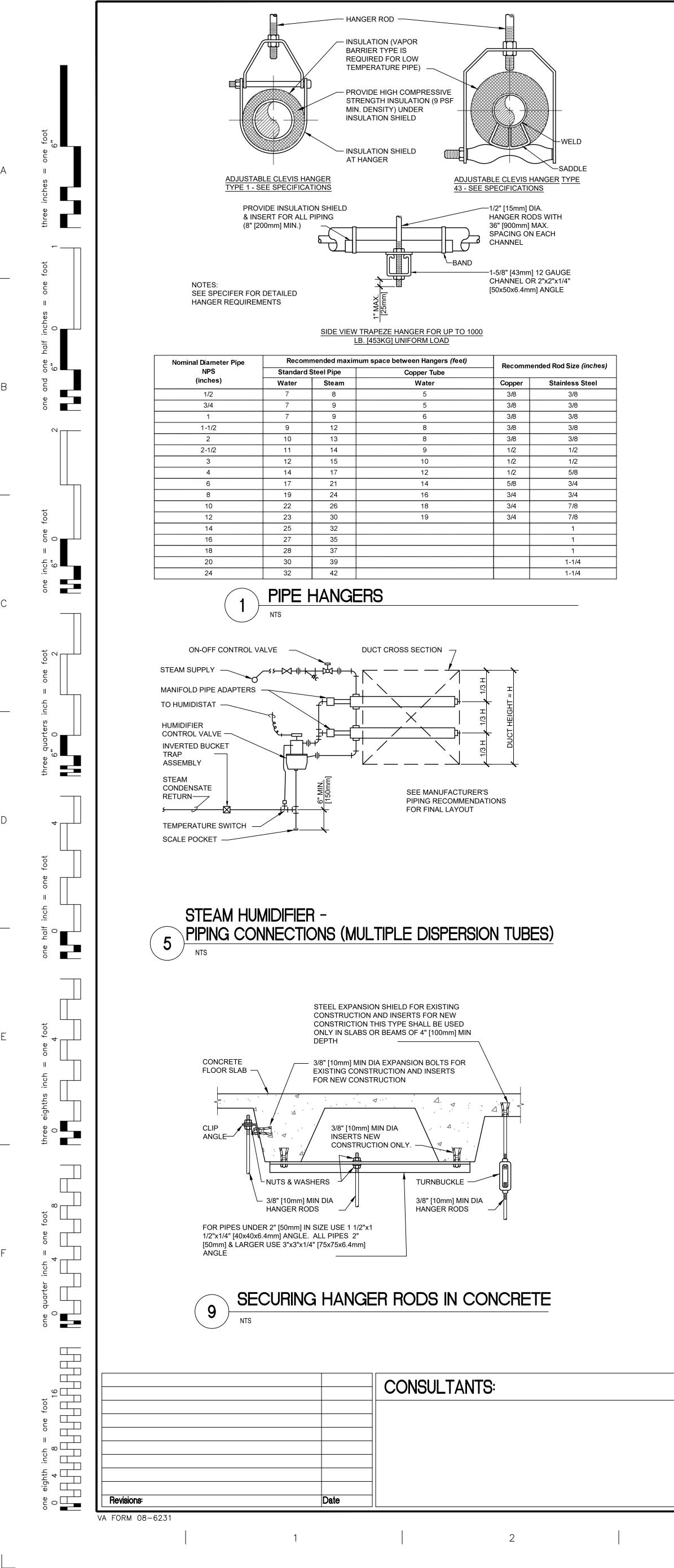
| e, Engineering, | Drawing Title MECHANICAL PENTHOUSE PIPING PLAN | | Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212 | | | Project Number 436-17-102 Building Number 154 | | |
|---|---|---------------|--|--|---------------|--|----------------|---|
| able Design Tempe, Arizona 85282, (480) 454-2961 | - - VAPAHCS PLANNING AN | D ENGINEERING | | Location FT. HARRISON Date 07/21/17 | Checked OG | HELENA, MT Drawn CR | Drawing Number |) |
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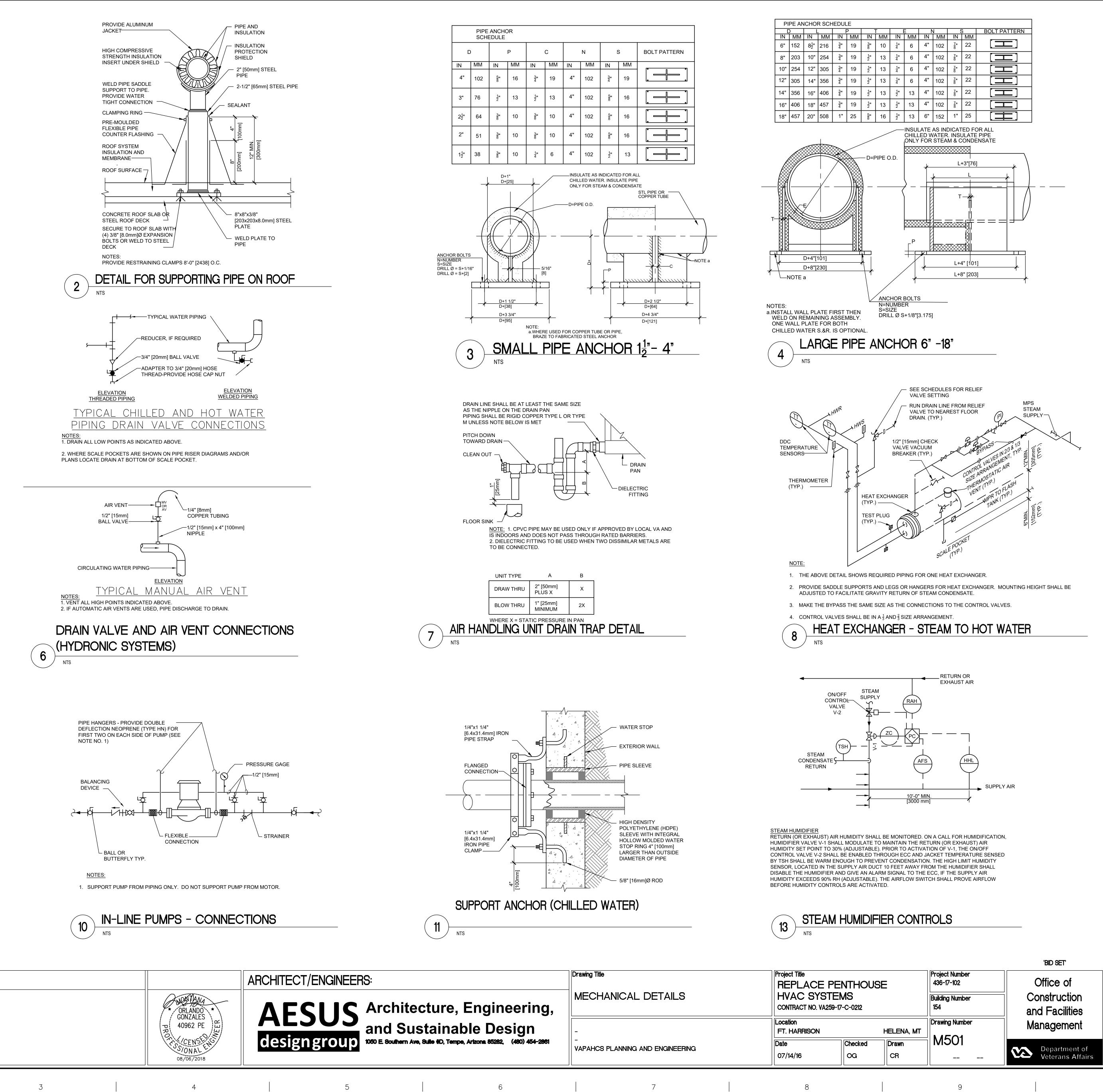


| Title | Project Title | | | Project Number |
|------------------------------|--------------------------|----------------|------------|-----------------|
| CHANICAL | REPLACE PENTHOUSE | | | 436-17-102 |
| CTIONS | HVAC SYSTEMS | | | Building Number |
| | Location FT. HARRISON | .259-17-C-0212 | HELENA, MT | Drawing Number |
| HCS PLANNING AND ENGINEERING | Date | Checked | Drawn | M301 |
| | 07/21/17 | OG | CR | |

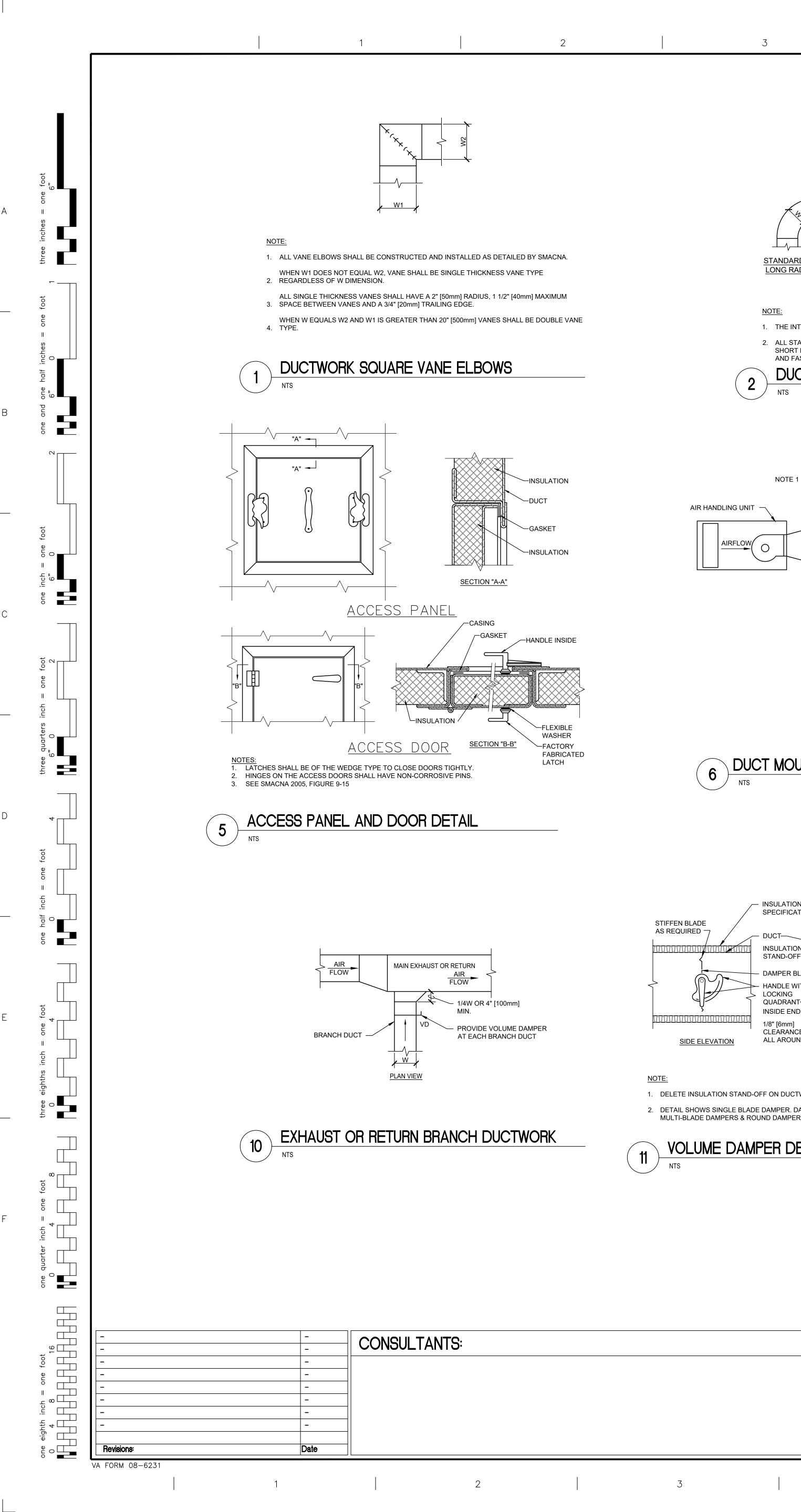
| KEY | PLAN NTS |
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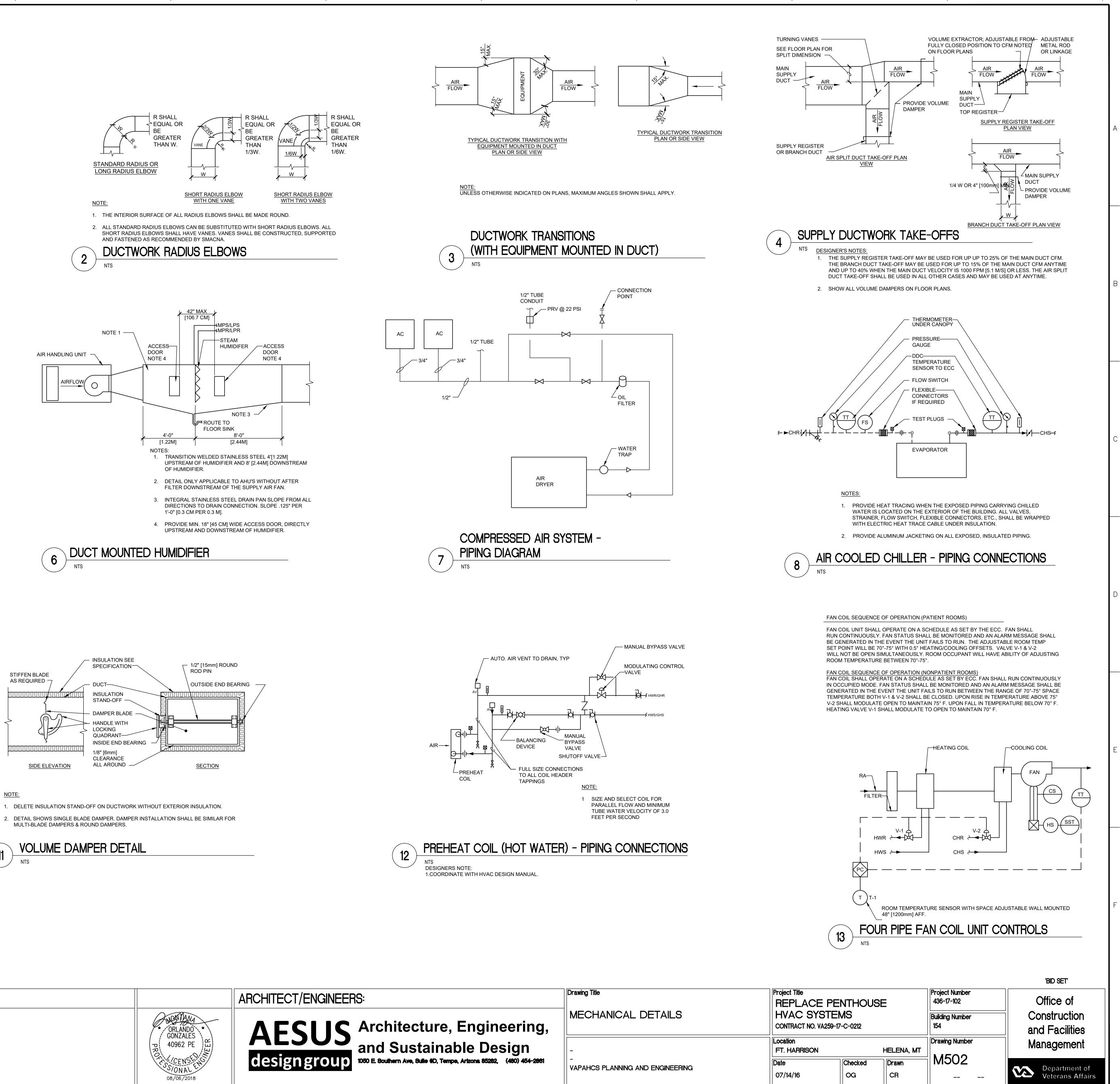








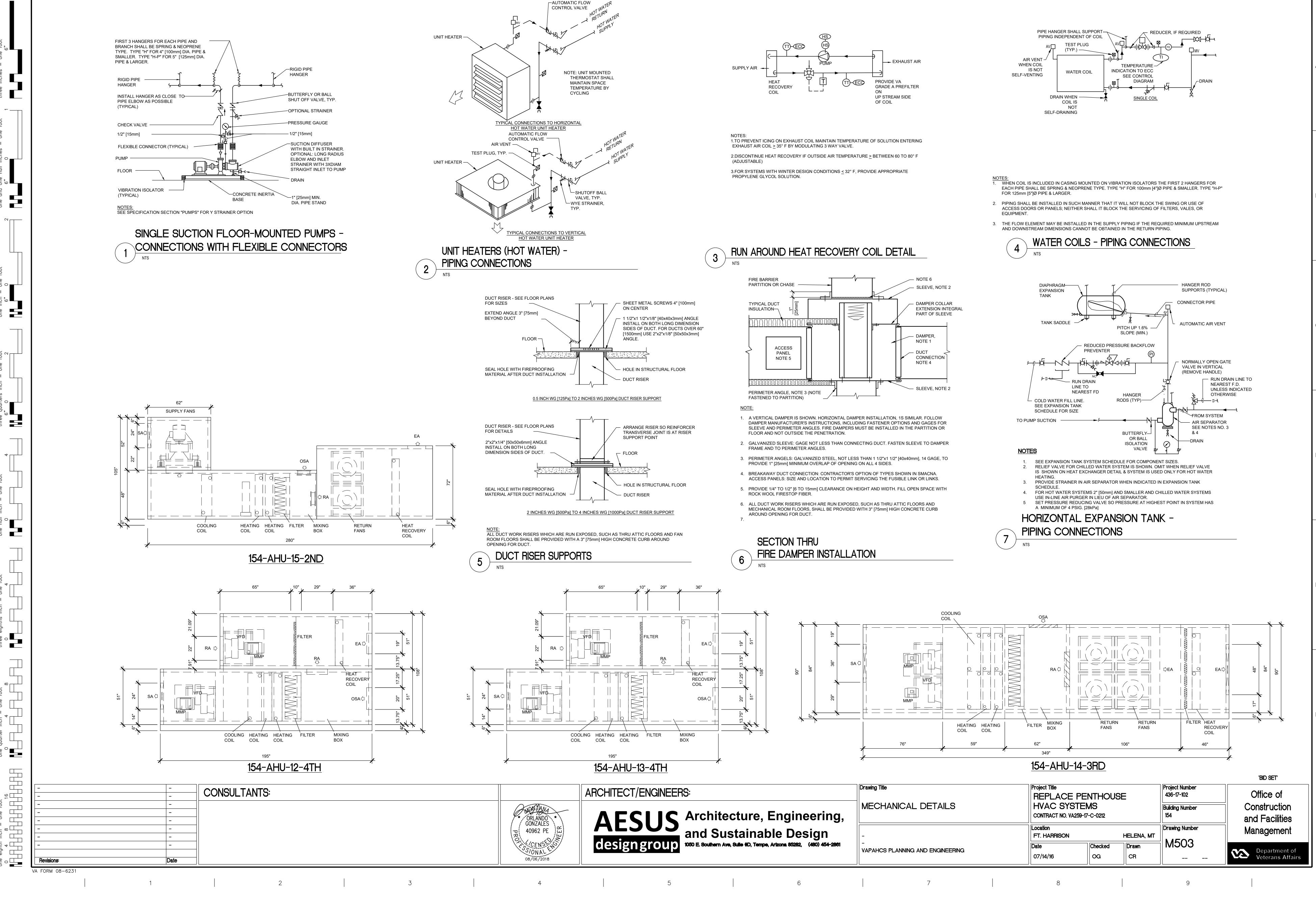


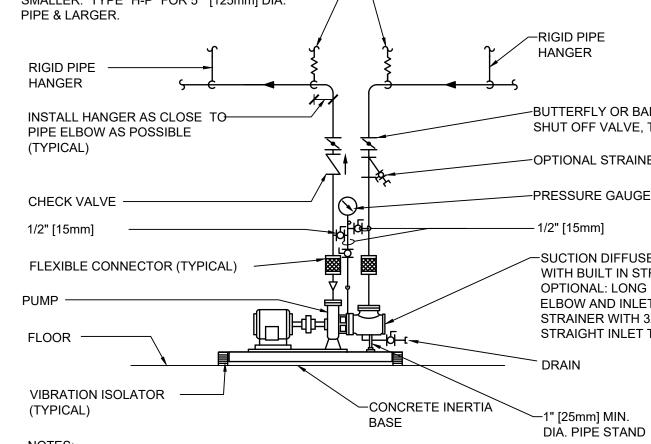


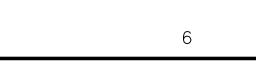


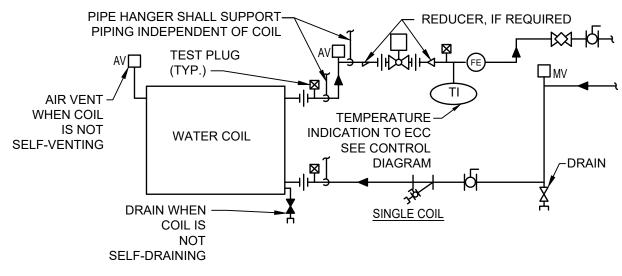
| e, Engineering, able Design Tempe, Arizona 85282, (480) 454-2961 | Drawing Title Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212 | | | Project Numbe 436-17-102 Building Numbe 154 | | |
|--|---|-------|--|--|---------------------------|----------------------|
| | - - VAPAHCS PLANNING AND ENGINE | ERING | Location FT. HARRISON Date 07/14/16 | Checked OG | HELENA, MT Drawn CR | Drawing Numb M502 |
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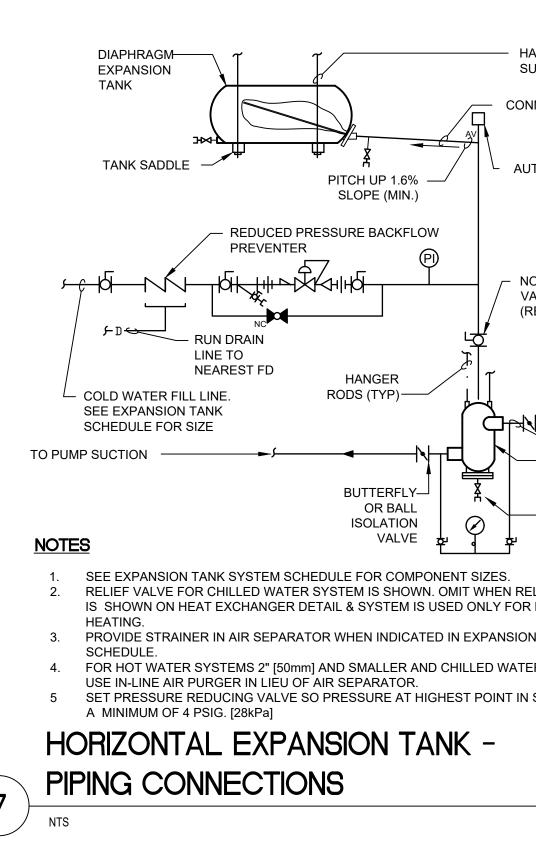


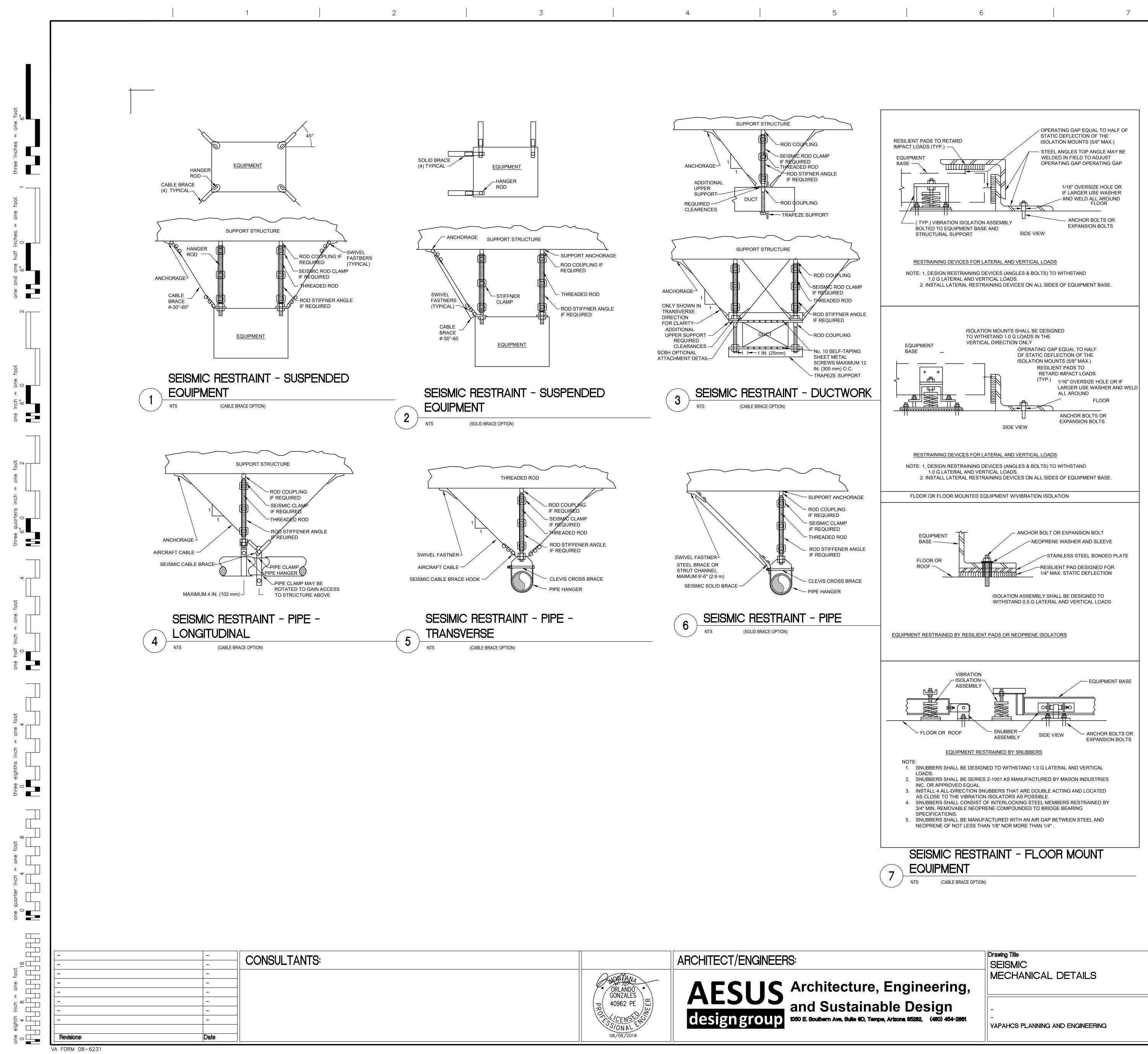






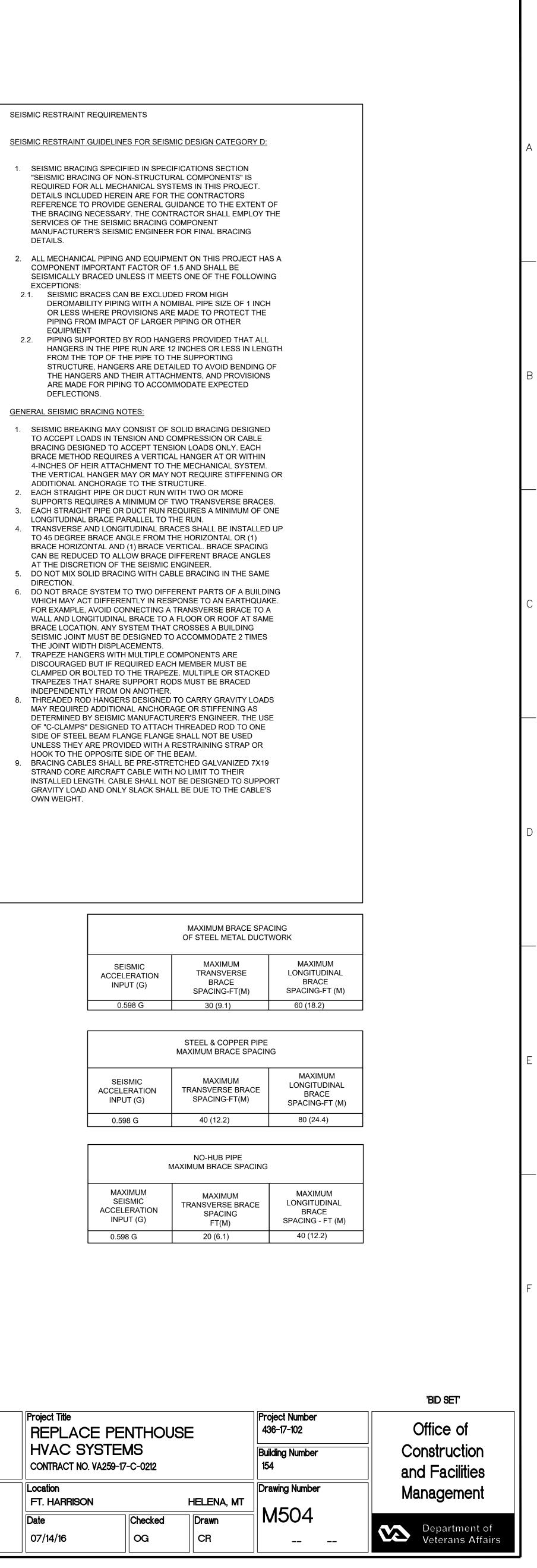






| | ARCHITECT/ENGINEEF | RS: |
|---|------------------------------|--|
| ORLANDO ORLANDO GONZALES 40962 PE H S/ONAL O8/06/2018 | AESUS design group | Architecture, En and Sustainable 1050 E. Bouthern Ave, Butte HD, Tempe, Arizon |
| | | |





| | MAXIMUM BRACE SPA OF STEEL METAL DUCT | |
|---|---|--------------------------|
| SEISMIC ACCELERATION INPUT (G) | MAXIMUM TRANSVERSE BRACE SPACING-FT(M) | MA LONG E SPAC |
| 0.598 G | 30 (9.1) | 60 (|
| | STEEL & COPPER PIPE MAXIMUM BRACE SPACIN | G |
| SEISMIC ACCELERATION INPUT (G) | MAXIMUM TRANSVERSE BRACE SPACING-FT(M) | M. LONG E SPAC |
| 0.598 G | 40 (12.2) | 80 |
| Ν | NO-HUB PIPE MAXIMUM BRACE SPACING | |
| MAXIMUM SEISMIC ACCELERATION INPUT (G) | MAXIMUM TRANSVERSE BRACE SPACING FT(M) | MA LONG B SPACI |
| 0.598 G | 20 (6.1) | 40 |

| gineering, | Drawing Title SEISMIC MECHANICAL DETAILS | Project Title REPLACE HVAC SYS CONTRACT NO. V | | SE | Project Numbe 436-17-102 Building Numbe 154 |
|--------------------------|--|--|---------|------------|--|
| Design | _ | Location FT. HARRISON | | HELENA, MT | Drawing Numb |
| na 85282, (480) 454-2861 | - VAPAHCS PLANNING AND ENGINEERING | Date | Checked | Drawn | ∣M504 |
| | | 07/14/16 | OG | CR | |



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Cut 'n Wrap™ Insulation Kits* Flanges and Valves

Peel hook and 4. loop strips from the roll equal in lengths to the Cut 'n Wrap blanket plus 6 inches.

> Staple one end of each strip of hook and loop to one end of the Cut 'n Wrap blanket piece. Use at least 2 staples per strip.

Make a small loop at the loose end of the hook and loop material and staple. This makes it easier to work with gloves and to detach the hook and loop strip from itself.

Wrap the first blanket around the valve or flange to be insulated (Note: for a gate valve, that should be the stem, immediately beneath the wheel). Pull the hook and loop

straps so as to tighten the Cut'n Wrap blanket. If insulating a flange, you are done with that pipe component.











A Manufacturing, Inc. INNOVATIONON FIRE 34 Walker Road P.O. Box 220 Mechanic Falls, Maine 04256

T: 1-800-264-6689 • 207-345-8271 F: 207-345-3380 E-mail: sales@auburnmfg.com www.auburnmfg.com.com

8. For a gate valve, continue

installing the

around the

valve stem,

closest to the

valve blanket.

9. For a gate valve, continue

installing the

third blanket

around the

valve body. It

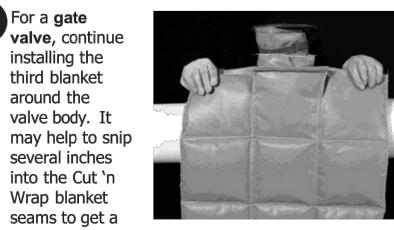
several inches into the Cut 'n Wrap blanket

seams to get a

second blanket

lower part of the

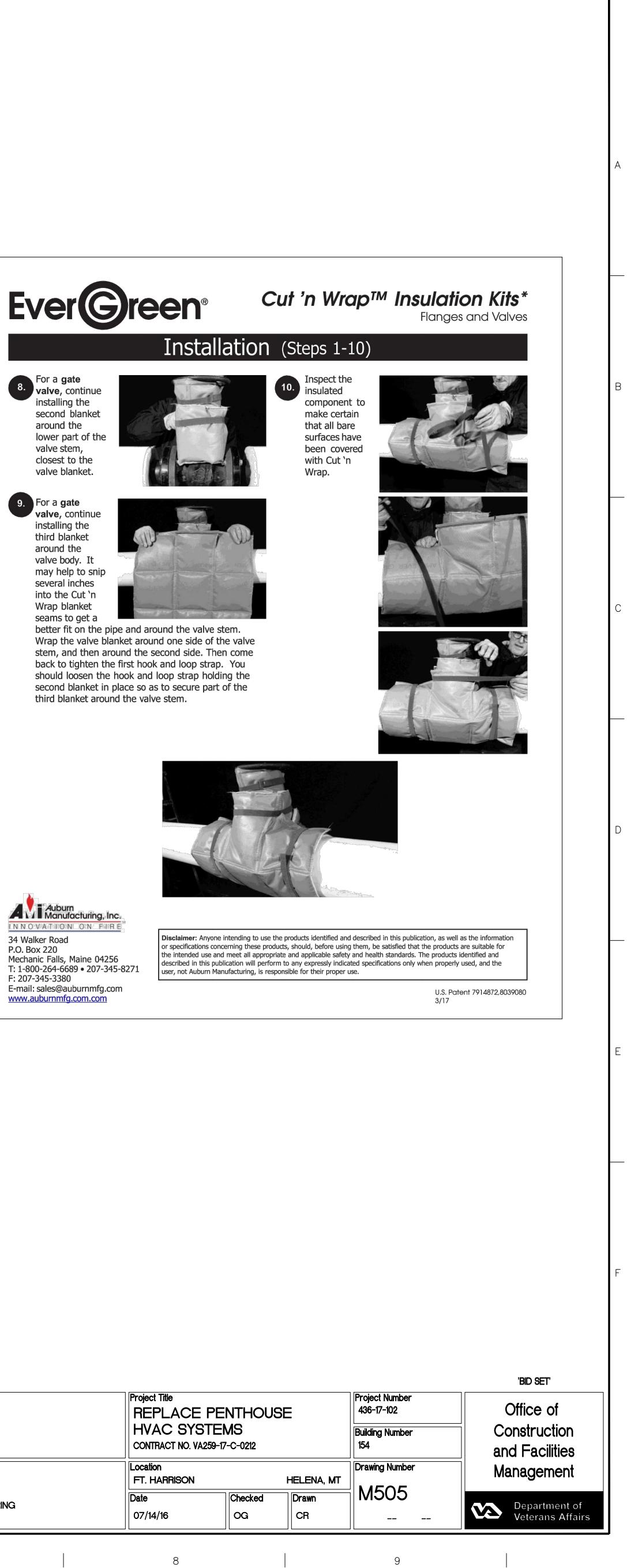




better fit on the pipe and around the valve stem. Wrap the valve blanket around one side of the valve stem, and then around the second side. Then come back to tighten the first hook and loop strap. You should loosen the hook and loop strap holding the second blanket in place so as to secure part of the third blanket around the valve stem.







| gineering, | Drawing Title MECHAN | NICAL DETAILS | | Project Title REPLACE HVAC SYS CONTRACT NO. VA | | SE | Project Numl 436-17-102 Building Num 154 |
|---------------------------------|-------------------------|------------------------|---|---|---------------|---------------------------|---|
| Design 85282, (480) 454-2861 | - - VAPAHCS PL | ANNING AND ENGINEERING | i | Location FT. HARRISON Date 07/14/16 | Checked OG | HELENA, MT Drawn CR | Drawing Nun M50 |
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| | | | | | | | | | | | AIR C | OOLED | CHILL | ER SC | HEDULE | _ | | | | | | | | | | |
|------------------------------|--------------------|--------------------------|-------------------|--|--------|--------------|---------------|-----------|------------------|---------|---------|---------|------------|--------|---------------|--------|---------|-----------|------|--------|------------------|---------|----------|------|------|---------|
| | | AREA | | | | | | | | | E | VAPORAT | OR | | CONDEN SER | | | | | ELEC | TRICAL | | | | | |
| | | | | | | # 05 | MAV | | MAX | | | | | | | C | COMPRES | SSOR MOTO | R | | COI | NDENSER | FAN MOTO | DRS | | |
| MARK | BASIS OF DESIGN | AND/OR BLDG SERVED | TYPE | CAPACITY | WEIGHT | # OF COMP | MAX kW/TON | MIN COP | IPLV (kW/TON) | FLOW | EWT | LWT | MAX WPD | FOULIN | | # COMP | HP | PHASE | VOLT | # FANS | NOMINAL POWER | | МСА | MOCP | VOLT | REMARKS |
| | | | | TONS | LBS | | | | | GPM | °F | °F | FT | | °F | | | | | | HP | | AMPS | AMPS | | |
| 154-CHLR- 05B-AHU13 15 | 1 | PENTHOUSE UNITS | HELICAL ROTARY | 100 | 6751 | 4 | 1.2 | 3 | 0.85 | 240 | 55 | 45 | 15 | 0.0001 | -15 | 4 | _ | 3 | 208 | 8 | 1.3 | 3 | 444 | 500 | 208 | |
| 2. "MAXI | | D "MIN COP" | SPECIFIE | LICABLE ENG D ARE AT DE WITH UNIT. | | | | kw/ton in | CLUDES CO | ONDENSE | R FANS. | - | 1 | | | 1 | 4 | | I | | 1 | 1 | 1 | 1 | | |

4. UNIT SHALL BE (CGAM 100A 2C02 AXD2 AIAI AIAX XAIC IA4X YAXX XAIA SAID XXXC XX) SAME AS EXISTING CHILLER.

| | AREA | SYSTEM | | AIR FLOW | MAX FACE | APD | E | AT | L | AT | TOTAL MIN | | FLU | UID | | | - | | | |
|-----------------------|--------|----------------|--------------|----------|----------|-------|------|------|------|------|-----------|------|------|------|-----|---------|---------|-------|------|-----------|
| LOCATION | AND/OR | AND/OR | APPLICATION | | VELOCITY | AFD | Db | Wb | Db | Wb | | FLOW | EWT | LWT | WPD | PUMP NO | PUMP HP | PHASE | VOLT | REMARKS |
| | BLDG | SERVICE | | CFM | FPM | IN WG | °F | °F | °F | °F | MBH | GPM | °F | °F | FT | | | | | |
| ELEVATOR PENTHOUSE | 154 | 154-AHU-15-2ND | SUPPLY COIL | 8000 | 400 | 0.3 | 34.6 | - | 48.6 | - | 121.2 | 75 | 52.7 | 49.5 | 5 | - 1-P7 | 0.75 | 3 | 208 | WINTER |
| ELEVATOR PENTHOUSE | 154 | 154-AHU-15-2ND | EXHAUST COIL | 8000 | 400 | 0.3 | 70 | 45 | 51 | 35.8 | 82 | 75 | 49.5 | 52 | 5 | | 0.10 | | 200 | CONDITION |
| ELEVATOR PENTHOUSE | 154 | 154-AHU-14-3RD | SUPPLY COIL | 24200 | 400 | 0.3 | 40.6 | - | 51.6 | | 261.8 | 200 | 54.2 | 51.6 | 12 | – 1-P7 | 0.75 | 2 | 208 | WINTER |
| ELEVATOR PENTHOUSE | 154 | 154-AHU-14-3RD | EXHAUST COIL | 24200 | 400 | 0.3 | 77 | 54.4 | 52.6 | 44.5 | 254.4 | 200 | 51.6 | 54 | 12 | | 0.75 | 5 | 200 | CONDITION |
| OUTBOARD PENTHOUSE | 154 | 154-AHU-12-4TH | SUPPLY COIL | 10000 | 400 | 0.3 | 51.2 | _ | 55.2 | - | 43 | 100 | 56.2 | 55.3 | 12 | 1.07 | 0.75 | 2 | 208 | WINTER |
| OUTBOARD PENTHOUSE | 154 | 154-AHU-12-4TH | EXHAUST COIL | 10000 | 400 | 0.3 | 70 | 54.4 | 55.5 | 48.2 | 45.5 | 100 | 55.3 | 56 | 12 | – 1-P7 | 0.75 | 3 | 200 | CONDITION |
| OUTBOARD PENTHOUSE | 154 | 154-AHU-13-4TH | SUPPLY COIL | 10300 | 400 | 0.3 | 51.2 | - | 55.2 | - | 43.9 | 100 | 55.6 | 54.8 | 12 | 4.07 | 0.75 | 2 | 000 | WINTER |
| OUTBOARD PENTHOUSE | 154 | 154-AHU-13-4TH | EXHAUST COIL | 10300 | 400 | 0.3 | 70 | 54.4 | 54.8 | 47.8 | 40.4 | 100 | 54.7 | 56 | 12 | – 1-P7 | 0.75 | 3 | 208 | CONDITIO |

| | EXPANSION TANK SCHEDULE | | | | | | | | | | | | | | |
|------------------------|-------------------------|---------------|--------------------------|---------------------------|---------------------|-------------|--|--|--|--|--|--|--|--|--|
| MARK | LOCATION | VOLUME (GAL.) | DIA. X LENGTH (IN) | OPER. PRESS. (PSIG) | OPER. WT. (LBS.) | REMARKS | | | | | | | | | |
| 154-ET- 1- HEX09 | PENTHOUSE | 23 | 20x32 | 125 | 312 | MODEL CA-90 | | | | | | | | | |
| AIR SEPARATOR SCHEDULE | | | | | | | | | | | | | | | |

| | | | DIA. X | OPER. | OPER. WT. | |
|--------------|-----------|-----|--------|--------|-----------|----------------|
| MARK | LOCATION | GPM | LENGTH | PRESS. | (LBS.) | REMARKS |
| | | | (IN) | (PSIG) | (LDO.) | |
| 154-AS- 1 | PENTHOUSE | 130 | 17X17 | 125 | 50 | MODEL ACT03 |

| | | CONSULTANTS: |
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| | | |
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| Revisions: | Date | |
| VA FORM 08-6231 | | |

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|---|---|-------------------------------------|-----------|-----------|----------|----------|--|----------|---------|--------------------|---------|--|-----------|-------------------------------------|-----------------------|------|-------------------|-------|----|----------|---|----------|--------------------|
| | | STEAM HU | MIDIFER | SCHED | ULE (HE | EATING | | N) | | | | | | | F | | CHEDUL | E | | | | | |
| | | PIFIER ABSORP. DISTANCE (IN.) | | EAT Wb | Db °F | AT Wb | STEAM PRESS ENT VALVE PSIG | CONTROL | | BASIS OF DESIGN | REMARKS | MARK LOCATION AREA AND/OR BLDG SERVED SERVED | | FLUID | OW HEA | LE | B TEMPER ATURE | SP GR | | | | TICAL MO | DTOR MAX RPN |
| | 1-H2ND ELEVATOR 154-AHU- MOU PENTHOUSE 15-2ND DISPE TU | RSION 29 8 BE | 000 36.6 | 37.6 | 85 | 56.3 | 10 | DDC | 73.1 | DRISTEEM | 1 1,2,3 | 154-CHWP- | D CENTRIF | U CHILLED WATER 46% 3 PGW | <u>PM FT</u> 30 51 | | °F 55 | 1.08 | 77 | HP 10 | 3 | 208 | 1750 |
| | 1A-H4TH PENTHOUSE 12-4TH DUTBOARD 154-AHU- MOU PENTHOUSE 12-4TH TL DU | ITED 41 10 RSION BE | 0300 48.5 | 46.2 | 85 | 57 | 10 | DDC | 55.6 | DRISTEEM | 1 1,2,3 | 154-HWP- 11-PENT1 ELEVATOR 154-HWP- PENTHOUSE BLDG 154 HOT | CAL | J HEATING HOT WATER 1 46% PGW | 30 36.2 | 2.85 | 140 | 1.08 | 72 | 3 | 3 | 208 | 1750 |
| | 2A-H4TH OUTBOARD 154-AHU- MOU PENTHOUSE 13-4TH DISPE | ITED 40 10 RSION BE | 0000 44.3 | 43.3 | 85 | 58.4 | 10 | DDC | 61.8 | DRISTEEM | 1,2,3 | | RY INLINE | HEAT RECOVERY 7 WATER | 5 10 | N/A | | 1 | 66 | 2 | 3 | 208 | 1750 |
| | 2-H3RD ELEVATOR 154-AHU- MOU PENTHOUSE 14-3RD DISPE | NTED 35 24 | 1200 36.6 | 37.5 | 85 | 56.8 | 10 | DDC | 240.1 | DRISTEEM | 1,2,3 | 154-HRP-1- AHU12ELEVATOR PENTHOUSE154-AHU- 12-4THHEAT RECOVE LOOF | RY INLINE | HEAT RECOVERY 1 WATER | 00 25 | N/A | | 1 | 66 | 2 | 3 | 208 | 1750 |
| | ΝΟΤΕ | BE | | | | | 1 | | | | | 154-HRP-2-ELEVATOR154-AHU-HEATAHU13PENTHOUSE13-4THRECOVELOOF | RY INLINE | HEAT RECOVERY 1 WATER | 00 25 | N/A | | 1 | 66 | 2 | 3 | 208 | 1750 |
| | CASING MATERIAL AND MOUNT STEAM TRAP SHALL BE ORDER PROVIDE PRESSURE/ZED CONT | ED AS PART OF | THE MANUE | ACURER'S | | | ZED BY TH | IE MANUF | ACTURER | | | 154-HRP-3- AHU14ELEVATOR PENTHOUSE154-AHU- 14-3RDHEAT RECOVE LOOF | RY INLINE | HEAT RECOVERY 2 WATER | 00 10 | N/A | | 1 | 66 | 7.5 | 3 | 208 | 1750 |

3. PROVIDE PRESSUREIZED CONDENSATE RETURN, PCR-1, FROM MANUFACTURER.

| | | AREA | | | | | | | | | | | CHILLED | WATER CO | JIL | | | | | | | | PF | REHEAT CO |)IL | | | | | F' | FILTER |
|------|----------|----------------|----------|-------------|--------|----------|--------|------|------------|------|--|-------|-------------|-------------|------|----|----|----|----------|------|------|---------|------|-----------|-----|-----|----|---------|---------|---------------|------------|
| MARK | LOCATION | AND/OR BLDG | TYPE | AIR FLOW | | AIR FLOV | V | E | Α Τ | LA | LAT TOTAL SENSIBL EWT LWT % MAX FACE TEMPERATURES TOTAL EWT LWT GLYCOL VELOCITY EAT LAT OADAOUT GPM WPD EWT LWT GL | | % GLYCOL | MAX FACE | | | | | | | | | | | | | | | | | |
| | | SERVED | | FLOW | SUPPLY | MIN OA | RETURN | Db | Wb | Db | Wb | Υ | CAPACIT | GPIVI | | | | | VELOCITY | EAT | LAT | CAPACIT | GPM | VVPD | | | | VELOCIT | HUM | | |
| | | SERVED | | | CFM | CFM | CFM | °F | °F | °F | °F | MBH | MBH | | | °F | °F | % | FPM | °F | °F | MBH | - | | °F | °F | % | FPM | SECTION | PF1 | PF2 |
| | ELEVATOR | BLDG 154 | FAN WALL | VAV | 8,000 | 3,400 | SA.OA | 80.9 | 57 | 55.8 | 46.3 | 219.2 | 219.2 | 48.6 | 12.0 | 45 | 55 | 45 | 500 | 34.6 | 65.6 | 268.6 | 14.7 | 5.0 | 140 | 100 | 45 | 500 | YES | MERV N 7 1 | MERV 11 |
| | ELEVATOR | BLDG 154 | FAN WALL | VAV | 24,200 | 11,300 | SA.OA | 79.4 | 59.6 | 55 | 50.7 | 547.3 | 547.3 | 121.0 | 8.8 | 45 | 55 | 45 | 500 | 40.6 | 65.7 | 597.3 | 28.0 | 3.3 | 140 | 100 | 45 | 500 | NO | MERV N 7 1 | MERV 11 |
| | OUTBOARD | BLDG 154 | FAN WALL | VAV | 10,000 | 2,900 | SA.OA | 78 | 58.6 | 53.9 | 49.6 | 223.4 | 223.4 | 500 | 8.6 | 45 | 55 | 45 | 500 | 46.5 | 71.5 | 219.8 | 10.0 | 5.0 | 140 | 100 | 45 | 500 | NO | MERV N 7 1 | MERV 11 |
| | OUTBOARD | BLDG 154 | FAN WALL | VAV | 10,300 | 2,500 | 7800 | 76.9 | 54.4 | 55.6 | 44.9 | 237.2 | 237.2 | 50.0 | 9.0 | 45 | 55 | 45 | 500 | 51.2 | 71 | 221.4 | 10.0 | 5.0 | 140 | 100 | 45 | 500 | NO | MERV | MERV |

| | BUFFER TANK SCHEDULE | | | | | | | | | | | | | | |
|-------------------------|----------------------|---------------|--------------------------|---------------------------|---------------------|---------|--|--|--|--|--|--|--|--|--|
| MARK | LOCATION | VOLUME (GAL.) | DIA. X LENGTH (IN) | OPER. PRESS. (PSIG) | OPER. WT. (LBS.) | REMARKS | | | | | | | | | |
| 154-BT- 1- CHLR05 | PENTHOUSE | 210 | 30X75 | 125 | 2,179 | 36,000 | | | | | | | | | |

| | GLYCOL FEED PUMP SCHEDULE | | | | | | | | |
|----------|---------------------------|---------------|--------------------------|-----|------|---------------------|---------------------------|--|--|
| MARK | LOCATION | VOLUME (GAL.) | DIA. X LENGTH (IN) | GPM | PSIG | OPER. WT. (LBS.) | ELECTRICAL | | |
| 154-GF-1 | PENTHOUSE | 50 | 28X55 | 1.8 | 25 | 843 | 120V 1ph 60 HZ, 15amps | | |

| | | | STE | AM TO | WATE | R HEAT | EXCH | ANGEF | R SCHE | DULE | | | |
|---------|-----------------------|--------|------------------|-----------------|------|----------|-----------|-------|--------|---------|--------|---------|---------|
| | | AREA | SYSTEM | | | WATER CO | ONDITIONS | | STEAM | CONTROL | TR | AP | |
| MARK | LOCATION | AND/OR | AND/OR | TYPE | FLOW | EWT | LWT | WPD | ENT | VALVE | TRAP # | CAPACIT | REMARKS |
| | | BLDG | SERVICE | | GPM | °F | °F | PSI | PSIG | LBS/HR | | LBS/HR | |
| 154-HX1 | ELEVATOR PENTHOUSE | 154 | HEATING WATER | SHELL & COIL | 133 | 140 | 180 | 7 | 10 | 2732 | | | |

ARCHITECT/ENGINEERS:



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AESUS Architecture, Eng and Sustainable D designgroup and Sustainable L 1050 E. Southern Ave, Suite #D, Tempe, Arizona &



| | | FAN SCHEDULE | | | | | | | | | | | | | | | | |
|----------|-------------------------------|----------------|--------------------|-------|--------------------------|--------|---------------|----|--------------|--------|----------------|----------|----------|-------|------|------|-----------------|-------------|
| | | AREA | SYSTEM | | AIR FAN MOTOR ELECTRICAL | | | | | | | | | | | | | |
| MARK | LOCATIO N | AND/OR BLDG | AND/OR SERVICE | FLOW | TSP | NUMBER | DISCHAR GE | ĸ | MIN % EFF | DRIVE | FAN MAX RPM | | - | PHASE | VOLT | RPM | SPEED CONTRO | REMARK S |
| | | SERVED | | CFM | IN | | | IN | | 8 | 1 | BHP | HP | | | | <u> </u> | |
| 1-SF2ND | ELEVATOR PENTHOU SE | 2ND FLOOR | 154-AHU- 15-2ND | 8000 | 4.7 | 2 | TOP | - | 90.0% | DIRECT | 1800 | 4.4 (EA) | 5.0 (EA) | 3 | 208 | 1750 | VARIABLE | 1 |
| 1-RF2ND | ELEVATOR PENTHOU SE | 2ND FLOOR | 154-AHU- 15-2ND | 8000 | 2.3 | 2 | TOP | | 89.5% | DIRECT | 1846 | 2.3 (EA) | 3 (EA) | 3 | 208 | 1750 | VARIABLE | 1 |
| 1A-SF4TH | OUTBOAR D PENTHOU SE | 4TH FLOOR | 154-AHU- 12-4TH | 10300 | 4.9 | 2 | ТОР | | 91.7% | DIRECT | 1800 | 5.7 | 7.5 (EA) | 3 | 208 | 1750 | VARIABLE | 1 |
| 1A-RF4TH | OUTBOAR D PENTHOU SE | 4TH FLOOR | 154-AHU- 12-4TH | 10300 | 2.3 | 2 | ТОР | | 89.5% | DIRECT | 1800 | 3.2 (EA) | 5 (EA) | 3 | 208 | 1750 | VARIABLE | 1 |
| 2A-SF4TH | OUTBOAR D PENTHOU SE | 4TH FLOOR | 154-AHU- 13-4TH | 10000 | 4.5 | 2 | TOP | | 89.5% | DIRECT | 1800 | 4.8 (EA) | 5 (EA) | 3 | 208 | 1750 | VARIABLE | 1 |
| 2A-RF4TH | OUTBOAR D PENTHOU SE | 4TH FLOOR | 154-AHU- 13-4TH | 10000 | 2.3 | 2 | TOP | | 89.5% | DIRECT | 1800 | 3.1 (EA) | 5 (EA) | 3 | 208 | 1750 | VARIABLE | 1 |
| 2-SF3RD | ELEVATOR PENTHOU SE | 3RD FLOOR | 154-AHU- 14-3RD | 24200 | 4.7 | 6 | TOP | | 89.5% | DIRECT | 1800 | 4.5 (EA) | 5 (EA) | 3 | 208 | 1750 | VARIABLE | 1 |
| 2-RF3RD | ELEVATOR PENTHOU SE | 3RD FLOOR | 154-AHU- 14-3RD | 24200 | 2.1 | 4 | TOP | | 89.5% | DIRECT | 1800 | 3.5 (EA) | 5 (EA) | 3 | 208 | 1750 | VARIABLE | 1 |

NOTE

1. VFD SHALL BE INTEGRAL WITH UNIT AND PROVIDED BY MANUFACTURER

| | VAR | | FREQUE | ENCY D | RIVES | CHEDULE | |
|-------|-----------------------|-----------|--------|--------|--------|-----------------|-----|
| MARK | LOCATION | SERVES | МОТ | OR | RYPASS | BASIS OF DESIGN | |
| | LOOATION | | HP | VOLT | БПХОО | | |
| VFD-1 | ELEVATOR PENTHOUSE | 154-CHP-1 | 10 | 208/3 | YES | DANFOS | 1,2 |
| VFD-2 | ELEVATOR PENTHOUSE | 154-CHP-2 | 10 | 208/3 | YES | DANFOS | 1,2 |
| VFD-3 | ELEVATOR PENTHOUSE | 154-HWP-1 | 3 | 208/3 | YES | DANFOS | 1,2 |
| VFD-4 | ELEVATOR PENTHOUSE | 154-HWP-2 | 3 | 208/3 | YES | DANFOS | 1,2 |

| | НС | DT WATER UI | | ATER S | CHEDULE | | |
|---------------------------|--------------------------|-----------------------------|----------|--------|-------------|--------|---------|
| MARK | TYPE | MANUFACTURER & MODEL NO. | CFM | GPM | VOLTAGE/PH. | BTU | REMARKS |
| 154-UH-1 THRU 154-UH-4 | HOT WATER UNIT HEATER | TRANE UHSBA36 | 850 | 3.6 | 115/1 | 36,000 | 1,2,3 |
| 2. PROVIDE I | MANUFACTU | PENSION AS DIR | JTY TSTA | | | | |

3. PROVIDE WITH INTEGRAL DISCONNECT.

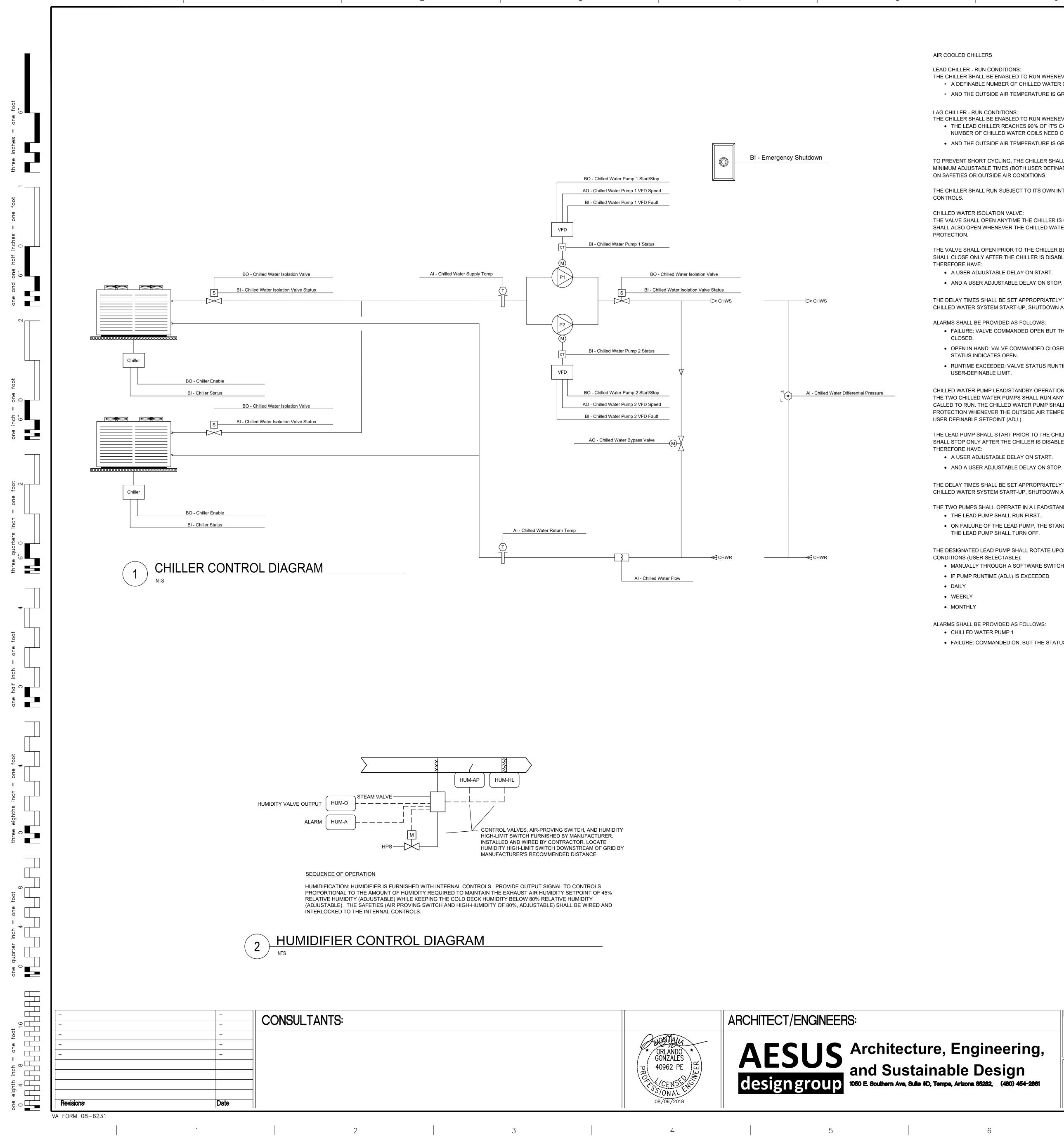
1. PROVIDE MINIMUM NEMA 1 ENCLOSURE FOR INDOOR INSTALLATION.

NOTE

2. ALL VFDS FURNISHED WITHIN EQUIPMENT CONTROL PANEL OR PROVIDED SEPERATIELY SHALL BE THE PRODUCT OF ONE MANUFACTURER.

| | | | | | | 'BID SET' |
|---------------------------------|----------------------------------|-----------------------------|---------------|-------------|------------------------------|-----------------------------------|
| | Drawing Title MECHANICAL | Project Title REPLACE | PENTHOUS | 6E | Project Number 436-17-102 | Office of |
| gineering, | SCHEDULES | HVAC SYS CONTRACT NO. VA | | | Building Number 154 | Construction and Facilities |
| Design | - | Location FT. HARRISON | | HELENA, MT | Drawing Number | Management |
| a 85282, (480) 454-286 1 | VAPAHCS PLANNING AND ENGINEERING | Date 07/14/16 | Checked OG | Drawn CR | M601 | Department of Veterans Affairs |

|)R | | |
|------------|------------------|---------|
| MAX RPM | SPEED CONTROL | REMARKS |
| 1750 | VARIABLE | |
| 1750 | VARIABLE | |
| 750 | CONSTANT | |



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FMS

LEAD CHILLER - RUN CONDITIONS:

THE CHILLER SHALL BE ENABLED TO RUN WHENEVER: A DEFINABLE NUMBER OF CHILLED WATER COILS NEED COOLING • AND THE OUTSIDE AIR TEMPERATURE IS GREATER THAN 54°F (ADJ.).

LAG CHILLER - RUN CONDITIONS:

THE CHILLER SHALL BE ENABLED TO RUN WHENEVER: • THE LEAD CHILLER REACHES 90% OF IT'S CAPACITY AND A DEFINABLE NUMBER OF CHILLED WATER COILS NEED COOLING • AND THE OUTSIDE AIR TEMPERATURE IS GREATER THAN 54°F (ADJ.).

TO PREVENT SHORT CYCLING, THE CHILLER SHALL RUN FOR AND BE OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER DEFINABLE), UNLESS SHUTDOWN

THE CHILLER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND

CHILLED WATER ISOLATION VALVE:

THE VALVE SHALL OPEN ANYTIME THE CHILLER IS CALLED TO RUN. THE VALVE SHALL ALSO OPEN WHENEVER THE CHILLED WATER PUMP RUNS FOR FREEZE

THE VALVE SHALL OPEN PRIOR TO THE CHILLER BEING ENABLED AND SHALL CLOSE ONLY AFTER THE CHILLER IS DISABLED. THE VALVE SHALL

A USER ADJUSTABLE DELAY ON START.

• AND A USER ADJUSTABLE DELAY ON STOP.

THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

ALARMS SHALL BE PROVIDED AS FOLLOWS: FAILURE: VALVE COMMANDED OPEN BUT THE STATUS INDICATES

OPEN IN HAND: VALVE COMMANDED CLOSED BUT THE

STATUS INDICATES OPEN. RUNTIME EXCEEDED: VALVE STATUS RUNTIME EXCEEDS A

CHILLED WATER PUMP LEAD/STANDBY OPERATION:

THE TWO CHILLED WATER PUMPS SHALL RUN ANYTIME THE CHILLER IS CALLED TO RUN. THE CHILLED WATER PUMP SHALL ALSO RUN FOR FREEZE PROTECTION WHENEVER THE OUTSIDE AIR TEMPERATURE IS LESS THAN A USER DEFINABLE SETPOINT (ADJ.).

THE LEAD PUMP SHALL START PRIOR TO THE CHILLER BEING ENABLED AND SHALL STOP ONLY AFTER THE CHILLER IS DISABLED. THE PUMP(S) SHALL

A USER ADJUSTABLE DELAY ON START.

THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

THE TWO PUMPS SHALL OPERATE IN A LEAD/STANDBY FASHION. THE LEAD PUMP SHALL RUN FIRST. ON FAILURE OF THE LEAD PUMP, THE STANDBY PUMP SHALL RUN AND

THE LEAD PUMP SHALL TURN OFF. THE DESIGNATED LEAD PUMP SHALL ROTATE UPON ONE OF THE FOLLOWING

CONDITIONS (USER SELECTABLE): MANUALLY THROUGH A SOFTWARE SWITCH

IF PUMP RUNTIME (ADJ.) IS EXCEEDED

ALARMS SHALL BE PROVIDED AS FOLLOWS:

CHILLED WATER PUMP 1

• FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.

• RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.

 RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.

- VFD FAULT.
- CHILLED WATER PUMP 2
- FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.
- VFD FAULT.

CHILLED WATER DIFFERENTIAL PRESSURE CONTROL: THE CONTROLLER SHALL MEASURE CHILLED WATER DIFFERENTIAL PRESSURE AND MODULATE THE LEAD CHILLED WATER PUMP VFD TO MAINTAIN ITS CHILLED WATER DIFFERENTIAL PRESSURE SETPOINT. THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES. ALL SETPOINTS SHALL BE FIELD ADJUSTED DURING THE COMMISSIONING PERIOD TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS.

THE CONTROLLER SHALL MODULATE CHILLED WATER PUMP SPEED TO MAINTAIN A CHILLED WATER DIFFERENTIAL PRESSURE OF 12LBF/IN2 (ADJ.). THE VFD MINIMUM SPEED SHALL NOT DROP BELOW 10% (ADJ.).

- ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH CHILLED WATER DIFFERENTIAL PRESSURE: IF THE CHILLED WATER DIFFERENTIAL PRESSURE IS 25% (ADJ.) GREATER THAN SETPOINT.
- LOW CHILLED WATER DIFFERENTIAL PRESSURE: IF THE CHILLED WATER DIFFERENTIAL PRESSURE IS 25% (ADJ.) LESS THAN SETPOINT.

CHILLED WATER BYPASS VALVE - MINIMUM FLOW CONTROL: THE CONTROLLER SHALL MEASURE CHILLED WATER FLOW THROUGH THE CHILLER AND, AS THE CHILLED WATER FLOW DROPS BELOW SETPOINT, THE CONTROLLER SHALL MODULATE THE CHILLED WATER BYPASS VALVE OPEN TO

MAINTAIN THE MINIMUM CHILLED WATER FLOW SETPOINT.

ALARMS SHALL BE PROVIDED AS FOLLOWS: • LOW CHILLED WATER FLOW: IF THE CHILLED WATER FLOW IS 25% (ADJ.) LESS THAN SETPOINT.

CHILLER:

THE CHILLER SHALL BE ENABLED A USER ADJUSTABLE TIME AFTER PUMP STATUSES ARE PROVEN ON. THE CHILLER SHALL THEREFORE HAVE A USER ADJUSTABLE DELAY ON START.

THE DELAY TIME SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

THE CHILLER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

- CHILLER FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- CHILLER RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON CHILLER RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER

CHILLER CHILLED WATER SUPPLY SETPOINT:

THE CHILLER SHALL MAINTAIN A CHILLED WATER SUPPLY TEMPERATURE SETPOINT AS DETERMINED BY ITS OWN INTERNAL CONTROLS (PROVIDED BY OTHERS).

CHILLED WATER TEMPERATURE MONITORING:

THE FOLLOWING TEMPERATURES SHALL BE MONITORED: CHILLED WATER SUPPLY.

CHILLED WATER RETURN.

DEFINABLE LIMIT.

- ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS GREATER THAN 55°F (ADJ.).
- LOW CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS LESS THAN 38°F (ADJ.).

| | Project Title | | | Project Number | |
|---------------------------------------|--------------------------|----------------|---|---|--|
| | | PENTHOUS | SE . | 436-17-102 | Office of |
| HVAC CONTROL DIAGRAMS | | | | Building Number 154 | Construction and Facilities |
| - | Location FT. HARRISON | | HELENA, MT | Drawing Number | Management |
| - VAPAHCS PLANNING AND ENGINEERING | Date | Checked | Drawn | | Department of Veterans Affairs |
| | HVAC CONTROL DIAGRAMS | - FT. HARRISON | - CONTRACT NO. VA259-17-C-0212 - FT. HARRISON VAPAHCS PLANNING AND ENGINEERING Checked | - CONTRACT NO. VA259-17-C-0212 - FT. HARRISON HELENA, MT - Date Checked Drawn | - CONTRACT NO. VA259-17-C-0212 154 154 154 154 154 154 154 154 154 154 |

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| EMS | |
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| $\left(\begin{array}{c} x \\ x $ | |

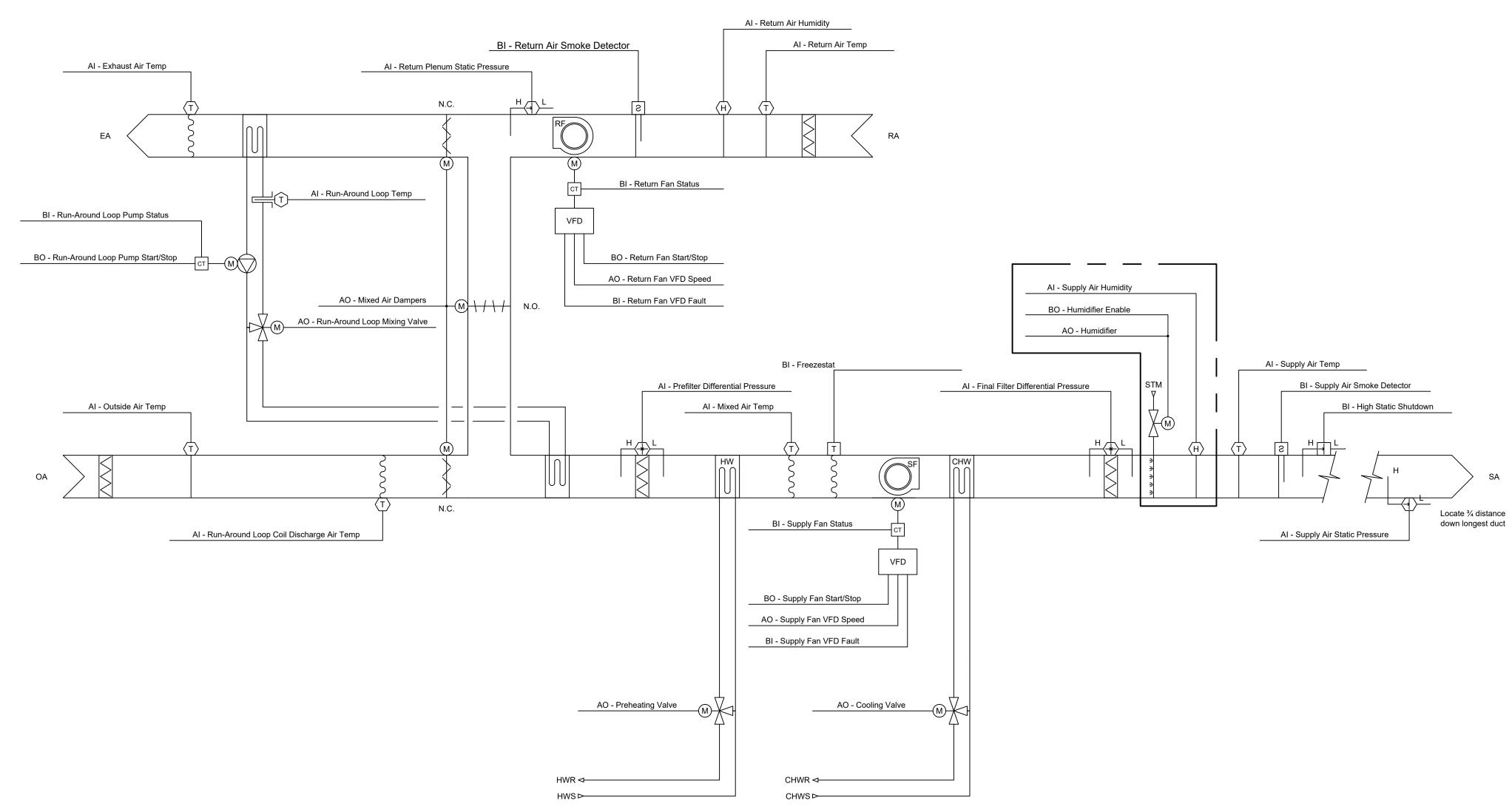
| ABBREVIATIONS |
|------------------------------|
| DIRECT DIGITAL CONTROL |
| NORMALLY OPEN |
| NORMALLY CLOSED |
| SPRING RANGE |
| THROTTLING RANGE |
| PREHEAT |
| CONTROL POINT ADJUSTMENT |
| DIRECT ACTING |
| REVERSE ACTING |
| FACILITY MANAGEMENT SYSTEM |
| ENTERPRISE MANAGEMENT SYSTEM |
| |
| |

SYMBOLS

HARD-WIRED SAFETY INTERLOCK

HARDWARE POINT





AHU CONTROL DIAGRAM

| | | Hardwa | re Points | | Software Points | | | | | | |
|---|----|--------|-----------|----|-----------------|---|------|---|-------|-------|-----------------|
| Point Name | AI | AO | Bl | BO | AV | BV | Loop | Sched | Trend | Alarm | Show On Graphic |
| Exhaust Air Temp | x | | | | | | | | x | | x |
| Final Filter Differential Pressure | x | | | | | | | * | x | | |
| Mixed Air Temp | x | | | | | | | | x | | x |
| Outside Air Temp | х | 1 - 2 | | | | | | | х | | х |
| Prefilter Differential Pressure | x | | | - | | | | | x | | ****** |
| Return Air Humidity | x | | | | | | | | x | | x |
| Return Air Temp | x | | | | | | | | x | | x |
| Return Plenum Static Pressure | x | | | | | | | | x | | х |
| Run-Around Loop Coil Discharge Air Temp | x | | | | | | | | x | | х |
| Run-Around Loop Temp | x | | | | | - | | - | x | | x |
| Supply Air Hum idity | x | | | | | - | | - | x | | x |
| Supply Air Static Pressure | x | | | - | | | | - | x | x | x |
| Supply Air Temp | x | | | | | | | | x | | x |
| Cooling Valve | | x | | | | | | | x | | х |
| Humidifier | | x | | | | | | - | x | | x |
| Mixed Air Dampers | | x | | | | | | | x | | x |
| Preheating Valve | | x | | | *** | *************************************** | | *************************************** | x | | x |
| Return Fan VFD Speed | | x | | | | | | | x | | х |
| Run-Around Loop Mixing Valve | | x | | | | | | | x | | х |
| Supply Fan VFD Speed | | x | | | | | | | x | | x |
| Freezestat | | | x | | | | | | x | x | x |
| High Static Shutdown | | | x | | | - | | | x | x | x |
| Return Air Smoke Detector | | | x | | | | | | х | х | х |
| Return Fan Status | | | x | | | | | | x | | x |
| Return Fan VFD Fault | | | x | | | | | | | х | x |
| Run-Around Loop Pump Status | | | x | | | | | | x | | x |
| Supply Air Smoke Detector | | | x | | | | | | x | x | x |
| Supply Fan Status | | | x | | | | | | х | | х |
| Supply Fan VFD Fault | | | x | | | | | | | х | х |
| Humidifier Enable | | | | x | | | | | | | x |
| Return Fan Start/Stop | İ | | | x | | | | | x | | x |
| Run-Around Loop Pump Start/Stop | | | | x | | - | | | x | | x |
| Supply Fan Start/Stop | | | | x | | | | | x | | x |
| Economizer Mixed Air Temp Setpoint | | | | | x | | | | x | | x |
| Humidifier Setpoint | | | | | x | | | | | | x |
| Preheating Mixed Air Temp Setpoint | | | | | x | - | | | x | | x |
| Return Plenum Static Pressure Setpoint | | | | | x | | | | x | | x |

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| _ | C | ONSULTANTS: |
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| - | | |
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| | | |
| Revisions: | Date | |

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| | | Hardwa | Hardware Points | | | | Software Points | | | | |
|---------------------------------------|---------|--------|-----------------|-----|----|----|-----------------|-------|-------|-------|----------------|
| Point Name | AI | AO | BI | BO | AV | BV | Loop | Sched | Trend | Alarm | Show On Graphi |
| Supply Air Static Pressure Setpoint | | | | | x | | | | x | | x |
| Supply Air Temp Setpoint | | | | | x | | | | x | | x |
| Emergency Shutdown | | | | | | x | | | х | x | x |
| Final Filter Change Required | | | | | | | | | | x | x |
| High Mixed Air Temp | ******* | | | | | | | | | x | |
| High Return Air Humidity | | | | | | | | | | x | |
| High Return Air Temp | | | | | | | | | | x | |
| High Return Plenum Static Pressure | | | | | | | | | | x | |
| High Supply Air Humidity | | | | | | | | | | x | |
| High Supply Air Static Pressure | | | | | | | | | | x | |
| High Supply Air Static Pressure | | | | | | | | | | x | |
| High Supply Air Temp | | | | | | | | | | x | |
| High Supply Air Temp | | | | | | | | | | x | |
| Low Mixed Air Temp | | | | | | | | | | x | |
| Low Return Air Humidity | | | | | | | | | | x | |
| Low Return Air Temp | | | | | | | | | | x | |
| Low Return Plenum Static Pressure | | | | *** | | | | | | × | |
| Low Supply Air Humidity | | | | | | | | | | x | |
| Low Supply Air Static Pressure | | | | | | | | | | x | |
| Low Supply Air Temp | | | | | | | | | | x | |
| Low Supply Air Temp | | | | | | | | | | x | |
| Prefilter Change Required | | | | | | | | - | | x | x |
| Return Fan Failure | | | | | | | | | | x | |
| Return Fan in Hand | | | | | | | | | | x | |
| Return Fan Runtime Exceeded | | | | | | | | | | x | |
| Run-Around Loop Pump Failure | | | | | | | | | | x | |
| Run-Around Loop Pump in Hand | | | | | | | - | | | x | |
| Run-Around Loop Pump Runtime Exceeded | | | | | | | | | | x | |
| Supply Fan Failure | | | | | | | | | | x | |
| Supply Fan in Hand | | | | | | 1 | | | | x | |
| Supply Fan Runtime Exceeded | | | | | | 1 | | | | x | 1 |
| Totals | 13 | 7 | 9 | 4 | 6 | 1 | 0 | 0 | 36 | 35 | 40 |





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Architecture, Eng and Sustainable CESIGNGIOUD 1050 E. Southern Ave, Suite #D, Tempe, Arizona &



3

SEQUENCE OF CONTROLS

RUN CONDITIONS - REQUESTED: THE UNIT SHALL RUN WHENEVER:

 ANY ZONE IS OCCUPIED. OR A DEFINABLE NUMBER OF UNOCCUPIED ZONES NEED HEATING OR COOLING.

EMERGENCY SHUTDOWN: THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING AN EMERGENCY SHUTDOWN SIGNAL.

FREEZE PROTECTION:

THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A FREEZESTAT STATUS.

HIGH/LOW STATIC SHUTDOWN:

THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING AN HIGH OR LOW STATIC SHUTDOWN SIGNAL.

RETURN AIR SMOKE DETECTION:

THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A RETURN AIR SMOKE DETECTOR STATUS. SUPPLY AIR SMOKE DETECTION:

THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A SUPPLY AIR SMOKE DETECTOR STATUS.

AHU OPTIMAL START: THE UNIT SHALL START PRIOR TO SCHEDULED OCCUPANCY BASED ON THE TIME NECESSARY FOR THE ZONES TO REACH THEIR OCCUPIED SETPOINTS. THE START TIME SHALL AUTOMATICALLY ADJUST BASED ON CHANGES IN OUTSIDE AIR TEMPERATURE AND ZONE TEMPERATURES.

SUPPLY FAN (12 FANS): THE SUPPLY FANS SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES. TO PREVENT SHORT CYCLING, THE SUPPLY FANS SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME. SUPPLY FANS SHALL RAMP UP AS ONE FAN.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

• SUPPLY FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF. • SUPPLY FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON. SUPPLY FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

SUPPLY AIR DUCT STATIC PRESSURE CONTROL:

THE CONTROLLER SHALL MEASURE DUCT STATIC PRESSURE AND MODULATE THE SUPPLY FAN VFD SPEED TO MAINTAIN A DUCT STATIC PRESSURE SETPOINT. THE SPEED SHALL NOT DROP BELOW 30% (ADJ.). THE STATIC PRESSURE SETPOINT SHALL BE RESET BASED UPON THE POSITION OF THE ZONE DAMPERS, WITH A GOAL OF REDUCING THE STATIC PRESSURE UNTIL AT LEAST ONE ZONE DAMPER IS NEARLY WIDE OPEN.

- THE INITIAL DUCT STATIC PRESSURE SETPOINT SHALL BE 1.5IN H2O (ADJ.). • IF NO ZONE DAMPER IS NEARLY WIDE OPEN, THE SETPOINT SHALL INCREMENTALLY RESET DOWN TO A
- MINIMUM OF 1.3IN H2O (ADJ.). AS ONE OR MORE DAMPERS NEARS THE WIDE OPEN POSITION, THE SETPOINT SHALL INCREMENTALLY RESET UP TO A MAXIMUM OF 1.8IN H2O (ADJ.).

ALARMS SHALL BE PROVIDED AS FOLLOWS:

• HIGH SUPPLY AIR STATIC PRESSURE: IF THE SUPPLY AIR STATIC PRESSURE IS 25% (ADJ.) GREATER THAN SETPOINT • LOW SUPPLY AIR STATIC PRESSURE: IF THE SUPPLY AIR STATIC PRESSURE IS 25% (ADJ.) LESS THAN SETPOINT. SUPPLY FAN VFD FAULT.

RETURN FANS (12 FANS): THE RETURN FANS SHALL RUN WHENEVER THE SUPPLY FANS RUN. RETURN FANS SHALL RAMP UP AND DOWN AS ONE FAN AND NOT BE STAGED.

ALARMS SHALL BE PROVIDED AS FOLLOWS: RETURN FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.

• RETURN FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON. • RETURN FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.). RETURN FAN VFD FAULT.

RETURN PLENUM STATIC PRESSURE CONTROL:

THE CONTROLLER SHALL MEASURE RETURN PLENUM STATIC PRESSURE AND MODULATE THE RETURN FAN VFD SPEED TO MAINTAIN A RETURN PLENUM STATIC PRESSURE SETPOINT OF 0.2IN H2O (ADJ.). THE RETURN FAN VFD SPEED SHALL NOT DROP BELOW 20% (ADJ.).

ALARMS SHALL BE PROVIDED AS FOLLOWS:

 HIGH RETURN PLENUM STATIC PRESSURE: IF THE RETURN AIR PLENUM STATIC PRESSURE IS 25% (ADJ.) GREATER THAN SETPOINT. LOW RETURN PLENUM STATIC PRESSURE: IF THE RETURN AIR PLENUM STATIC PRESSURE IS 25% (ADJ.) LESS THAN SETPOINT.

ENERGY RECOVERY - RUN-AROUND LOOP COILS: THE CONTROLLER SHALL MODULATE THE RUN-AROUND LOOP MIXING VALVE FOR ENERGY RECOVERY AS FOLLOWS. COOLING RECOVERY MODE:

THE CONTROLLER SHALL MEASURE THE RUN-AROUND LOOP COIL DISCHARGE AIR TEMPERATURE (DOWNSTREAM OF THE OUTSIDE AIR COIL) AND MODULATE THE RUN-AROUND LOOP MIXING VALVE TO MAINTAIN A SETPOINT 2°F (ADJ.) LESS THAN THE UNIT SUPPLY AIR TEMPERATURE SETPOINT. THE RUN-AROUND LOOP SHALL RUN FOR COOL **RECOVERY WHENEVER:**

- UNIT RETURN AIR TEMPERATURE IS 5°F (ADJ.) OR MORE BELOW THE OUTSIDE AIR TEMPERATURE. AND THE UNIT IS IN A COOLING MODE.
- AND THE ECONOMIZER IS OFF. AND THE SUPPLY FAN IS ON.

HEATING RECOVERY MODE:

THE CONTROLLER SHALL MEASURE THE RUN-AROUND LOOP COIL DISCHARGE AIR TEMPERATURE (DOWNSTREAM OF THE OUTSIDE AIR COIL) AND MODULATE THE RUN-AROUND LOOP MIXING VALVE TO MAINTAIN A SETPOINT 2°F (ADJ.) GREATER THAN THE UNIT SUPPLY AIR TEMPERATURE SETPOINT. THE RUN-AROUND LOOP SHALL RUN FOR HEAT RECOVERY WHENEVER:

UNIT RETURN AIR TEMPERATURE IS 5°F (ADJ.) OR MORE ABOVE THE OUTSIDE AIR TEMPERATURE.

- AND THE UNIT IS IN A HEATING MODE.
- AND THE ECONOMIZER IS OFF.
- AND THE SUPPLY FAN IS ON.
- FROST PROTECTION:

THE RUN-AROUND LOOP PUMP SHALL RUN AND THE RUN-AROUND LOOP MIXING VALVE SHALL CLOSE TO 0% (ADJ.) IN ORDER TO CIRCULATE WATER THROUGH THE RUN-AROUND LOOP EXHAUST AIR COIL WHENEVER: RUN-AROUND LOOP TEMPERATURE DROPS BELOW 33°F (ADJ.) • OR THE EXHAUST AIR TEMPERATURE DROPS BELOW 30°F (ADJ.).

PREHEATING COIL VALVE:

THE CONTROLLER SHALL MEASURE THE MIXED AIR TEMPERATURE AND MODULATE THE PREHEATING COIL VALVE TO MAINTAIN ITS SETPOINT 5°F (ADJ.) LESS THAN THE SUPPLY AIR TEMPERATURE SETPOINT.

THE PREHEATING SHALL BE ENABLED WHENEVER: OUTSIDE AIR TEMPERATURE IS LESS THAN 60°F (ADJ.).

 AND THE ECONOMIZER IS DISABLED. AND THE SUPPLY FAN STATUS IS ON.

THE PREHEATING COIL VALVE SHALL OPEN FOR FREEZE PROTECTION WHENEVER: MIXED AIR TEMPERATURE DROPS FROM 40°F TO 35°F (ADJ.).

OR THE FREEZESTAT IS ON.

SUPPLY AIR TEMPERATURE SETPOINT - OPTIMIZED: THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE AND SHALL MAINTAIN A SUPPLY AIR TEMPERATURE SETPOINT RESET BASED ON ZONE COOLING AND HEATING REQUIREMENTS

THE SUPPLY AIR TEMPERATURE SETPOINT SHALL BE RESET FOR COOLING BASED ON ZONE COOLING REQUIREMENTS AS FOLLOWS:

THE INITIAL SUPPLY AIR TEMPERATURE SETPOINT SHALL BE 55°F (ADJ.).

 AS COOLING DEMAND INCREASES, THE SETPOINT SHALL INCREMENTALLY RESET DOWN TO A MINIMUM OF 53°F (ADJ.). AS COOLING DEMAND DECREASES, THE SETPOINT SHALL INCREMENTALLY RESET UP TO A MAXIMUM OF

72°F (ADJ.). IF MORE ZONES NEED HEATING THAN COOLING, THEN THE SUPPLY AIR TEMPERATURE SETPOINT SHALL BE RESET

- FOR HEATING AS FOLLOWS: • THE INITIAL SUPPLY AIR TEMPERATURE SETPOINT SHALL BE 82°F (ADJ.).
- AS HEATING DEMAND INCREASES, THE SETPOINT SHALL INCREMENTALLY RESET UP TO A MAXIMUM OF 85°F (ADJ.).
- AS HEATING DEMAND DECREASES, THE SETPOINT SHALL INCREMENTALLY RESET DOWN TO A MINIMUM OF 72°F (ADJ.).

7

SEQUENCE OF CONTROLS (C

COOLING COIL VALVE: THE CONTROLLER SHALL MEASURE THE SUPPLY AIR TEMP MAINTAIN ITS COOLING SETPOINT.

- AND THE HEATING IS NOT ACTIVE.
- THE COOLING COIL VALVE SHALL OPEN TO 50% (ADJ.) WHI ALARMS SHALL BE PROVIDED AS FOLLOWS: HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPER

LOW SUPPLY AIR TEMPERATURE ALARM: THE CONTROLLER SHALL ALARM IF THE SUPPLY AIR TEMF

THE OUTSIDE AND EXHAUST AIR DAMPERS SHALL CLOSE . IS OFF. IF OPTIMAL START UP IS AVAILABLE THE MIXED AIR MODE EXCEPT THAT THE OUTSIDE AIR DAMPER SHALL MO MINIMUM OUTSIDE AIR VENTILATION - FIXED PERCENTAGE

THE CONTROLLER SHALL MEASURE THE RETURN AIR HUMI SETPOINT OF 50% RH (ADJ.). THE HUMIDIFIER SHALL BE EN THE HUMIDIFIER SHALL TURN OFF WHENEVER:

GENERAL NOTES

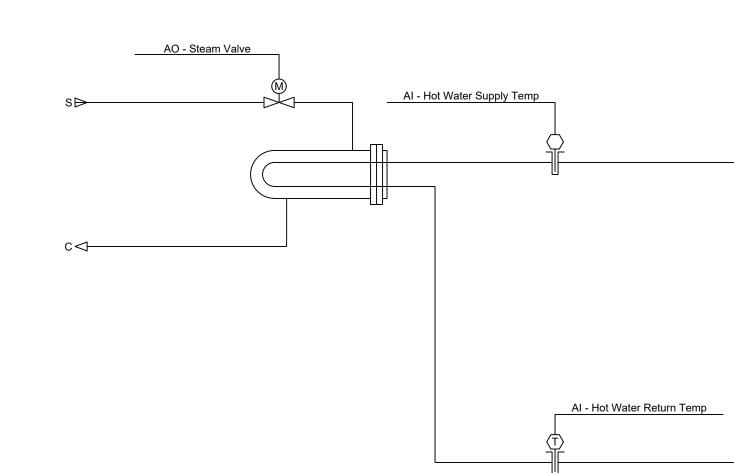
- CONTROLS CONTRACTOR SHALL ADD A LINK ON THE FRONT AND CONTROLS DIAGRAM FOR THE EQUIPMENT INSTALLED CAPABILITY TO SELECT THE EQUIPMENT AND REVIEW THE S
- 2. ALL NEW CONTROLS TO COMMUNICATE WITH EXISTING EMS EQUIPMENT TO DETERMINE CAPACITIES AND NETWORK LAY DIAGRAM AS REQUIRED BY SPECIFICATIONS.
- 3. PROVIDE CONTROL CABINET WHERE REQUIRED (SUITABLE I POWER SUPPLIES, CONDUIT, SENSOR WIRING, COMMUNIC/ SOFTWARE. UNLESS NOTED OTHERWISE, THE BUILDING CO EMERGENCY POWER.
- 4. ALL SETPOINTS INDICATED SHALL BE ADJUSTABLE AT THE COMPUTER CONNECTED TO ANY EMS CONTROL PANEL OR MATCH NAMING CONVENTION OF EXISTING EMS. POINT NAM REFERENCE ONLY.
- 5. COORDINATE ALL SENSOR INSTALLATIONS WITH THE MECH LOCATIONS ON PIPING COORDINATION DRAWING SUBMITTA MANUFACTURER'S RECOMMENDED UPSTREAM AND DOWNS (ESPECIALLY FLOW ELEMENTS AND TRANSMITTERS).
- WHENEVER A UNIT IS SHUTDOWN BECAUSE OF ONE OF ITS READING AND SET POINT OF EACH DEVICE TO HELP THE OP SHUTDOWN.
- 7. IF ANY LOCAL, TERMINAL, OR UNITARY CONTROLLER OR EQ LOSES COMMUNICATION WITH THE BAS NETWORK, AN ALAF THE LOCATION OF THE FAULT.
- 8. UNLESS NOTED OTHERWISE, ALL CONTROL VALVES SHALL FLOATING-POINT CONTROLS SHALL BE ALLOWED. VALVES S
- VFD'S SHALL BE CONNECTED TO THE EMS NETWORK THRO THROUGH THE HARDWIRED POINTS INDICATED. IT IS THE I COORDINATE AND ADAPT THE EMS NETWORK TO THE COM VFD MANUFACTURER. THE FOLLOWING POINTS SHALL BE I FREQUENCY OUTPUT, CURRENT, TORQUE, POWER, DC BUS DRIVE TEMPERATURE, ALARMS, STATUSES
- 10. DUCT SMOKE DETECTORS PROVIDED AND INSTALLED BY T WIRE AND CONDUIT TO THE MOTOR CONTROLLER AND THE TO THE DETECTOR, WIRE, AND CONDUIT BY THE ELECTRICA PLANS AND FIRE ALARM CONTRACTOR FOR REQUIRED POV
- 11. VFD'S SHALL BE CONNECTED TO THE EMS NETWORK THRO AS THROUGH THE HARDWIRED POINTS INDICATED. IT IS TH COORDINATE AND ADAPT THE EMS NETWORK TO THE COM VFD MANUFACTURER.
- 12. CONTROLS SHALL BE SCHNEIDER ELECTRIC BUILDING AUTO HARRISON ENGINEERING DEPARTMENT.

| jineering, | Drawing Title HVAC CONTROL DIAGRAMS | Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212 | Project Num 436-17-102 Building Num 154 | | | |
|-----------------------|---------------------------------------|--|--|--|--|--|
| Design | _ | Location FT. HARRISON HELENA, MT | | | | |
| 35282, (480) 454-2861 | - VAPAHCS PLANNING AND ENGINEERING | DateCheckedDrawn07/14/16OGCR | M80 2 | | | |
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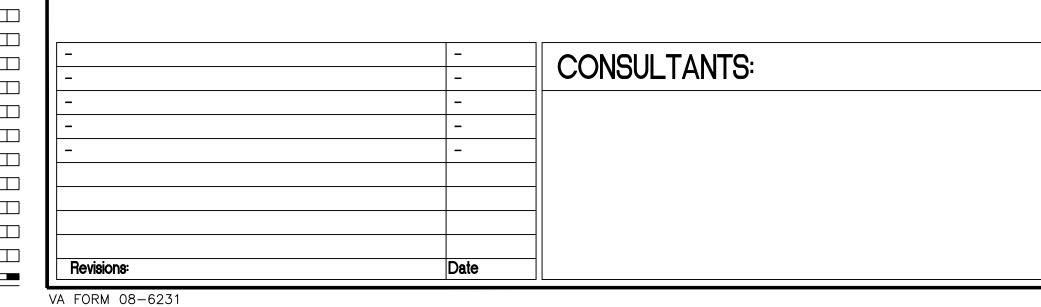
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| SEQU | ENCE O | F CONTR | OLS (CONT.) | |
| | OIL VALVE: ROLLER SHALL M | IEASURE THE SUP | PLY AIR TEMPERATURE A | ND MODULATE THE COOLING COIL VALVE TO |
| HE COOLI | | ABLED WHENEVE | | |
| • ANC • ANC | THE ECONOMIZ | ER IS DISABLED C IN STATUS IS ON. | TER THAN 60°F (ADJ.). DR FULLY OPEN. | |
| HE COOLI | NG COIL VALVE S | SHALL OPEN TO 50 | 0% (ADJ.) WHENEVER THE | FREEZESTAT IS ON. |
| • HIGI | | | Y AIR TEMPERATURE IS 5°. | °F (ADJ.) GREATER THAN SETPOINT. A |
| THE CONTR | ROLLER SHALL A | LARM IF THE SUPF | PLY AIR TEMPERATURE IS | |
| SEQUENCE | TO MAINTAIN A | SETPOINT 2°F (AD | J.) LESS THAN THE SUPPL | D MODULATE THE ECONOMIZER DAMPERS IN Y AIR TEMPERATURE SETPOINT. THE OUTSIDE 20% (ADJ.) OPEN WHENEVER OCCUPIED. |
| OUTANE | SIDE AIR TEMPE | E ENABLED WHEN RATURE IS LESS T IR TEMPERATURE IN STATUS IS ON. | | RN AIR TEMPERATURE. |
| • MIXI • OR | ED AIR TEMPERA THE FREEZESTA | | DM 40°F TO 35°F (ADJ.). | |
| S OFF. IF C | OPTIMAL START L | JP IS AVAILABLE TI | | FURN AIR DAMPER SHALL OPEN WHEN THE UN T IALL OPERATE AS DESCRIBED IN THE OCCUPIED FULLY CLOSED. |
| HE OUTSI | DE AIR DAMPERS OSED DURING UI | TILATION - FIXED F S SHALL MAINTAIN NOCCUPIED HOUR | A MINIMUM ADJUSTABLE | POSITION DURING BUILDING OCCUPIED HOURS B |
| HE CONTR | | | | ODULATE THE HUMIDIFIER TO MAINTAIN A NEVER THE SUPPLY FAN STATUS IS ON. |
| • SUP | PLY AIR HUMIDIT | RN OFF WHENEVEI TY RISES FROM 90' PLY FAN STATUS. | % RH TO 95% RH (ADJ.). | |
| HIGILOW | H SUPPLY AIR HU / SUPPLY AIR HU | MIDITY: IF THE SU | IPPLY AIR HUMIDITY IS LES | EATER THAN 90% RH (ADJ.). SS THAN 30% RH (ADJ.). |
| THE CONTR | ROLLER SHALL M HALL BE PROVIDE | ED AS FOLLOWS: | ERENTIAL PRESSURE ACF | |
| (AD. | J.). | L PRESSURE MON | | SSURE EXCEEDS A USER DEFINABLE LIMIT |
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| RETURN AI THE CONTR | R HUMIDITY: | | | SE AS REQUIRED FOR ECONOMIZER CONTROL |
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| RETURN AI THE CONTR | R TEMPERATURE ROLLER SHALL M | E: IONITOR THE RETU | | ND USE AS REQUIRED FOR SETPOINT CONTROL |
| ALARMS SH • HIGI | H RETURN AIR TE | ED AS FOLLOWS: EMP: IF THE RETUF | RN AIR TEMPERATURE IS (RN AIR TEMPERATURE IS L | GREATER THAN 90°F (ADJ.). |
| | R TEMPERATURE | E | PLY AIR TEMPERATURE. | D |
| HIGI | H SUPPLY AIR TE | | .Y AIR TEMPERATURE IS G Y AIR TEMPERATURE IS LE | REATER THAN 120°F (ADJ.). |
| | | | TAIR TEMPERATURE IS LE | -55 THAN 45 F (ADJ.). |
| ND CONTR | OLS DIAGRAM FO | OR THE EQUIPMEN | NT INSTALLED IN THIS PRO | HOWS THE SEQUENCE OF OPERATION JECT. THE CLIENT SHALL HAVE THE GRAM FOR THE EQUIPMENT. |
| L NEW CC | ONTROLS TO COM | MUNICATE WITH I | EXISTING EMS. FIELD INVI | ESTIGATE EXISTING CONTROLS TO BID. SUBMIT DETAILED NETWORK |
| ROVIDE CO DWER SUP | ONTROL CABINET PLIES, CONDUIT, UNLESS NOTED | WHERE REQUIRE , SENSOR WIRING, | , COMMUNICATION WIRING | ED LOCATION) COMPLETE WITH G AND RELATED HARDWARE AND TEM SHALL BE CONNECTED TO |
| L SETPOII | NTS INDICATED S | ANY EMS CONTRO | OL PANEL OR CONTROLLE | JTER WORKSTATION AND VIA A LAPTOP R. ACTUAL POINT NAMES SHALL ON THE CONTROL DIAGRAMS ARE FOR |
| EFERENCE DORDINAT DCATIONS | : ONLY. E ALL SENSOR IN ON PIPING COOF | ISTALLATIONS WIT | TH THE MECHANICAL CON NG SUBMITTAL. COORDIN/ | TRACTOR AND SUBMIT PROPOSED ATE TO INSURE THAT THE SENSOR |
| SPECIALL [\] HENEVER | Y FLOW ELEMEN ⁻ A UNIT IS SHUTD | TS AND TRANSMIT | TERS). F ONE OF ITS SAFETIES, T | E DIAMETERS ARE PROVIDED HE BAS SHALL RETAIN IN MEMORY THE ISOLATE THE CAUSE OF THE |
| IUTDOWN | \L, TERMINAL, OR | | OLLER OR EQUIPMENT MA | NUFACTURER'S CONTROL SYSTEM |
| IE LOCATI | ON OF THE FAUL | T. , ALL CONTROL VA | ALVES SHALL HAVE PROPO | |
| D'S SHALI | BE CONNECTED | D TO THE EMS NET | TWORK THROUGH A DIREC | ZE A 0-10 VDC CONTROL SIGNAL. CT NETWORK CONNECTION AS WELL AS ITY OF THE EMS CONTRACTOR TO |
| DORDINAT | E AND ADAPT TH ACTURER. THE F | E EMS NETWORK OLLOWING POINT ENT, TORQUE, PO | TO THE COMMUNICATION IS SHALL BE INTEGRATED | S PROTOCOLS AVAILABLE FROM THE INTO THE EMS: SPEED FEEDBACK, DUTPUT VOLTAGE, KWH COUNTER, |
| IRE AND C D THE DET | ONDUIT TO THE I ECTOR, WIRE, AN | MOTOR CONTROL | LER AND THE FACP BY TH | RM CONTRACTOR (BELOW IN SPACE). E FIRE ALARM CONTRACTOR. POWER TOR. COORDINATE WITH ELECTRICAL |
| D'S SHALI THROUG DORDINAT | L BE CONNECTED H THE HARDWIRI | D TO THE EMS NET ED POINTS INDICA | TWORK THROUGH A RS486 ATED. IT IS THE RESPONSI | OR BACNET IP CONNECTION AS WELL BILITY OF THE EMS CONTRACTOR TO S PROTOCOLS AVAILABLE FROM THE |
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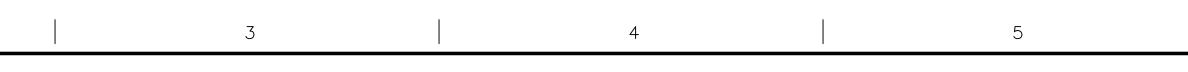
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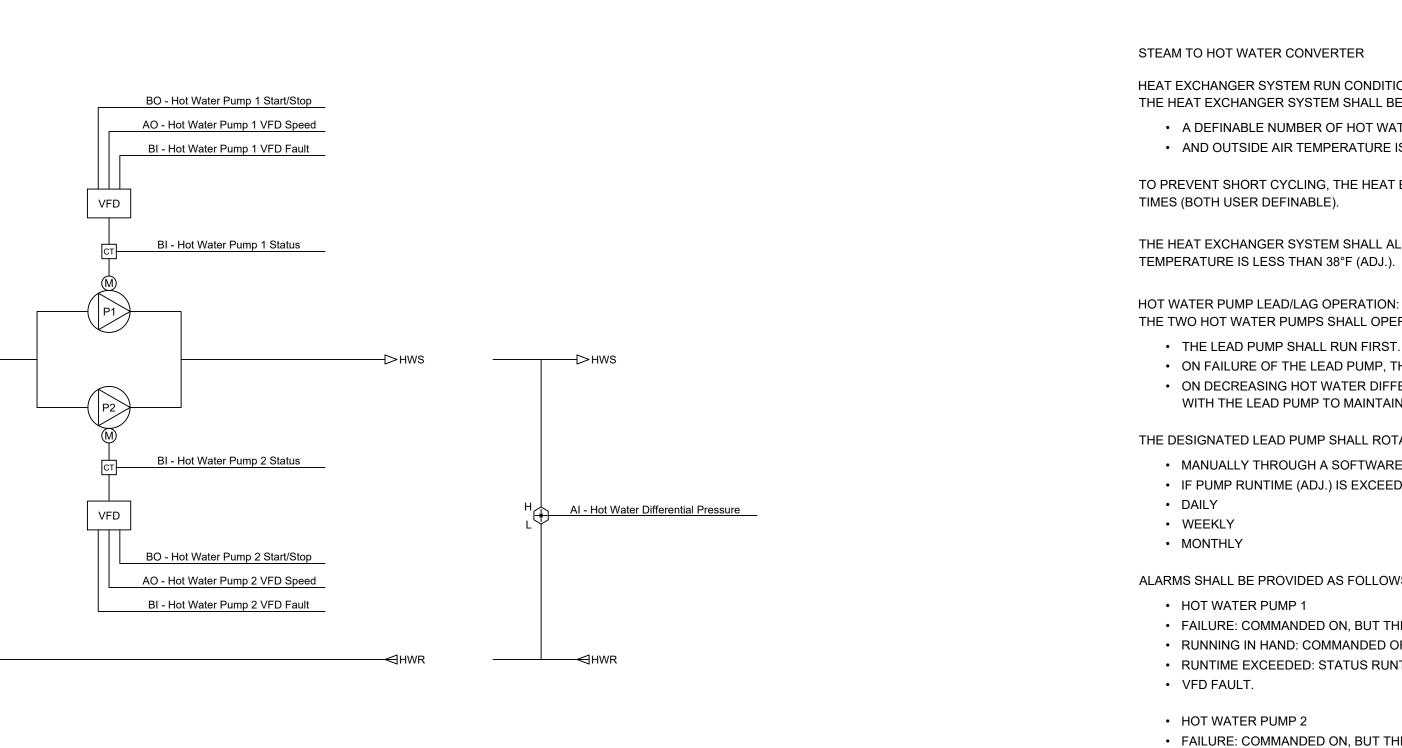


1 STEAM TO HOT WATER CONTROL DIAGRAM



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VFD FAULT. VFDS IN SEQUENCE TO MAINTAIN ITS HOT WATER DIFFERENTIAL PRESSURE SETPOINT.

THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES. ALL SETPOINTS SHALL BE FIELD ADJUSTED DURING THE COMMISSIONING PERIOD TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS.

AS FOLLOWS:

ON RISING HOT WATER DIFFERENTIAL PRESSURE, THE VFDS SHALL STAGE OFF AS FOLLOWS: • IF THE VFDS SPEEDS DROPS BACK TO 60% (ADJ.) BELOW SETPOINT, THE LAG VFD SHALL STAGE OFF. • THE LEAD VFD SHALL CONTINUE TO RUN TO MAINTAIN SETPOINT.

ALARMS SHALL BE PROVIDED AS FOLLOWS: • HIGH HOT WATER DIFFERENTIAL PRESSURE: IF 25% (ADJ.) GREATER THAN SETPOINT. • LOW HOT WATER DIFFERENTIAL PRESSURE: IF 25% (ADJ.) LESS THAN SETPOINT.

MAINTAIN ITS SETPOINT.

THE STEAM VALVE SHALL OPEN TO 100% (ADJ.) WHENEVER THE HEAT EXCHANGER IS IN FREEZE PROTECTION DUE TO LOW OUTSIDE AIR TEMPERATURE.

200°F (ADJ.).

ARCHITECT/ENGINEERS:



designgroup and Sustainable Arizona &



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6 7

STEAM TO HOT WATER CONVERTER

HEAT EXCHANGER SYSTEM RUN CONDITIONS: THE HEAT EXCHANGER SYSTEM SHALL BE ENABLED TO RUN WHENEVER:

 A DEFINABLE NUMBER OF HOT WATER COILS NEED HEATING. • AND OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).

TO PREVENT SHORT CYCLING, THE HEAT EXCHANGER SHALL RUN FOR AND BE OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER DEFINABLE).

THE HEAT EXCHANGER SYSTEM SHALL ALSO RUN FOR FREEZE PROTECTION WHENEVER OUTSIDE AIR

HOT WATER PUMP LEAD/LAG OPERATION:

THE TWO HOT WATER PUMPS SHALL OPERATE IN A LEAD/LAG FASHION. THE LEAD PUMP SHALL RUN FIRST.

• ON FAILURE OF THE LEAD PUMP, THE LAG PUMP SHALL RUN AND THE LEAD PUMP SHALL TURN OFF. ON DECREASING HOT WATER DIFFERENTIAL PRESSURE, THE LAG PUMP SHALL STAGE ON AND RUN IN UNISON WITH THE LEAD PUMP TO MAINTAIN HOT WATER DIFFERENTIAL PRESSURE SETPOINT.

THE DESIGNATED LEAD PUMP SHALL ROTATE UPON ONE OF THE FOLLOWING CONDITIONS (USER SELECTABLE): MANUALLY THROUGH A SOFTWARE SWITCH IF PUMP RUNTIME (ADJ.) IS EXCEEDED

ALARMS SHALL BE PROVIDED AS FOLLOWS: HOT WATER PUMP 1 • FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.

• RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON. • RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.

 HOT WATER PUMP 2 • FAILURE: COMMANDED ON, BUT THE STATUS IS OFF. • RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON. RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.

HOT WATER DIFFERENTIAL PRESSURE CONTROL: THE CONTROLLER SHALL MEASURE HOT WATER DIFFERENTIAL PRESSURE AND MODULATE THE HOT WATER PUMP

THE CONTROLLER SHALL MODULATE HOT WATER PUMP SPEEDS TO MAINTAIN A HOT WATER DIFFERENTIAL PRESSURE OF 12LBF/IN2 (ADJ.). THE VFDS MINIMUM SPEED SHALL NOT DROP BELOW 20% (ADJ.).

ON DROPPING HOT WATER DIFFERENTIAL PRESSURE, THE VFDS SHALL STAGE ON AND RUN TO MAINTAIN SETPOINT

• THE CONTROLLER SHALL MODULATE THE LEAD VFD TO MAINTAIN SETPOINT. • IF THE LEAD VFD SPEED IS GREATER THAN A SETPOINT OF 90% (ADJ.), THE LAG VFD SHALL STAGE ON. • THE LAG VFD SHALL RAMP UP TO MATCH THE LEAD VFD SPEED AND THEN RUN IN UNISON WITH THE LEAD VFD TO MAINTAIN SETPOINT.

HOT WATER SUPPLY TEMPERATURE SETPOINT: THE HOT WATER SUPPLY TEMPERATURE SETPOINT SHALL BE A FIXED SETPOINT OF 180°F (ADJ.).

ALARMS SHALL BE PROVIDED AS FOLLOWS: • HIGH HOT WATER SUPPLY TEMP: IF GREATER THAN 200°F (ADJ.). LOW HOT WATER SUPPLY TEMP: IF LESS THAN 100°F (ADJ.).

HEAT EXCHANGER STEAM VALVE - HOT WATER CONTROL: THE CONTROLLER SHALL MEASURE THE HOT WATER SUPPLY TEMPERATURE AND MODULATE THE STEAM VALVE TO

THE STEAM VALVE SHALL BE ENABLED WHENEVER: • THE HEAT EXCHANGER IS CALLED TO RUN.

AND HOT WATER SUPPLY TEMPERATURE IS BELOW SETPOINT.

THE STEAM VALVE SHALL CLOSE WHENEVER THE HOT WATER SUPPLY TEMPERATURE RISES FROM 180°F TO

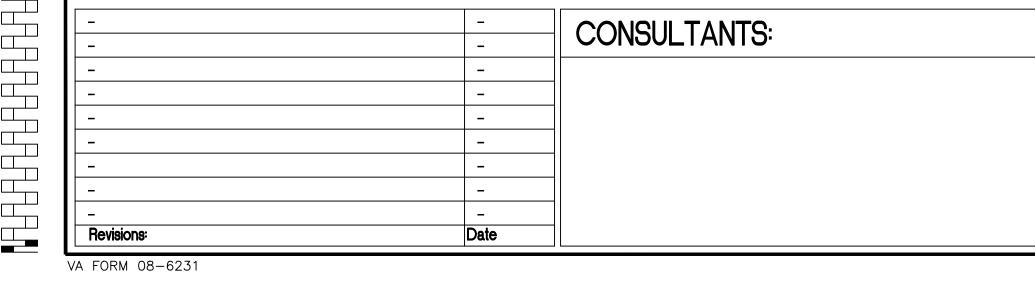
| ngineering, e Design ma 85282, (480) 454-2861 | Drawing Title HVAC CONTROL DIAGRAMS | HVAC SYS | Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212 | | | | |
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| mber | Management |
| 3 | Department of Veterans Affairs |
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| PH | SINGLE-PHASE | CAB | CABINET | DMR SW | DIMMER SWITCH | GFCI | GROUND FAULT CIRCUIT INTERRUPTER | MG | MOTOR GENERATOR | REC | RECESSED |
|------|------------------------------------|---------------|---------------------------------|-----------|------------------------------|---------|--|-----------|--|-------|-------------------------------|
| | | CALC | CALCULATE | DN | DOWN | GTB | GROUND TERMINAL BOX | MH | MANHOLE | RECPT | RECEPTACLE |
| | TWO-CONDUCTOR | CAP | CAPACITY | DPDT | DOUBLE POLE, DOUBLE THROW | | | MIN | MINIMUM | RGS | RIGID GALVANIZED STEEL |
| | THREE-CONDUCTOR | CAT | CATALOG | DPST | DOUBLE POLE, SINGLE THROW | HID | HIGH INTENSITY DISCHARGE | MOCP | MAXIMUM OVERCURRENT PROTECTION | RM | ROOM |
| | | CATV | COMMUNITY ANTENNA TELEVISION | DRSW | DOOR SWITCH | HOA | HAND-OFF-AUTOMATIC | MIO | MAIN LUGS ONLY | RMS | ROOT MEAN SQUARE |
| | FOUR-CONDUCTOR | CCR | CONTROL CONTACTOR | DS | DISCONNECT SWITCH | | HORSEPOWER | MT | MOUNT | REQD | REQUIRED |
| | FOUR-WIRE | CCTV | CLOSED CIRCUIT TELEVISION | DWG | DRAWING | | HEIGHT | | MOUNTED | | |
| | TOOK WIKE | cd | CANDELA | | | | HERTZ | MTG | MOUNTING | SCC | SHORT CIRCUIT CAPACITY |
| UNIT | AIR CONDITIONING UNIT | CD | CONSTRUCTION DOCUMENTS | | EMPTY CONDUIT | | | | MANUAL TRANSFER SWITCH | SES | SERVICE ENTRANCE SECTION |
| UNIT | | CF | CONTRACTOR FURNISHED | EC | EQUIPMENT GROUND | IESNA | ILLUMINATION ENGINEERING SOCIETY OF | | MANUAL TRANSFER SWITCH MEDIUM VOLTAGE | SES | SMOKE DETECTOR |
| | ARCHITECT/ENGINEER | CF CF/CI | | | | IESINA | | | | | |
| | | | CONTRACTOR FURNISHED/CONTRACTOR | | | | NORTH AMERICA | MVA | MEGAVOLT-AMPERE | | SQUARE FOOT (FEET) |
| | ALTERNATING CURRENT OR ARMORED | | INSTALLED | ELEC | ELECTRIC OR ELECTRICAL | | INTERMEDIATE METAL CONDUIT | MW | MEGAWATT MICROWAVE | SHT | SHEET |
| | | CF/OI | CONTRACTOR FURNISHED/OWNER | ELEV | ELEVATOR | INCAND | INCANDESCENT | | | SI | INTERNATIONAL SYSTEM OF UNITS |
| C | ACCESSIBLE | | INSTALLED | EMCP | EMERGENCY MONITORING CONTROL | IR | INFRARED | NA | NOT APPLICABLE | SPEC | SPECIFICATION |
|)L | ADDITIONAL | CFE | CONTRACTOR FURNISHED EQUIPMENT | | PANEL | IWH | INSTANTANEOUS WATER HEATER | NEC | NATIONAL ELECTRICAL CODE | SPST | SINGLE POLE, SINGLE THROW |
| | , | CHW | CHILLED WATER | EMER | EMERGENCY | | | NEMA | NATIONAL ELECTRICAL MANUFACTURERS | SURF | SURFACE |
| | | CHWP | CHILLED WATER PUMP | EMI | ELECTROMAGNETIC INTERFERENCE | J-BOX | JUNCTION BOX | | ASSOCIATION | SW | SWITCH |
| | | CKT | CIRCUIT | EMT | ELECTRICAL METALLIC TUBING | | | NEUT OR N | | SWBD | SWITCHBOARD |
| | ABOVE FINISHED COUNTER, AUTOMATIC | | CIRCUIT BREAKER | ENCL | ENCLOSURE | kV | KILOVOLT | NFPA | NATIONAL FIRE PROTECTION ASSOCIATIO | NSWGR | SWITCHGEAR |
| | FREQUENCY CONTROL, OR AVAILABLE | CLF | CURRENT LIMITING FUSE | EPO | EMERGENCY POWER OFF | kVA | KILOVOLT AMPERE | NIC | NOT IN CONTRACT | | |
| | FAULT CURRENT | CLG | CEILING | EPRF | EXPLOSION PROOF | kVAH | KILOVOLT AMPERE PER HOUR | NL | NIGHT LIGHT | TC | TIME CLOCK |
| | ABOVE FINISHED FLOOR | CMU | CONCRETE MASONRY UNIT | ESMT | EASEMENT | kVAR | KILOVOLT AMPERE REACTIVE | NO | NORMALLY OPEN | TEL | TELEPHONE |
| | | COAX | COAX CABLE | EWC | ELECTRIC WATER COOLER | kW | KILOWATT | NS | NO SCALE | TP | TWISTED PAIR |
| | | COMM | COMMUNICATION | I EWH | ELECTRIC WATER HEATER | kWH | KILOWATT HOUR | NTS | NOT TO SCALE | TPS | TWISTED PAIR SHIELDED |
| | | COMPT | COMPARTMENT | EXIST | EXISTING | kWHM | KILOWATT HOUR METER | | | | TELEPHONE TERMINAL BOARD |
| | | CONC | CONCRETE | FA | FIRE ALARM | | | | ON CENTER | | TELEVISION |
| | ALTERNATE | CONC | CONTINUE | FAAP | FIRE ALARM ANNUNCIATOR PANEL | | LIGHT EMITTING DIODE | | OUTSIDE DIAMETER | | TYPICAL |
| R A | AMBIENT | CONTR | CONTRACTOR | FABL | FIRE ALARM BELL | | LINEAR FEET (FOOT) | | OVERLOAD | | |
| A | AMPERE | COORD | | FABL | | | | | | UFD | UNDERFLOOR DUCT |
| | | | COORDINATE | | FIRE ALARM BOX | | | | POLE | UGND | |
| | ARCHITECT | CPT | CONTROL POWER TRANSFORMER | FACP | FIRE ALARM CONTROL PANEL | | LIGHT POLE | | | | |
| | AMPS SHORT CIRCUIT | CRI | COLOR RENDERING INDEX | | FOOTCANDLE | | LOW PRESSURE SODIUM | | PUBLIC ADDRESS | | |
| | AMPERE TRIP | CI | CURRENT TRANSFORMER | | FILM ILLUMINATOR | | LOCKED ROTOR AMPS | PR | PANELBOARD, PULL BOX, OR | UON | UNLESS OTHERWISE NOTED |
| | AUTOMATIC TRANSFER SWITCH | CTV | CABLE TELEVISION | FIXT | FIXTURE | LTCP | LOCAL TEMPERATURE CONTROL PANEL | | PUSHBUTTON | UPS | UNINTERRUPTIBLE POWER SUPPLY |
| | AUTOMATIC | CU | COPPER | FLA | FULL LOAD AMPS | LT | LIGHT | PBPU | PREFABRICATED BEDSIDE PATIENT UNIT | UTIL | UTILITY |
| | AUDIO VISUAL | CU FT | CUBIC FEET | FLEX | FLEXIBLE METALLIC CONDUIT | LTG | LIGHTING | PCB | POLYCHLORINATED BIPHENYL | | |
| | | CUR | CURRENT | FLT | FLOODLIGHT | LTG PNL | LIGHTING PANEL | PEC | PHOTOELECTRIC CELL | V | VOLT |
| | BATTERY | | | FLUOR | FLUORESCENT | LTNG | LIGHTNING | PED | PEDESTAL | VA | VOLT AMPERE |
| | BARE COPPER | DB | DECIBEL OR DIRECT BURIAL | FLUOR FIX | FLUORESCENT FIXTURE | LV | LOW VOLTAGE | PEND | PENDANT | VAR | VOLT AMPERE REACTIVE |
| | BOARD | DC | DIRECT CURRENT | FOUTT | TELEPHONE FLOOR OUTLET | | | PF | POWER FACTOR | VFD | VARIABLE FREQUENCY DRIVE |
| | BELOW FINISH FLOOR | DCP | DIMMER CONTROL PANEL | FP | FIRE PROTECTION | MATV | MASTER ANTENNA TELEVISION SYSTEM | PH | PHASE | VSD | VARIABLE SPEED DRIVE |
| | | DEG C | DEGREES CELSIUS | FT | FEET OR FOOT | MAX | MAXIMUM | PNL | PANEL | VOLT | VOLTAGE |
| | | DEG F | DEGREES FAHRENHEIT | FU SW | FUSED SWITCH | MC | METAL-CLAD | POD | POWER OPERATED DAMPER | | |
| | BOILER PLANT INSTRUMENTATION PANEL | | DEMOLITION | FVNR | FULL VOLTAGE NON-REVERSING | MCA | MINIMUM CIRCUIT AMPS | PT | POTENTIAL TRANSFORMER | W | watt |
| | BREAKER | DIAG | DIAGRAM | FVR | FULL VOLTAGE REVERSING | MCB | MAIN CIRCUIT BREAKER | PTRV | POWER TYPE ROOF VENTILATION | I W H | WATER HEATER |
| | BY PASS | DIAG | DISCONNECT | | I OLL VOLIAGE NEVENSING | | MAIN CIRCOIT BREAKER MOTOR CONTROL CENTER | PVC | POLYVINYL CHLORIDE (PLASTIC) | | WEATHERPROOF |
| | UI FAJJ | DISC DISTR | | | | MDP | | | | ** 「 | |
| | CONDUIT | | | G OR GND | | | MAIN DISTRIBUTION PANEL | PWR | POWER | | |
| | CONDUIT | DISTR PNL | DISTRIBUTION PANEL | GEN | GENERATOR | MECH | MECHANICAL | RCP | REFLECTED CEILING PLAN | XFER | TRANSFER |
| | | | 1 | 1 | 1 | | 1 | 1 | 1 | XFMR | TRANSFORMER |

| ELECTRICAL | SYMBOLS | - DIAGRAM |
|------------|---------|-----------|

| ELEC | TRICAL SYMBOLS - DIAG | RAM | | ELECT | RICAL SYMBOLS - POWER PI | _AN | |
|------------------------|--|--|--|----------|--|-------------|--|
| \Box | DELTA CONNECTION | | FUSE WITH RATING | | MOTOR, SINGLE-PHASE | € | DROP CORD, SINGLE CONVENIENCE OUT |
| \neg | MOTOR, SINGLE-PHASE | | MOLDED CASE CIRCUIT BREAKER | Ø | MOTOR, THREE-PHASE | | GROUNDING TYPE, 20A, W/#12 CONDUC CORD (CENTER LINE OF OUTLET: 6'-6" |
| Ø | MOTOR, THREE-PHASE | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | LOW-VOLTAGE DRAWOUT AIR CIRCUIT BREAKER | T | TRANSFORMER, PLAN | | MINIMUM). |
| | TRANSFORMER | | MEDIUM-VOLTAGE OIL CIRCUIT BREAKER | Υ. | WYE CONNECTION | R 50 | RELAY; LETTER INDICATES RELAY TYPE 50 = INSTANTANEOUS OVERCURRENT O |
| Y. | WYE CONNECTION | | MEDIUM-VOLTAGE DRAWOUT AIR CIRCUIT BREAKER | L I | EARTH GROUND | | 51 = AC - TIME OVERCURRENT 67 = AC - DIRECTIONAL OVERCURRENT |
| Ţ | EARTH GROUND | | SWITCH AND FUSE UNIT | = | UNCTION DOV | | 86 = LOCK OUT |
| - 0 | JUNCTION BOX | $\sim \sim \sim$ | FUSED DRAWOUT POTENTIAL TRANSFORMER | | JUNCTION BOX BRANCH CIRCUIT HOMERUN. LINES INDICATE NUMBER | Ľ | DISCONNECT SWITCH, FUSED |
| PB | PULL BOX | R 50 | RELAY; LETTER INDICATES RELAY TYPE 50 = INSTANTANEOUS OVERCURRENT OR RATE-OF-RISE | Į – € | OF CIRCUITS, NEUTRAL, AND SWITCH LEG CONDUCTORS. ONE SEPARATE GREEN GROUNDING CONDUCTOR SHALL | | DISCONNECT SWITCH, UNFUSED |
| ۰_ م | PRESSURE SWITCH-CLOSE ON INCREASE | | 51 = AC - TIME OVERCURRENT 67 = AC - DIRECTIONAL OVERCURRENT | | BE PROVIDED FOR EACH HOMERUN; NOT SHOWN | | STARTER, COMBINATION WITH DISCONNED |
| | | | 86 = LOCK OUT | PB | PULL BOX | | STARTER OR MOTOR CONTROLLER |
| | DDECCUDE OWITCH ODEN ON INCDEACE | Ľ | DISCONNECT SWITCH, FUSED | WW | WIREWAY | | VARIABLE FREQUENCY DRIVE |
| To | PRESSURE SWITCH-OPEN ON INCREASE | | DISCONNECT SWITCH, UNFUSED | | | VFD TC | TIME CLOCK |
| \square | | \frown | FUSIBLE LINK | BB | BUSWAY | | – POTHEAD |
| ✓ 0- | SWITCH, MULTIPOSITION | | STARTER, COMBINATION WITH DISCONNECT SWITCH | | PUSH BUTTON | | - STRESS CONE |
| 0- | | | STARTER OR MOTOR CONTROLLER | DP# | DISTRIBUTION PANEL | | |
| | SWITCH, NORMALLY CLOSED FLOAT | | VARIABLE FREQUENCY DRIVE | | LIGHTING PANEL | R | RECTIFIER, CATHODIC PROTECTION SANIT |
| -07-0- | SWITCH, NORMALLY CLOSED FOOT OPERATED | G | GENERATOR, POWER | | PANELBOARD CABINET, FLUSH MOUNTED | 4 | VENTILATOR OR FAN COIL UNIT OUTLET |
| -20- | SWITCH, NORMALLY CLOSED LIMIT | <u>+</u> | BATTERY | | PANELBOARD CABINET, SURFACE MOUNTED | \otimes - | CONDUIT TERMINATED 6" [152mm] AFF |
| -0-10- | SWITCH, NORMALLY CLOSED TEMPERATURE ACTIVATE | _{ED} —) | CAPACITOR | - | RECEPTACLE, DUPLEX | Q | EXTENSION TO EQUIPMENT AS DIRECTED |
| 5 | | | POTHEAD | - | RECEPTACLE, DUPLEX ON EMERGENCY POWER | \bigcirc | CONDUIT TERMINATED W/COUPLING (FLU |
| -0-10- | SWITCH, NORMALLY CLOSED TIME DELAY | \longrightarrow | STRESS CONE | - | RECEPTACLE, DUPLEX WITH GROUND FAULT CIRCUIT | ¢ | FOR EXTENSION TO EQUIPMENT AS DIRE |
| ~_^ | SWITCH, NORMALLY OPEN FLOAT | | LIGHTNING ARRESTOR | Щ Ц | | D 2 | SWITCH F = FUSED SWITCH K |
| Ó | | | | ₩ | RECEPTACLE, QUADRAPLEX | | L = LOCK LM M = MANUAL MOTOR STARTING M |
| -0~0- | SWITCH, NORMALLY OPEN LIMIT | R | RECTIFIER, CATHODIC PROTECTION | | RECEPTACLE, SPECIAL PURPOSE A = 120V, 20A, 1 PHASE, 2-POLE, 3W, NEMA 5-20R. | | MP= MOTOR SNAP WITH PILOT P LIGHT (THERMAL TYPE) |
| | SWITCH, NORMALLY OPEN TEMPERATURE ACTIVATED | A | AMMETER | | B = 208V, 20A, 1 PHASE, 2-POLE, 3W, NEMA 6-20R. C = 120V, 30A, 1 PHASE, 2-POLE, 3W, NEMA 5-30R. | | PB= PUSH BUTTON STATION ROWER WEATHER PROOF X |
| ے ` ۲ | | \bigtriangledown | VOLTMETER | | D = 208V, 30A, 1 PHASE, 2-POLE, 3W, NEMA 6-30R. E = 208V, 60A, 1 PHASE, 3-POLE, 4W, NEMA 14-60R. | | |
| -070- | SWITCH, NORMALLY OPEN TIME DELAY | W | WATTMETER | | F = 208V, 30A, 3 PHASE, 3-POLE 4W, NEMA 15-30R. | | |
| -0-0- | SWITCH, SINGLE BREAK | WH | WATT-HOUR METER | | G = 208V, 50A, 3 PHASE, 3 POLE, 4W, NEMA 15-30R. H = 208V, 60A, 3 PHASE, 3 POLE, 4W, NEMA 15-60R. | | |
| ≭ | NORMALLY CLOSED RELAY CONTACT | | | | | | |
| + | NORMALLY OPEN RELAY CONTACT | | | | | | |



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ARCHITECT/ENGINEERS:



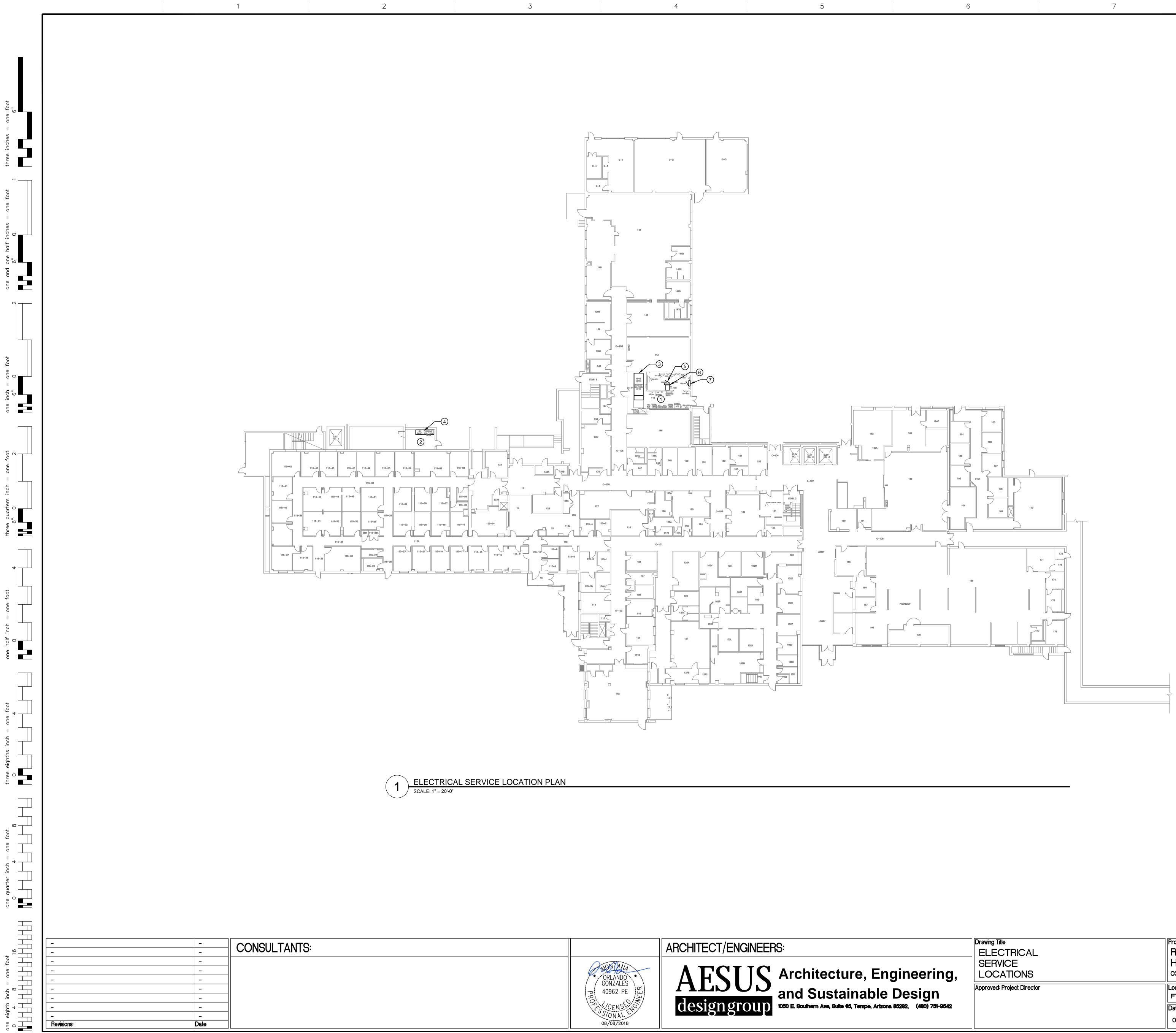
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AESUS Architecture, Engineering Architecture

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| ABBREVIATION Approved: Project Director | | Location FT. HARRISON Date | Checked | HELENA, MT | Drawing Number |
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| | | | | | |
| ELECTRICAL SYMBOLS ANI | | Project Title REPLACE F HVAC SYST CONTRACT NO. VA25 | EMS | E | Project Number 436-17-102 Building Number 154 |
| | PB= PUSH BUTTON STATION T = TIMER OPERATED RECESSED DOWNLIGHT FIXTURE, LIGHT FIXTURE, RECESSED FLUOF LETTER INDICATES TYPE. LIGHT FIXTURE, RECE (1'x8'); LETTER INDIC LIGHT FIXTURE, SURI 305x2439mm (1'x8' LIGHT FIXTURE, FLUORESCENT EN LETTER INDICATES TYPE. HIGHT FIXTURE, WALL MOUNTE LIGHTING, EXTERIOR BUILDING EXIT SIGN, WALL MOUNTED WITH AS SHOWN | RC= REMOTE (WP= WEATHER Mo= OCCUPAN LETTER INDICATES TYPE RESCENT, 305×1220mm ESSED FLUORESCENT, 3 CATES TYPE. FACE MOUNTED FLUORE); LETTER INDICATES TY MERGENCY; ED DIRECTIONAL ARROWS TH DIRECTIONAL ARROWS | CONTROL PROOF CY SENSOR (1'x4'); 05x2439mm SCENT, 'PE. | BE FR PA EN DIF SU RE M. TH CO AL SU SY N. TH CO AL RE TH EN O. CO EX AN P. CO | EN REASSIGNED TO N OM SPARE BREAKERS NEL SUITABLE TO THE GINEER OF SUCH OCO RECTION. THE ENGINE GGESTIONS REGARDING FERENCED DEVICES. E CONTRACTOR IS REI ORDINATING WITH ALL L EQUIPMENT, DEVICES PORT AS REQUIRED STEM. E CONTRACTOR IS REI ORDINATING WITH ALL L CONNECTIONS AND QUIRED FOR A FULLY E SATISFACTION OF TH GINEER. ORDINATE WITH ARCHI ACT PLACEMENT OF L D DEVICES. |
| \$ # | BLANK = SINGLE POLE 3 = THREE-WAY D = DIMMER | 2 = DOUBLE F 4 = FOUR-WA K = KEY OPEF | Y RATED | PE EN | RFORMED TO THE SAT GINEER. Y EXISTING DEVICES V |
| | | | <u>AN</u> | TR | L WORK IS TO BE PE ADESMEN WITH EXPER DRK TO BE PERFORME |
| ELECT | RICAL SYMBOLS - | LIGHTING | PLAN | AN WI | ILTI—GANG BACKBOXES ID TYPES OF EMERGEN RING DEVICES SHALL I VICES. |
| | Silence Silenc | SF SWITCH (# SUBSCRIPT AS INDICA BLANK = SINGLE POLE 3 = THREE-WAY D = DIMMER UNE LOW VOLTAGE UME LOW VOLTAGE MASTER PB PUSH BUTTON STATION T = TIMER OPERATED Image: Constraint of the state of the s | Switch (∦ SUBSCRIPT AS INDICATED BELOW): BANK = SNOLE POLE 2 = DOUBLE (3 = THREE-WAY 4 = FOUR-WA 4 = FOUR-WA 0 = DUMWER V= LOW VOLTAGE P = WITH PLC UME LOW VOLTAGE P = WITH PLC UME LOW VOLTAGE D= DUMWER K = KEY OFE PE PUSH BUTTON STATION WP = WEATHER WEATHER D= DUMWER K = KEY OFE UGHT FIXTURE, RECESSED FLUORESCENT, 305x1220mm LETTER INDICATES TYPE. UGHT FIXTURE, RECESSED FLUORESCENT, 305x1250mm LETTER INDICATES TYPE. UGHT FIXTURE, RECESSED FLUORESCENT, 305x2439mm (1'x8'); LETTER INDICATES TYPE. UGHT FIXTURE, RUDRESCENT EMERGENCY; LETTER INDICATES TYPE. UGHT FIXTURE, WALL MOUNTED Y UGHT FIXTURE, WALL MOUNTED Y UGHT FIXTURE, WALL MOUNTED WITH DIRECTIONAL ARROWS / AS SHOWN 10 EXT SIGN, WALL MOUNTED WITH DIRECTIONAL ARROWS AS SHOWN 10 EXT SIGN, WALL MOUNTED WITH DIRECTIONAL ARROWS AS SHOWN | BLANK = SINGLE POLE 2 = DOUBLE POLE 3 = THREE-WAY 4 = FOUR-WAY D = DIMMER K = KEY OPERATED UV = LOW VOLTAGE P = WITH PILOT LIGHT UV = LOW VOLTAGE P = WITH PILOT LIGHT UV = LOW VOLTAGE P = WITH PILOT LIGHT UV = LOW VOLTAGE MASTER RECESSED DOWNLIGHT FIXTURE, LETTER INDICATES TYPE. UGHT FIXTURE, RECESSED FLUORESCENT, 305x1220mm (1'x4'); LETTER INDICATES TYPE. UGHT FIXTURE, SURFACE MOUNTED FLUORESCENT, 305x2439mm (1'x8'); LETTER INDICATES TYPE. UGHT FIXTURE, SURFACE MOUNTED FLUORESCENT, 305x2439mm (1'x8'); LETTER INDICATES TYPE. UGHT FIXTURE, FLUORESCENT EMERGENCY; LETTER INDICATES TYPE. UGHT FIXTURE, FLUORESCENT EMERGENCY; LETTER INDICATES TYPE. UGHT FIXTURE, WALL MOUNTED WI LIGHT FIXTURE, WALL MOUNTED WI LIGHT FIXTURE, WALL MOUNTED WI LIGHT FIXTURE, WALL MOUNTED WITH DIRECTIONAL ARROWS AND FACES AS SHOWN IGHT SIGN, CELLING MOUNTED WITH DIRECTIONAL ARROWS AND FACES AS SHOWN IGHT SIGN, CELLING MOUNTED WITH DIRECTIONAL ARROWS AND FACES AS SHOWN IGHT SIGN, CELLING MOUNTED WITH DIRECTIONAL ARROWS AND FACES AS SHOWN | ELECTRICAL SYMBOLS - LIGHTING PLAN ELECTRICAL SYMBOLS - LIGHTING PLAN S SWICH (# SUBSCRIPT AS INDICATED BELOW): BAAK = SINCL FOLE 3 - THEE-WY P = WHEN UN VOLTAGE 4 - FOUR-WY P = WHEN UN VOLTAGE YP = WHEN PLOT LIGHT WF = VECHER PROOF T = TIMER OFFRATE WF = VECHER PROOF T = TIMER OFFRATE UGV TOTAGE STOPE UGV T |

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| AL NOT | ES: | |
| THE SITE AND | R WILL BE RESPONSIBLE PERFORMING A FULL TO DETERMINE THE AND OF NEW | |
| | RMED IN STRICT NAL AND LOCAL CODES, < PROCEDURES. | А |
| RING DEVICES, O BE REMOVED, BACK TO THE JUNCTION BOX. | SUCH AS LIGHTING CONDUITS, ETC., SHOWN , REMOVE CONDUIT AND SOURCE OR TO THE RE-LABEL PANEL ANDONED CIRCUITS AS | |
| RCURRENT PROT | D WIRING OF ALL TYPES ECTIVE DEVICE. BANDONED WIRING. | |
| ND CONDUCTORS | INTERRUPTED, ALL S PASSING THROUGH VICING UNDISTURBED | |
| HED EQUIPMENT WILL COORDINA | NSIBLE FOR DISPOSAL AND DEVICES. THE ATE WITH VA ON OF ALL EQUIPMENT | В |
| TON OF ALL DE S THROUGH FIR LINGS OR ROOF | TURAL DRAWINGS FOR VICES. ALL RE RATED WALLS, SHALL BE SEALED WITH D FOR SUCH USE. | |
| ND CONTRACTOR G EQUIPMENT W | CAL AND PLUMBING R FOR ANY MECHANICAL HICH MAY NEED TO BE R NEW WORK TO BE TS. | |
| H CIRCUIT HOM THREE CIRCUITS ERUN SHALL HA QUIPMENT GROU | ERUN SHALL HAVE NO 5. EACH BRANCH AVE A SEPARATE GREEN JNDING CONDUCTOR. N.E.C. AND NFPA | С |
| OF EMERGENCY | OR DIFFERENT VOLTAGES AND NORMAL BRANCH E DIVIDERS BETWEEN | |
| WITH EXPERIENC | RMED BY QUALIFIED CE IN THE TYPE OF ALL WORK WILL BE ACTION OF THE | |
| IGNED TO NEW BREAKERS IN BLE TO THE EN SUCH OCCURF THE ENGINEER | SE CIRCUITS MAY HAVE WORK WILL BE RE-FED THE NEAREST AVAILABLE IGINEER. NOTIFY RENCES FOR FURTHER WILL EVALUATE FIELD EW SOURCES FOR | D |
| ENT, DEVICES AF | NSIBLE FOR ADES AND PROVIDING PPURTENANCES AND & A FULLY FUNCTIONAL | |
| TIONS AND APP OR A FULLY FUI | NSIBLE FOR NDORS AND PROVIDING URTENANCES AS NCTIONING SYSTEM TO OWNER, TENANT AND | |
| | TURAL DRAWINGS FOR NAIRES, RECEPTACLES | E |
| WILL MAINTAIN EQUIPMENT PER | CLEARANCES ABOUT NEC 110.26. | |
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| Imber | and Facilities Management | |
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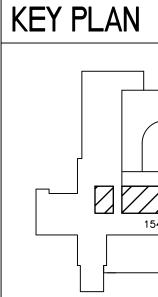
GENERAL

A. ALL EXTERIOR DI PROTECTED. B. MEMBRANE PENE

- ACCORDANCE WI C. ALL WORK WILL B NATIONAL AND LC
- PROCEDURES. D. ALL DEMOLITION EXISTING DEVICE THEY REMAIN FU ELECTRICAL CON INTEGRITY TO ALL
- DEVICES TO THE S E. COORDINATE WIT CONTRACTOR FO MAY NEED TO BE I PROVIDED WITH N
- F. THE CONTRACTOR TRADES AND PRO AND SUPPORT AS
- G. THE CONTRACTO VENDORS AND PF REQUIRED FOR A OF THE OWNER, 1
- H. CONTRACTOR WI EQUIPMENT PER N I. ALL WIRING FOR I MINIMUM OF 10 A. FOR UNDERGROU
- COPPER GROUND J. VERIFY ALL EXISTI TO START OF WOR
- K. NO DESIGN CHAN APPROVAL OF TH INSPECTOR.
- L. PLANS WERE DES THIS INFORMATIC TENANT IMPROVE NOTES, ETC.
- M. HOWEVER, AS EX PROVE TO CONTA PRIOR INSTALLATI CONTRACTOR SH FIELD VERIFY EXIS
- N. THE CONTRACTO COMPLETE AND LOCATION, CIRCU EQUIPMENT (I.E.:) LUMINAIRES, SWIT DEVICES, CONDUI BY THIS PROJECT.

KEY NOTES

- 1. LOCATION OF ROO
- 2. LOCATION OF ROO ROOM 144-B, THE
- 3. LOCATION OF EXIS
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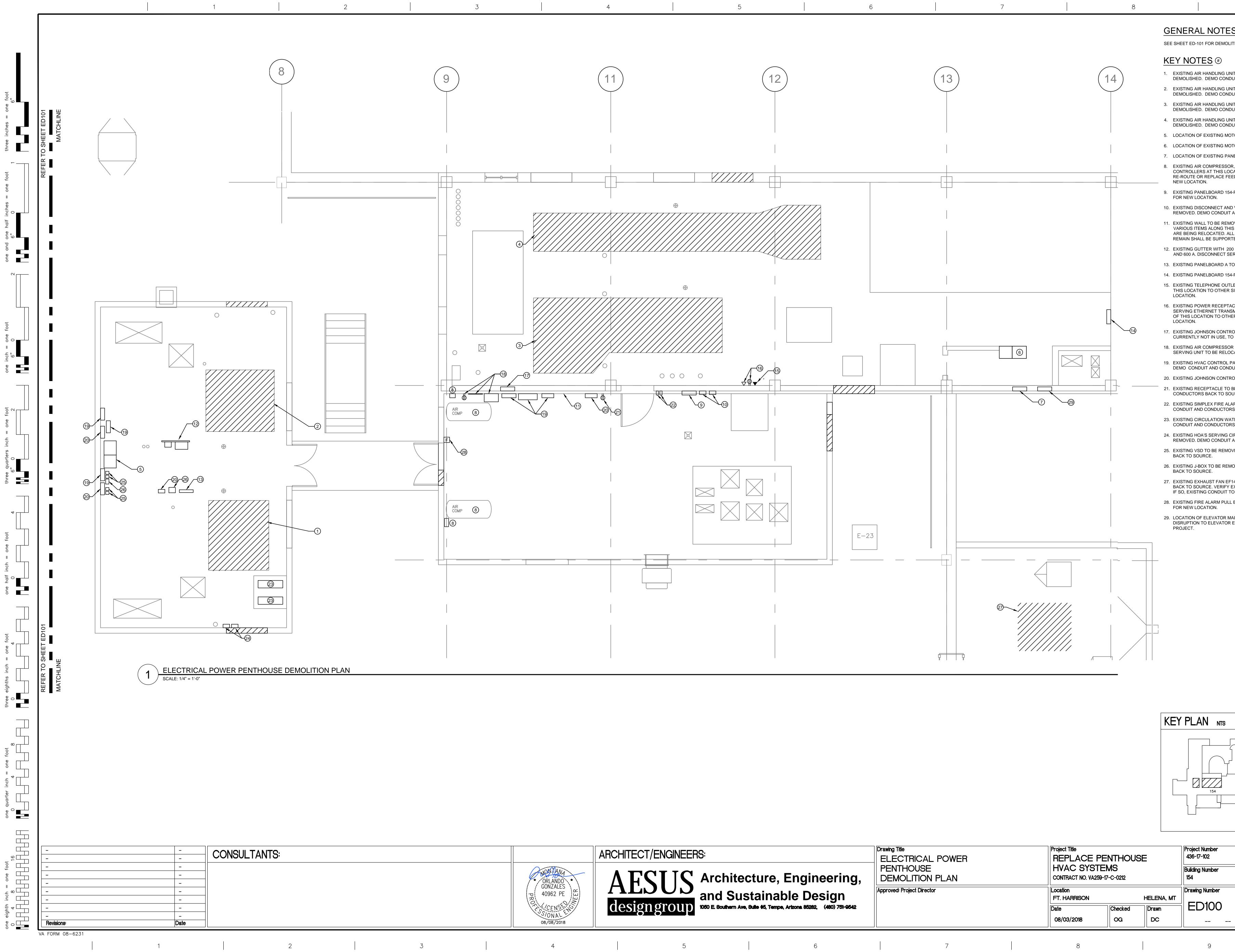


| neering, | Drawing Title ELECTRIC SERVICE LOCATION | | Project Title REPLACE F HVAC SYST CONTRACT NO. VA25 | EMS | SE | Project Number 436-17-102 Building Number 154 |
|-----------------------------|--|-----------------|--|---------------|---------------------------|--|
| esign 92, (480) 751-9542 | | Director | Location FT. HARRISON Date 08/03/2018 | Checked OG | HELENA, MT Drawn DC | Drawing Number E002 |
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| ENERAL | NOTES | |
| ALL EXTERIOR PROTECTED. | DEVICES SHALL BE WEATHERPROOF AND GFCI | |
| ACCORDANCE ALL WORK WIL NATIONAL AND | ENETRATION THROUGH WALLS SHALL BE PROTECTED IN WITH THE LATEST ADOPTED EDITION OF I.B.C. 712.32. L BE PERFORMED IN STRICT ACCORDANCE WITH ALL LOCAL CODES, STANDARDS AND SAFE WORK | |
| EXISTING DEVI THEY REMAIN ELECTRICAL CO INTEGRITY TO CONTRACTOR | ON AND NEW WORK MUST BE PERFORMED SUCH THAT CES, EQUIPMENT, ETC. ARE TO BE PROTECTED SO AS FULLY FUNCTIONAL FOR CONTINUED USE. THE ONTRACTOR IS RESPONSIBLE FOR MAINTAINING CIRCUIT ALL EQUIPMENT AND DEVICES TO REMAIN. THE WILL REPAIR ANY DAMAGE TO EXISTING EQUIPMENT OR HE SATISFACTION OF THE ENGINEER. | |
| COORDINATE N CONTRACTOR MAY NEED TO | WITH MECHANICAL AND PLUMBING DRAWINGS AND FOR ANY MECHANICAL OR PLUMBING EQUIPMENT WHICH BE DEMOLISHED, RELOCATED OR NEW WORK TO BE TH NEW CIRCUITS. | A |
| TRADES AND F | TOR IS RESPONSIBLE FOR COORDINATING WITH ALL PROVIDING ALL EQUIPMENT, DEVICES, APPURTENANCES AS REQUIRED FOR A FULLY FUNCTIONAL SYSTEM. | |
| VENDORS AND REQUIRED FOR | TOR IS RESPONSIBLE FOR COORDINATING WITH ALL PROVIDING ALL CONNECTIONS AND APPURTENANCES AS R A FULLY FUNCTIONING SYSTEM TO THE SATISFACTION R, TENANT AND ENGINEER. | |
| CONTRACTOR EQUIPMENT PE | WILL MAINTAIN CLEARANCES ABOUT ELECTRICAL ER NEC 110.26. | |
| MINIMUM OF 10 FOR UNDERGR | OR EXTERIOR LIGHTING AND POWER DEVICES SHALL BE A D A.W.G. COPPER WITH TYPE "THWN-2" INSULATION (UNO) COUND CIRCUITS RUN IN PVC. PROVIDE A 10 A.W.G. JND IN ADDITION TO CIRCUIT CONDUCTORS (UNO). | |
| TO START OF N | ANGE MAY BE MADE TO THE SYSTEM WITHOUT THE PRIOR | |
| INSPECTOR. PLANS WERE D THIS INFORMA | THE DESIGN ELECTRICAL ENGINEER AND THE ELECTRICAL DESIGNED USING INFORMATION AVAILABLE TO ENGINEER. TION MAY CONSIST OF ORIGINAL BUILDING PLANS, PRIOR | |
| NOTES, ETC. HOWEVER, AS PROVE TO COM PRIOR INSTALL | OVEMENT PLANS, EXISTING PANEL SCHEDULES, FIELD EXISTING INFORMATION MAY BE INCOMPLETE OR MAY NTAIN INACCURACIES, THE ENGINEER CANNOT CERTIFY LATIONS AS PERFORMED BY OTHERS. THEREFORE, THE | |
| FIELD VERIFY E | SHALL INCLUDE IN HIS BID ALL WORK AS REQUIRED TO EXISTING CONDITIONS AND AVAILABLE CIRCUITS. TOR WILL PROVIDE ENGINEER AND OWNER WITH D ACCURATE "AS-BUILTS". THESE SHALL INCLUDE THE | |
| LOCATION, CIR EQUIPMENT (I.I LUMINAIRES, S | CUITING AND ROUTING OF ALL NEW AND RELOCATED E.: AIR HANDLERS, CHILLERS, FANS, RECEPTACLES, WITCHES, ETC) OVER-CURRENT DEVICES, STARTING DUIT, CONDUCTORS, AND ALL OTHER DEVICES IMPACTED | |
| EY NOTE | -5 | С |
| | ROOM 144, BUILDING154 ELECTRICAL SERVICE ROOM. | |
| | ROOM 144-A, ELECTRICAL SERVICE ROOM, ADJACENT TO HE GENERATOR ROOM. | |
| | EXISTING MAIN SWITCHBOARD "154-MSBD". EXISTING SWITCHBOARD "SES-144B". | |
| | EXISTING GENERATOR PANELBOARD "154-GSBD". | |
| | AUTOMATIC TRANSFER SWITCH "ATS-TSEE". EXISTING PANELBOARD "154-DEE". | |
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| Building Nu 154 | umber Construction and Facilities | |
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Department of Veterans Affairs

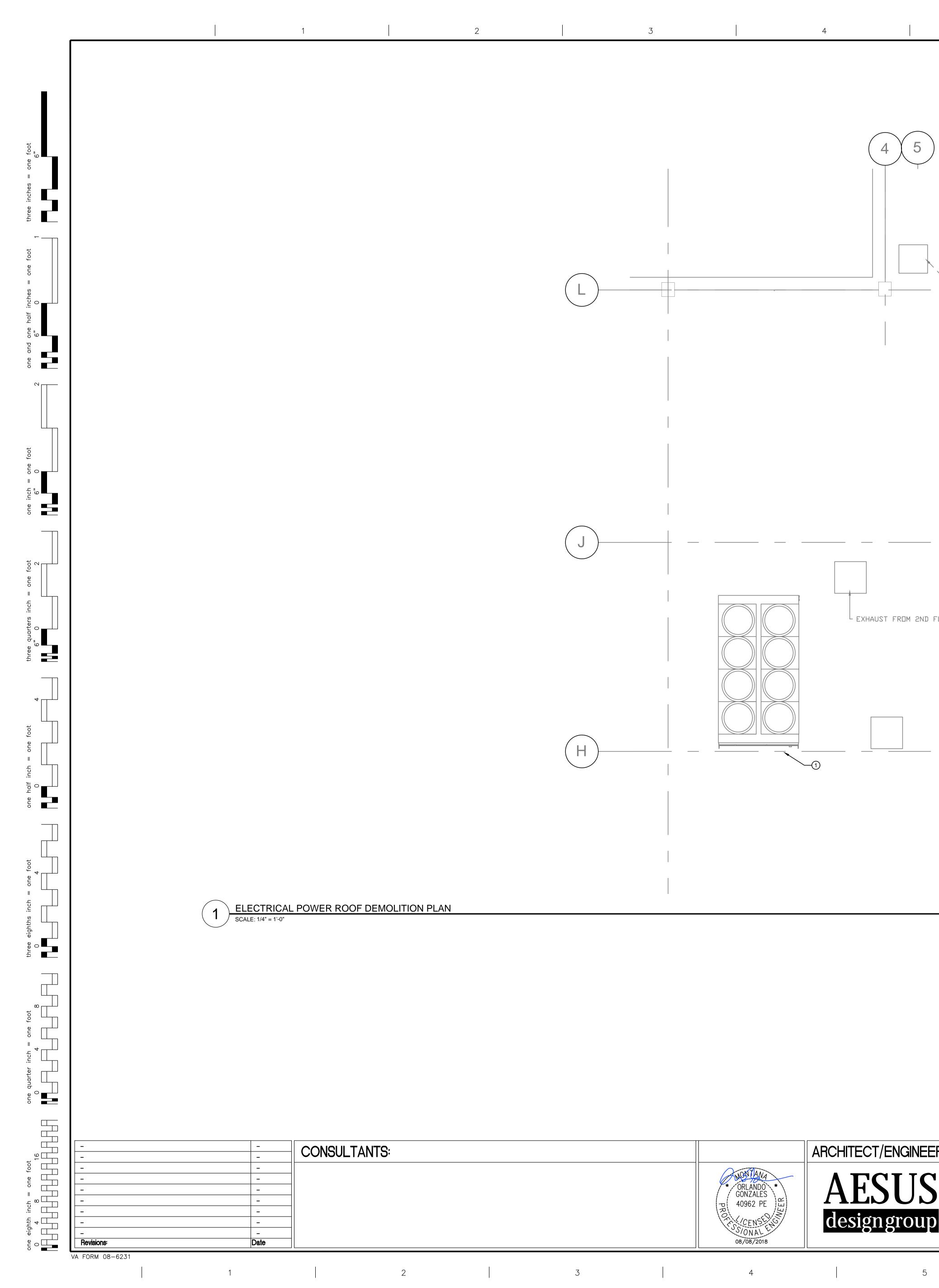


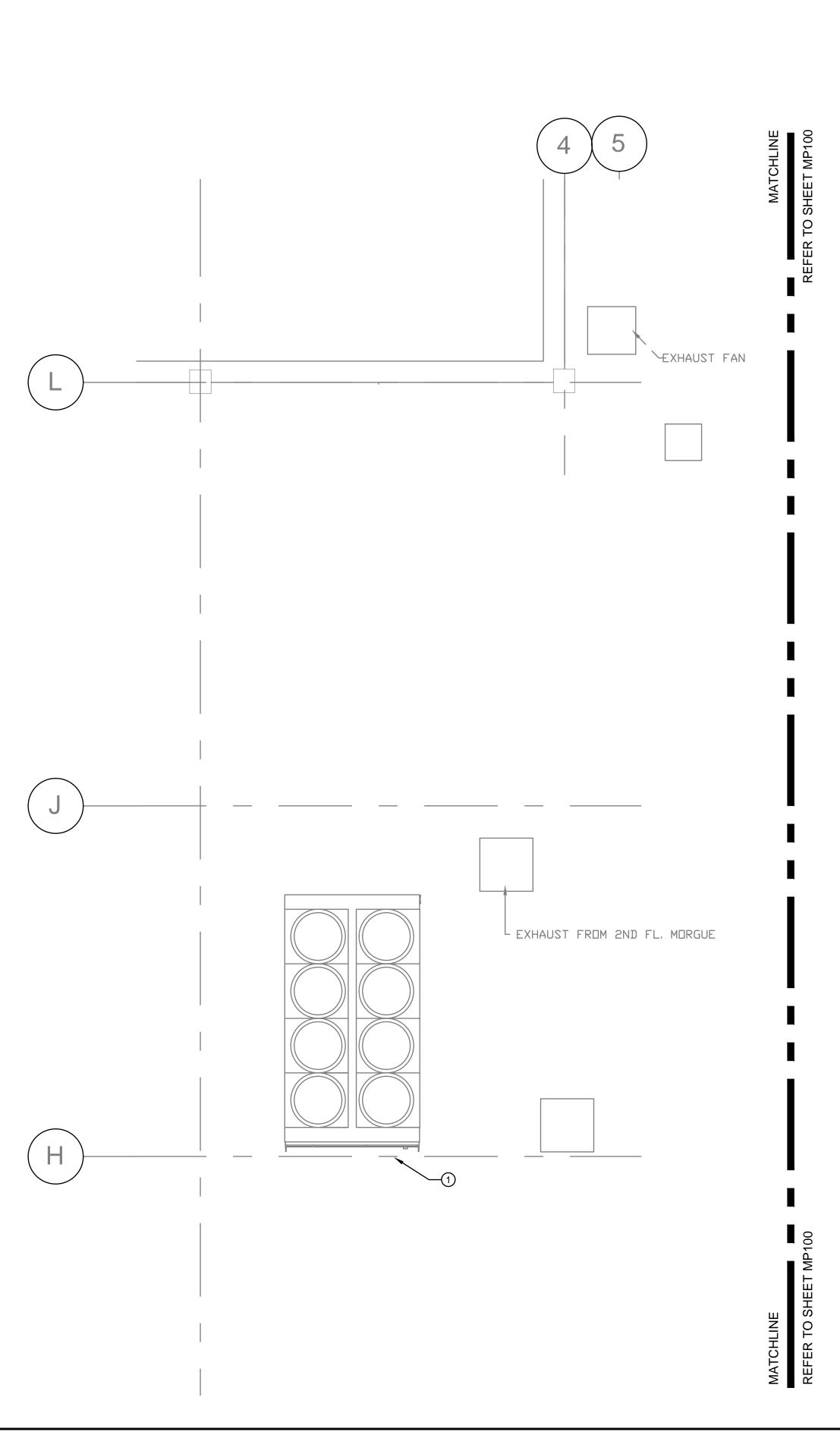
KEY PLAN

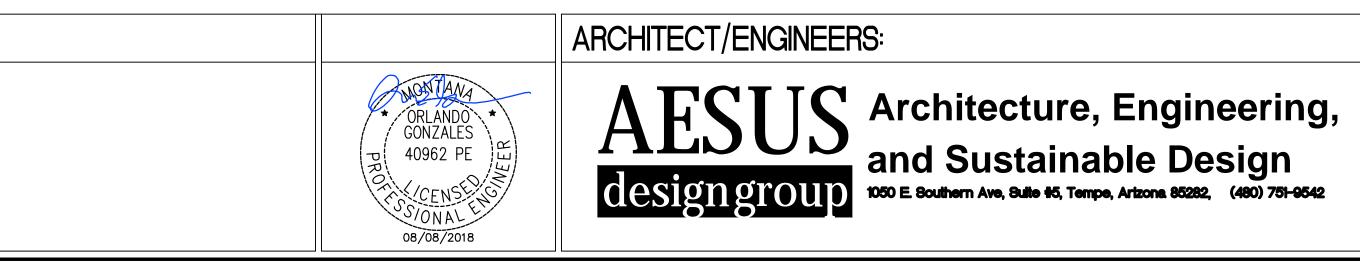
| Design DEMOLITION PLAN CONTRACT NO. VA259-17-C-0212 154 Approved: Project Director Location FT. HARRISON HELENA, MT Drag | 6-17-102 |
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| E DESIGN HELENA, MT | Building Number 154 Drawing Numb ED10 |
| na 85282, (480) 751-9542 | |
| 08/03/2018 OG DC | |

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| NOTES | | |
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| DEMO CONDUIT AND ANDLING UNIT S2A A DEMO CONDUIT AND ANDLING UNIT S2 AN DEMO CONDUIT AND ANDLING UNIT AC2 A DEMO CONDUIT AND KISTING MOTOR CON | ND STARTING UNIT TO BE CONDUCTORS BACK TO SOURCE. ND STARTING UNIT TO BE CONDUCTORS BACK TO SOURCE. D STARTING UNIT TO BE CONDUCTORS BACK TO SOURCE. ND STARTING UNIT TO BE CONDUCTORS BACK TO SOURCE. NTROL CENTER "MCC-5". | А |
| AT THIS LOCATION T | RD "154-PEE4". INNECTING MEANS AND TO BE RELOCATED. EXTEND, EQUIRED. SEE SHEET E100 FOR | |
| TION. NNECT AND VSD SE O CONDUIT AND CON TO BE REMOVED BE ALONG THIS WALL / DCATED. ALL CONDU BE SUPPORTED FOR ER WITH 200 AMPER ONNECT SERVING E BOARD A TO REMAN BOARD 154-PEE2 TO PHONE OUTLET TO B TO OTHER SIDE OF R RECEPTACLE ANE R RECEPTACLE ANE | | B |
| SON CONTROL CABIN T IN USE, TO BE REM OMPRESSOR DRYER O BE RELOCATED. CONTROL PANELS A AND CONDUCTORS SON CONTROL CABIN PTACLE TO BE REMO BACK TO SOURCE. EX FIRE ALARM DEV ONDUCTORS BACK ILATION WATER PUN ONDUCTORS BACK | NET AT THIS LOCATION, MOVED. SYSTEM AND RECEPTACLE ALONG WALL TO BE REMOVED. BACK TO SOURCE. NET TO BE REMOVED DVED. DEMO CONDUIT AND MICES TO BE RELOCATED. DEMO TO SOURCE. MPS 1 AND 2 TO BE REMOVED. DEMO TO SOURCE. MON WATER PUMPS 1 AND 2 TO BE NDUCTORS BACK TO SOURCE. | С |
| CE. TO BE REMOVED. D CE. JST FAN EF14 TO BE CE. VERIFY EXISTING CONDUIT TO BE RE- LARM PULL BOX TO FION. LEVATOR MAIN SHU | MO CONDUIT AND CONDUCTORS EMO CONDUIT AND CONDUCTORS REMOVED. DEMO CONDUCTORS CONDUIT IS IN GOOD CONDITION. USED TO SERVE NEW EF-14. BE RELOCATED. SEE SHEET E100 TOFF PANEL. ENSURE THAT NO ENT OCCURS DURING THIS | D |
| | | E |
| | | F |
| mber 2 mber Jmber | BID SET Office of Construction and Facilities Management | |
| | Veterans Affairs | |

Department of Veterans Affairs







DEMOLITIC

- A. ALL WORK WILL NATIONAL AND LC PROCEDURES.
- B. ALL WORK SHALL MANNER. CARE SH INCONVENIENCE C WHICH ARE TO RE
- C. ALL UTILITY OR SY THE OWNER AND I PRIOR PERMISSION
- D. THE CONTRACTOR CONDITIONS PRIO DISCREPANCIES S RESOLUTION.
- E. ALL DEMOLITION A EXISTING DEVICES THEY REMAIN FU ELECTRICAL CONT INTEGRITY TO ALL CONTRACTOR WIL DEVICES TO THE S
- F. ANY EXISTING DE REASSIGNED TO N IN THE NEAREST A NOTIFY ENGINEER THE ENGINEER WI
- G. THE CONTRACTOR EQUIPMENT AND D THE OWNER AND A TO OWNER STOCK
- H. THE CONTRACTOR PLUMBING DRAWI PLUMBING EQUIPN RELOCATED OR N
- I. ALL SHUT DOWNS COORDINATED WI RESPONSIBLE FOR ITEMS WITH THE C PHASING REQUIRE
- J. OPENINGS IN FLO REMOVED CONDU PATCHED TO MAT SHALL BE PERFOR TRADES.
- K. CONTRACTOR SH METHODS, TECHN PROPERTY BOTH F L. FOR EXISTING CIR
- DEVICES, REMOVE SOURCE AND REM BREAKERS ARE 1 INDICATE ABANDC M. PLANS WERE DES
- ENGINEER. THIS I PLANS, PRIOR TEN SCHEDULES, FIELI
- N. HOWEVER, AS EXIS PROVE TO CONTAI PRIOR INSTALLATIO CONTRACTOR SH FIELD VERIFY EXIS
- O. THE CONTRACTOR COMPLETE AND A LOCATION, CIRCUI EQUIPMENT (I.E.: LUMINAIRES, SWIT DEVICES, CONDUI IMPACTED BY THIS
- **KEY NOTES** 1. LOCATION OF EXIS

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SEE SHEET ED-100 FOR DEMOLITION GENERAL NOTES.

| Drawing Title ELECTRICAL POWER ROOF DEMOLITION PLAN | Project Title REPLACE PENTHOUS HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212 | E |
|--|---|------------|
| Approved: Project Director | Location FT. HARRISON | HELENA, MT |

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Date

08/03/2018

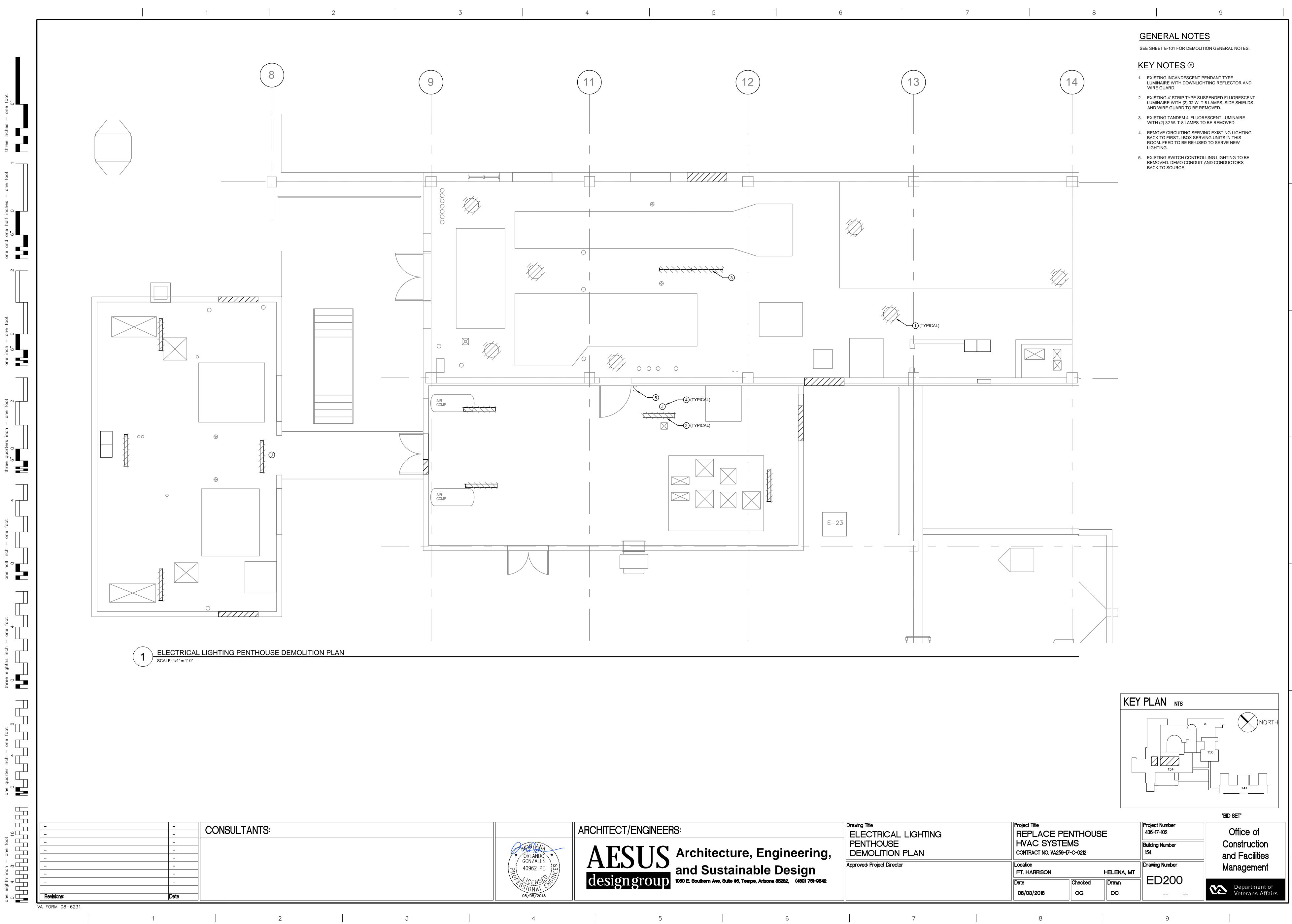
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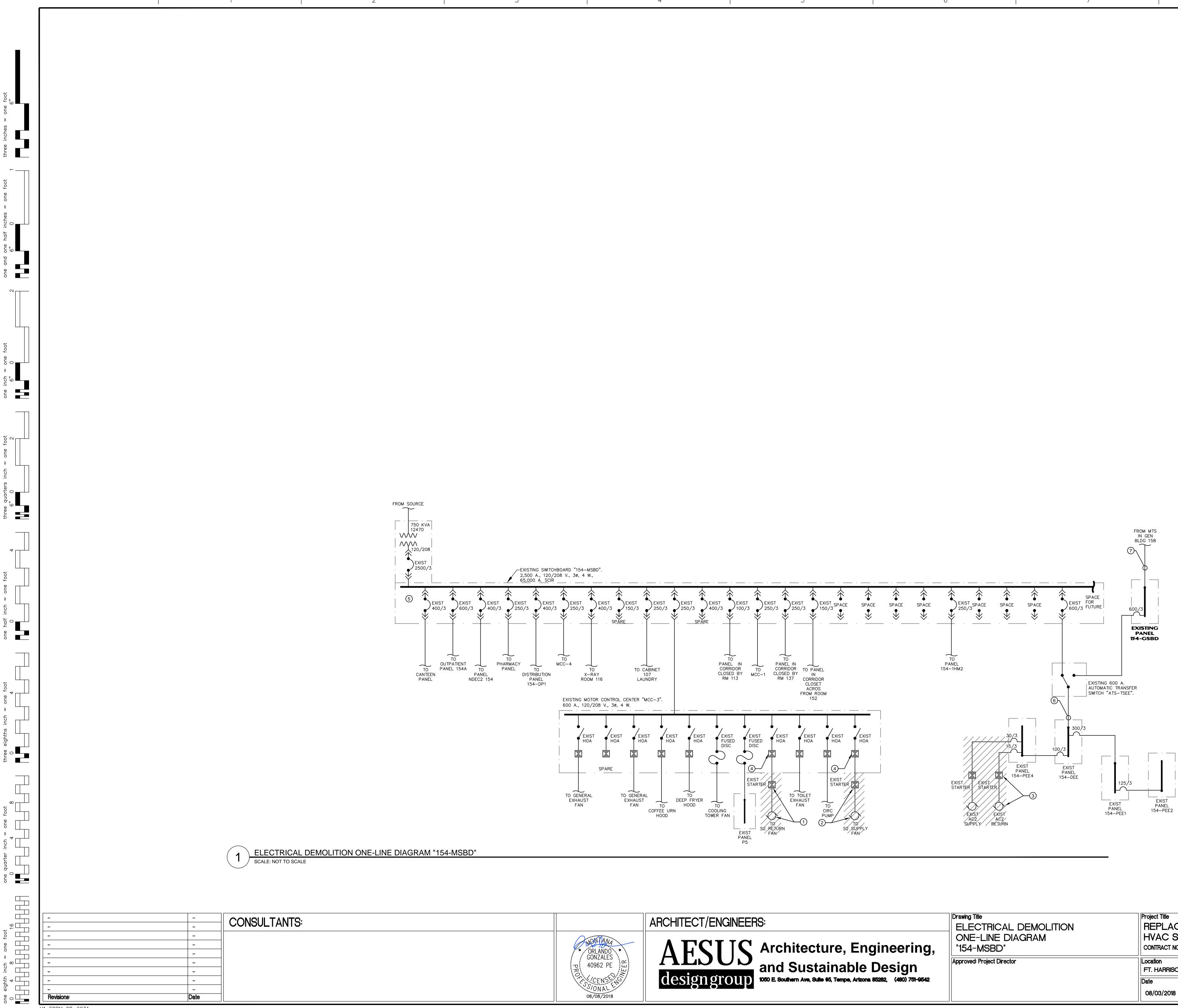
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|-------|--|---|
| D | EMOLITION GENERAL NOTES | |
| A. | ALL WORK WILL BE PERFORMED IN STRICT ACCORDANCE WITH ALL NATIONAL AND LOCAL CODES, STANDARDS AND SAFE WORK PROCEDURES. | |
| В. | ALL WORK SHALL BE PERFORMED IN A CLEAN AND WORKMANLIKE MANNER. CARE SHALL BE EXERCISED TO MINIMIZE ANY INCONVENIENCE OR DISTURBANCE TO OTHER AREAS OF THE BUILDING WHICH ARE TO REMAIN IN OPERATION. | |
| C. | ALL UTILITY OR SYSTEM SHUTDOWNS SHALL BE COORDINATED WITH THE OWNER AND ENGINEER. NO SHUTDOWNS CAN OCCUR WITHOUT PRIOR PERMISSION FROM THE OWNER. | |
| D. | THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND FIELD CONDITIONS PRIOR TO PROCEEDING WITH ANY WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER FOR RESOLUTION. | A |
| E. | ALL DEMOLITION AND NEW WORK MUST BE PERFORMED SUCH THAT EXISTING DEVICES, EQUIPMENT, ETC. ARE TO BE PROTECTED SO AS THEY REMAIN FULLY FUNCTIONAL FOR CONTINUED USE. THE ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR MAINTAINING CIRCUIT INTEGRITY TO ALL EQUIPMENT AND DEVICES TO REMAIN. THE CONTRACTOR WILL REPAIR ANY DAMAGE TO EXISTING EQUIPMENT OR DEVICES TO THE SATISFACTION OF THE ENGINEER. | |
| F. | ANY EXISTING DEVICES WHOSE CIRCUITS MAY HAVE BEEN REASSIGNED TO NEW WORK WILL BE RE-FED FROM SPARE BREAKERS IN THE NEAREST AVAILABLE PANEL SUITABLE TO THE ENGINEER. NOTIFY ENGINEER OF SUCH OCCURRENCES FOR FURTHER DIRECTION. THE ENGINEER WILL EVALUATE FIELD SUGGESTIONS REGARDING NEW SOURCES FOR REFERENCED DEVICES. | |
| G. | THE CONTRACTOR IS RESPONSIBLE FOR DISPOSAL OF DEMOLISHED EQUIPMENT AND DEVICES. THE CONTRACTOR WILL COORDINATE WITH THE OWNER AND ARCHITECT FOR ANY EQUIPMENT TO BE RETURNED TO OWNER STOCK PRIOR TO DISPOSAL. | |
| H. | THE CONTRACTOR SHALL COORDINATE WITH MECHANICAL AND PLUMBING DRAWINGS AND CONTRACTOR FOR ANY MECHANICAL OR PLUMBING EQUIPMENT WHICH MAY NEED TO BE DEMOLISHED, RELOCATED OR NEW WORK TO BE PROVIDED WITH NEW CIRCUITS. | В |
| I. | ALL SHUT DOWNS AND DEMOLITION SHALL BE PHASED AND COORDINATED WITH NEW WORK. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION SHUT DOWNS AND REMOVAL OF ITEMS WITH THE OWNER'S REPRESENTATIVE AND THE OWNER'S PHASING REQUIREMENTS. | |
| J. | OPENINGS IN FLOORS, WALLS, CEILINGS, ROOFS, ETC. AS A RESULT OF REMOVED CONDUIT AND CONDUCTORS, BUSWAY, ETC SHALL BE PATCHED TO MATCH EXISTING BUILDING CONSTRUCTION. WORK SHALL BE PERFORMED BY CRAFTSMEN SKILLED IN THEIR RESPECTIVE TRADES. | |
| K. | CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, AND SAFETY TO THE PUBLIC AND TO PROPERTY BOTH PRIVATE AND PUBLIC. | |
| L. | FOR EXISTING CIRCUITS SERVING DEMOLISHED EQUIPMENT OR DEVICES, REMOVE CONDUIT TO NEAREST USABLE J-BOX OR TO SOURCE AND REMOVE CONDUCTORS TO SOURCE. EXISTING BREAKERS ARE TO REMAIN IN PANEL. RE-LABEL PANEL SCHEDULES TO INDICATE ABANDONED CIRCUITS AS SPARE. | |
| M. | PLANS WERE DESIGNED USING INFORMATION AVAILABLE TO ENGINEER. THIS INFORMATION MAY CONSIST OF ORIGINAL BUILDING PLANS, PRIOR TENANT IMPROVEMENT PLANS, EXISTING PANEL SCHEDULES, FIELD NOTES, ETC. | С |
| N. | HOWEVER, AS EXISTING INFORMATION MAY BE INCOMPLETE OR MAY PROVE TO CONTAIN INACCURACIES, THE ENGINEER CANNOT CERTIFY PRIOR INSTALLATIONS AS PERFORMED BY OTHERS. THEREFORE, THE CONTRACTOR SHALL INCLUDE IN HIS BID ALL WORK AS REQUIRED TO FIELD VERIFY EXISTING CONDITIONS AND AVAILABLE CIRCUITS. | |
| Ο. | THE CONTRACTOR WILL PROVIDE ENGINEER AND OWNER WITH COMPLETE AND ACCURATE "AS-BUILTS". THESE SHALL INCLUDE THE LOCATION, CIRCUITING AND ROUTING OF ALL NEW AND RELOCATED | |
| | EQUIPMENT (I.E.: AIR HANDLERS, CHILLERS, FANS, RECEPTACLES, LUMINAIRES, SWITCHES, ETC) OVER-CURRENT DEVICES, STARTING DEVICES, CONDUIT, CONDUCTORS, AND ALL OTHER DEVICES | |
| KE | IMPACTED BY THIS PROJECT. | |
| 1. | LOCATION OF EXISTING CHILLER 154-CHLR-05A. | |
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| | 'BID SET' | |
| | Project Number 436-17-102 Office of | |
| | Building Number Construction 154 and Facilities | |
| IA, N | Drawing Number Management | |
|) | ED101 Department of | |
| | Veterans Affairs | |



| | Drawing Title | | | | Project Number |
|--------------------------|---|-------------------------------------|---|-------|-----------------|
| ngineering, | _ ELECTRICAL LIGHTING PENTHOUSE DEMOLITION PLAN | HVAC SYST | REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212 | | Building Number |
| e Design | Approved: Project Director | Location FT. HARRISON HELENA, MT | | | Drawing Numb |
| na 85282, (480) 751-9542 | | Date | Checked | Drawn | |
| | | 08/03/2018 | OG | DC | |

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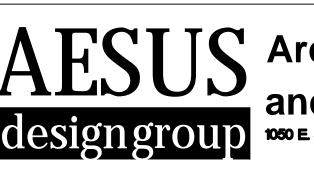
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GENERAL NOTES

SEE SHEET E-101 FOR DEMOLITION GENERAL NOTES.

- KEY NOTES 1. EXISTING AIR HANDLING UNIT "S2" RETURN FAN AND SOURCE.
- DEVICE TO BE REMOVED. DEMO FEED BACK TO SOURCE.
- BE REMOVED. DEMO FEED BACK TO SOURCE.
- 4. EXISTING HOA IN MOTOR CONTROL CENTER TO BE REMAIN. UNIT TO BE LISTED AS "SPARE".
- 5. ELECTRICAL CONTRACTOR TO PERFORM 30 DAY LOAD TEST
- 7. ELECTRICAL CONTRACTOR TO PERFORM 30 DAY LOAD TEST

| | Drawing Title ELECTRICAL DEMOLITION | REPLACE PENTHOUSE | | | Project Numb 436-17-102 |
|---------------------------------|--|-------------------------------------|--|------------|----------------------------|
| ngineering, | ONE-LINE DIAGRAM "154-MSBD" | HVAC SYS | HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212 | | |
| e Design | Approved: Project Director | Location FT. HARRISON HELENA, MT | | HELENA, MT | |
| na 85282, (480) 751-9542 | | Date | Checked | Drawn | 1 ED6 |
| | | 08/03/2018 | OG | DC | |

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STARTING DEVICE TO BE REMOVED. DEMO FEED BACK TO

2. EXISTING AIR HANDLING UNIT "S2" SUPPLY FAN AND STARTING

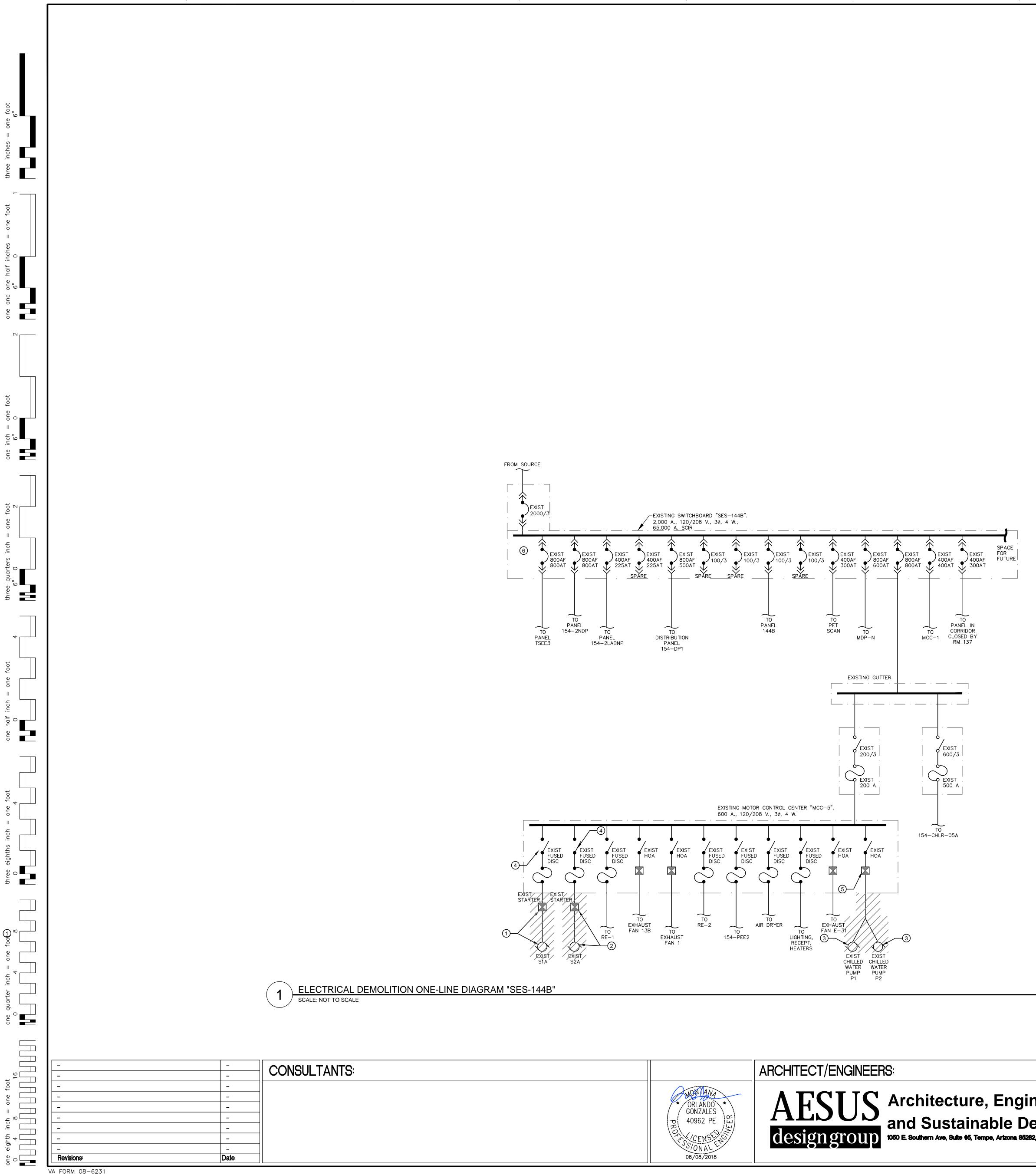
3. EXISTING AIR HANDLING UNIT "AC2" AND STARTING DEVICE TO

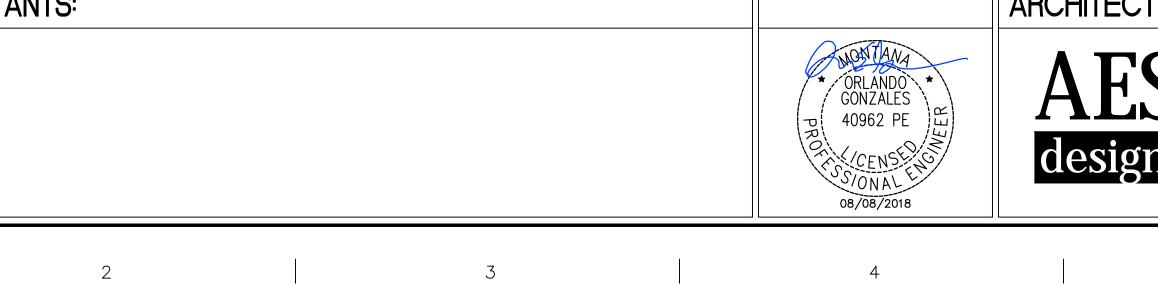
ON "154-MSBD" PRIOR TO COMMENCING WORK. VERIFY EXISTING DEMAND LOAD IS LESS THAN 2,100.0 AMPS. PROVIDE ENGINEER OF RECORD WITH RESULTS. IF HIGHER, COORDINATE WITH ENGINEER FOR FURTHER DIRECTION.

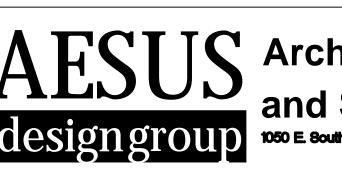
6. ELECTRICAL CONTRACTOR TO PERFORM 30 DAY LOAD TEST ON "154-DEE" FEEDERS PRIOR TO COMMENCING WORK. VERIFY EXISTING DEMAND LOAD IS LESS THAN 500.0 AMPS. PROVIDE ENGINEER OF RECORD WITH RESULTS. IF HIGHER, COORDINATE WITH ENGINEER FOR FURTHER DIRECTION.

ON "154-GSBD" FEEDERS PRIOR TO COMMENCING WORK. VERIFY EXISTING DEMAND LOAD IS LESS THAN 1,800.0 AMPS. PROVIDE ENGINEER OF RECORD WITH RESULTS. IF HIGHER, COORDINATE WITH ENGINEER FOR FURTHER DIRECTION.

> 'BID SET' nber Office of Construction mber and Facilities umber Management 600 Department of Veterans Affairs -- --







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GENERAL NOTES

SEE SHEET E-101 FOR DEMOLITION GENERAL NOTES.

KEY NOTES **#**

1. EXISTING AIR HANDLING BE REMOVED. DEMO FEE

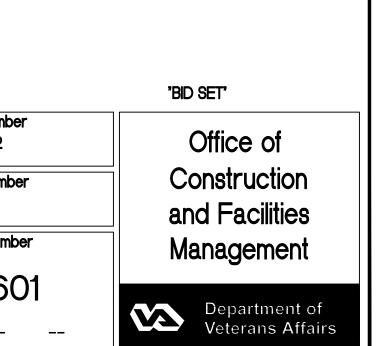
- 2. EXISTING AIR HANDLING BE REMOVED. DEMO FEE
- 3. EXISTING CHILLED WATE REMOVED. DEMO FEED E
- 4. EXISTING FUSED DISCONNECT IN MOTOR CONTROL CENTER TO REMAIN. UNIT TO BE LISTED AS "SPARE".
- TO BE LISTED AS "SPARE".

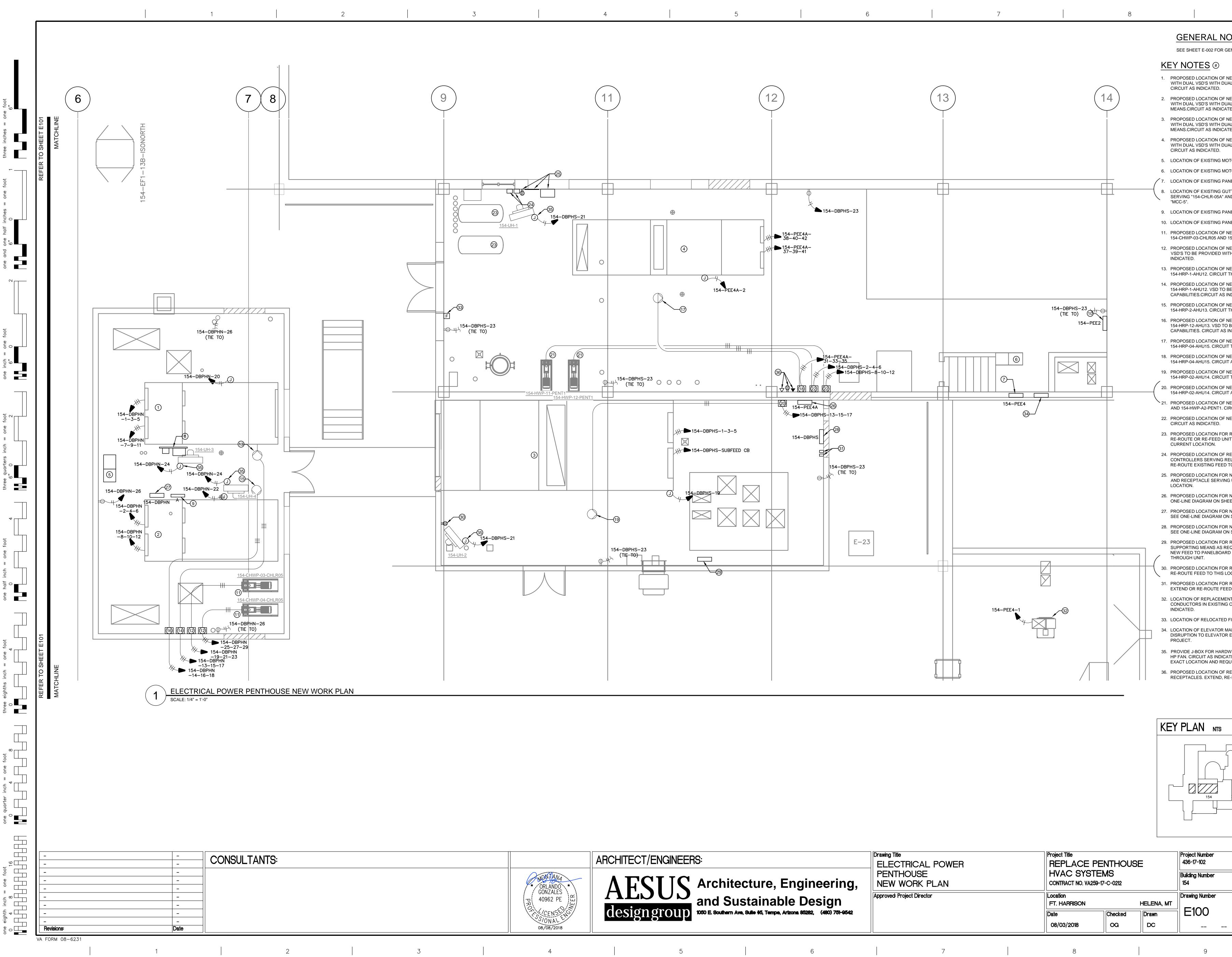
| Architecture, Engineering, and Sustainable Design 250 E. Southern Ave, Suite #5, Tempe, Arizona 85282, (480) 751-9542 | Drawing Title ELECTRICAL DEMOLITION ONE-LINE DIAGRAM "SES-144B" Approved: Project Director | Project Title REPLACE HVAC SYS CONTRACT NO. VA Location FT. HARRISON Date 08/03/2018 | TEMS | BE HELENA, MT Drawn DC | Project Number 436-17-102 Building Number 154 Drawing Number ED601 | |
|---|--|---|------|---------------------------------|---|--|
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| G UNIT "S1A" AND STARTING DEVICE TO EED BACK TO SOURCE. |
|--|
| G UNIT "S2A" AND STARTING DEVICE TO EED BACK TO SOURCE. |
| ER PUMPS "P1" AND "P2" TO BE BACK TO SOURCE. |

5. EXISTING HOA IN MOTOR CONTROL CENTER TO REMAIN. UNIT

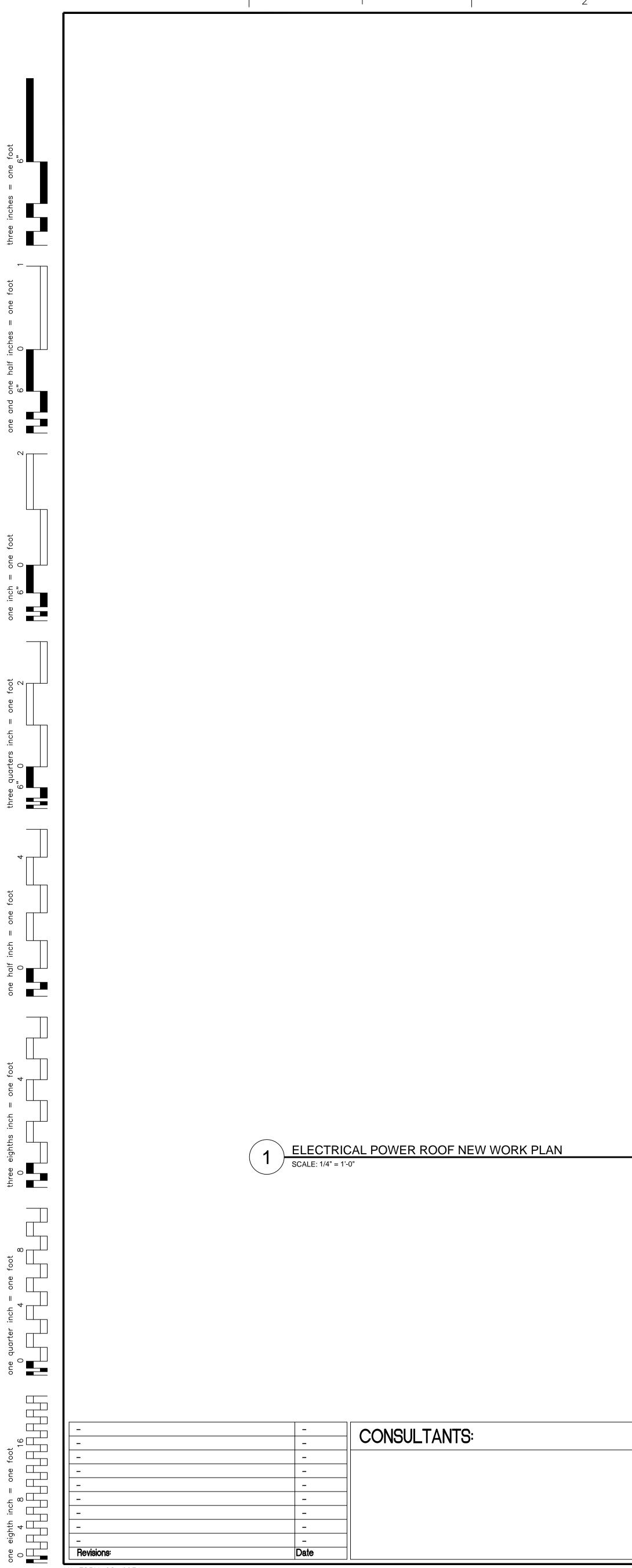
6. ELECTRICAL CONTRACTOR TO PERFORM 30 DAY LOAD TEST ON "SES-144B" PRIOR TO COMMENCING WORK. VERIFY EXISTING DEMAND LOAD IS LESS THAN 1,060.0 AMPS. PROVIDE ENGINEER OF RECORD WITH RESULTS. IF HIGHER, COORDINATE WITH ENGINEER FOR FURTHER DIRECTION.





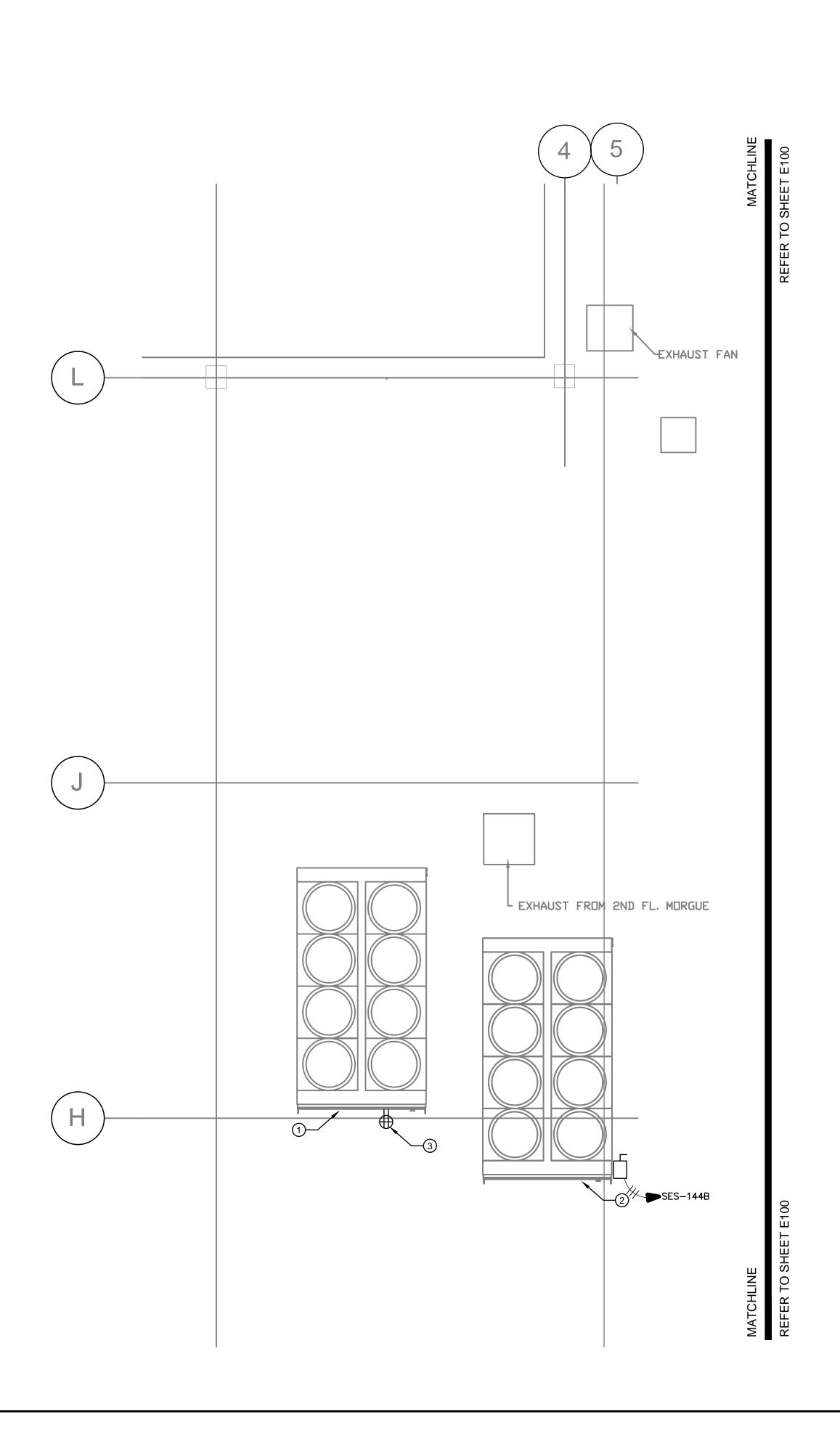
| | Drawing Title ELECTRICAL POWER | Project Title REPLACE F | Project Title REPLACE PENTHOUSE | | |
|------------------------------------|-----------------------------------|--------------------------------|------------------------------------|-------------|---------------------|
| ngineering, | PENTHOUSE NEW WORK PLAN | HVAC SYST CONTRACT NO. VA25 | | | Building Nur 154 |
| e Design | Approved: Project Director | Location FT. HARRISON | | HELENA, MT | Drawing Nu |
| zo na 85282, (480) 751-9542 | | Date 08/03/2018 | Checked OG | Drawn DC | E100 |

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| RAL NOTES | |
| -002 FOR GENERAL NOTES. | |
| S # CATION OF NEW AIR HANDLING UNIT 154-AHU-12-4th, 'S WITH DUAL INTEGRAL MAIN DISCONNECTING MEANS. | |
| ICATED. CATION OF NEW AIR HANDLING UNIT 154-AHU-13-4th, 'S WITH DUAL INTEGRAL MAIN DISCONNECTING TAS INDICATED. | |
| ATION OF NEW AIR HANDLING UNIT 154-AHU-14-3rd, 'S WITH DUAL INTEGRAL MAIN DISCONNECTING | А |
| AS INDICATED. CATION OF NEW AIR HANDLING UNIT 154-AHU-15-2nd, 'S WITH DUAL INTEGRAL MAIN DISCONNECTING MEANS. | |
| ICATED. XISTING MOTOR CONTROL CENTER "MCC-5". | |
| XISTING MOTOR CONTROL CENTER "MCC-3". XISTING PANELBOARD "154-PEE4". | |
| XISTING GUTTER WITH 600 AMPERE DISCONNECT HLR-05A" AND 200 AMPERE DISCONNECT SERVING | |
| XISTING PANELBOARD A. XISTING PANELBOARD 154-PEE2. | |
| ATION OF NEW CHILLED WATER PUMPS HLR05 AND 154-CHP-04-CHLR05. CIRCUIT THROUGH VSD. | |
| OVIDED WITH LOCKABLE OFF PROVISIONS. CIRCUIT AS | В |
| 2. CIRCUIT THROUGH VSD. ATION OF NEW VSD SERVING HEAT RECOVERY PUMP | |
| 2. VSD TO BE PROVIDED WITH LOCKABLE OFF IRCUIT AS INDICATED. ATION OF NEW HEAT RECOVERY PUMP | |
| 3. CIRCUIT THROUGH VSD. ATION OF NEW VSD SERVING HEAT RECOVERY PUMP 13. VSD TO BE PROVIDED WITH LOCKABLE OFF | |
| CIRCUIT AS INDICATED. CATION OF NEW HEAT RECOVERY PUMP 115. CIRCUIT THROUGH VSD. | |
| CATION OF NEW VSD SERVING HEAT RECOVERY PUMP 115. CIRCUIT AS INDICATED. | |
| CATION OF NEW HEAT RECOVERY PUMP 114. CIRCUIT THROUGH VSD. | |
| ATION OF NEW VSD SERVING HEAT RECOVERY PUMP 14. CIRCUIT AS INDICATED. ATION OF NEW HOT WATER PUMPS 154-HWP-11-PENT1 | С |
| 2-PENT1. CIRCUIT THROUGH VSD'S. ATION OF NEW VSD'S SERVING HOT WATER PUMPS. ICATED. | |
| ATION FOR RELOCATED AIR COMPRESSOR. EXTEND, E-FEED UNIT AS REQUIRED. SEE SHEET ED100 FOR TION. | |
| ATION OF RELOCATED DISCONNECTS AND SERVING RELOCATED AIR COMPRESSORS. EXTEND OR | ┝ |
| TING FEED TO THIS LOCATION. ATION FOR NEW AIR COMPRESSOR DRYER SYSTEM LE SERVING UNIT. EXTEND OR RE-ROUTE FEED TO THIS | |
| ATION FOR NEW PANELBOARD "154-PEE4A". SEE RAM ON SHEET E600 FOR DETAILS. | |
| ATION FOR NEW DISTRIBUTION BOARD "154-PBPHN". DIAGRAM ON SHEET E601 FOR DETAILS. | D |
| ATION FOR NEW DISTRIBUTION BOARD "154-DBPHS". DIAGRAM ON SHEET E600 FOR DETAILS. | |
| EANS AS REQUIRED. EXTEND, RE-ROUTE OR PROVIDE ANELBOARD AND TO ALL DOWNSTEAM UNITS SERVED | |
| ATION FOR RELOCATED RECEPTACLE. EXTEND OR TO THIS LOCATION. | |
| CATION FOR RELOCATED SIMPLEX FIRE ALARM DEVICES. ROUTE FEED TO NEW LOCATION. EPLACEMENT EXHAUST FAN EF-14. PROVIDE NEW | |
| N EXISTING CONDUIT BACK TO CIRCUIT BREAKER ELOCATED FIRE ALARM PULL BOX. | |
| LEVATOR MAIN SHUTOFF PANEL. ENSURE THAT NO ELEVATOR EQUIPMENT OCCURS DURING THIS | |
| FOR HARDWIRE CONNECTION TO UNIT HEATER WITH $\frac{1}{20}$ T AS INDICATED. COORDINATE WITH MECHANICAL FOR IN AND REQUIREMENTS. | E |
| ATION OF RELOCATED POWER, DATA AND TELEPHONE EXTEND, RE-ROUTEOR REFEED AS REQUIRED. | |
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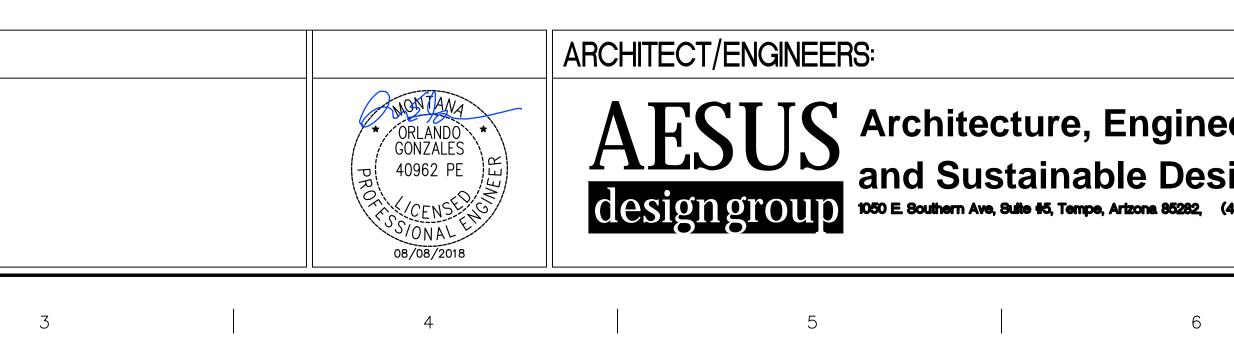


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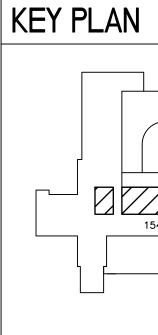
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GENERAL

- A. ALL EXTERIOR DI PROTECTED. B. MEMBRANE PENE
- ACCORDANCE WI C. ALL WORK WILL B NATIONAL AND LC
- PROCEDURES. D. ALL DEMOLITION EXISTING DEVICE THEY REMAIN FU ELECTRICAL CON INTEGRITY TO ALL
- CONTRACTOR WI DEVICES TO THE S E. COORDINATE WIT CONTRACTOR FO MAY NEED TO BE
- PROVIDED WITH N F. THE CONTRACTO TRADES AND PRC AND SUPPORT AS
- G. THE CONTRACTO VENDORS AND PF REQUIRED FOR A OF THE OWNER, 1
- H. CONTRACTOR WI EQUIPMENT PER N I. ALL WIRING FOR I MINIMUM OF 10 A FOR UNDERGROU
- COPPER GROUND J. VERIFY ALL EXISTI TO START OF WOR
- K. NO DESIGN CHAN APPROVAL OF TH INSPECTOR.
- L. PLANS WERE DES THIS INFORMATION TENANT IMPROVE NOTES, ETC.
- M. HOWEVER, AS EXI PROVE TO CONT PRIOR INSTALLAT CONTRACTOR SH FIELD VERIFY EXI
- N. THE CONTRACTO COMPLETE AND

KEY NOTES

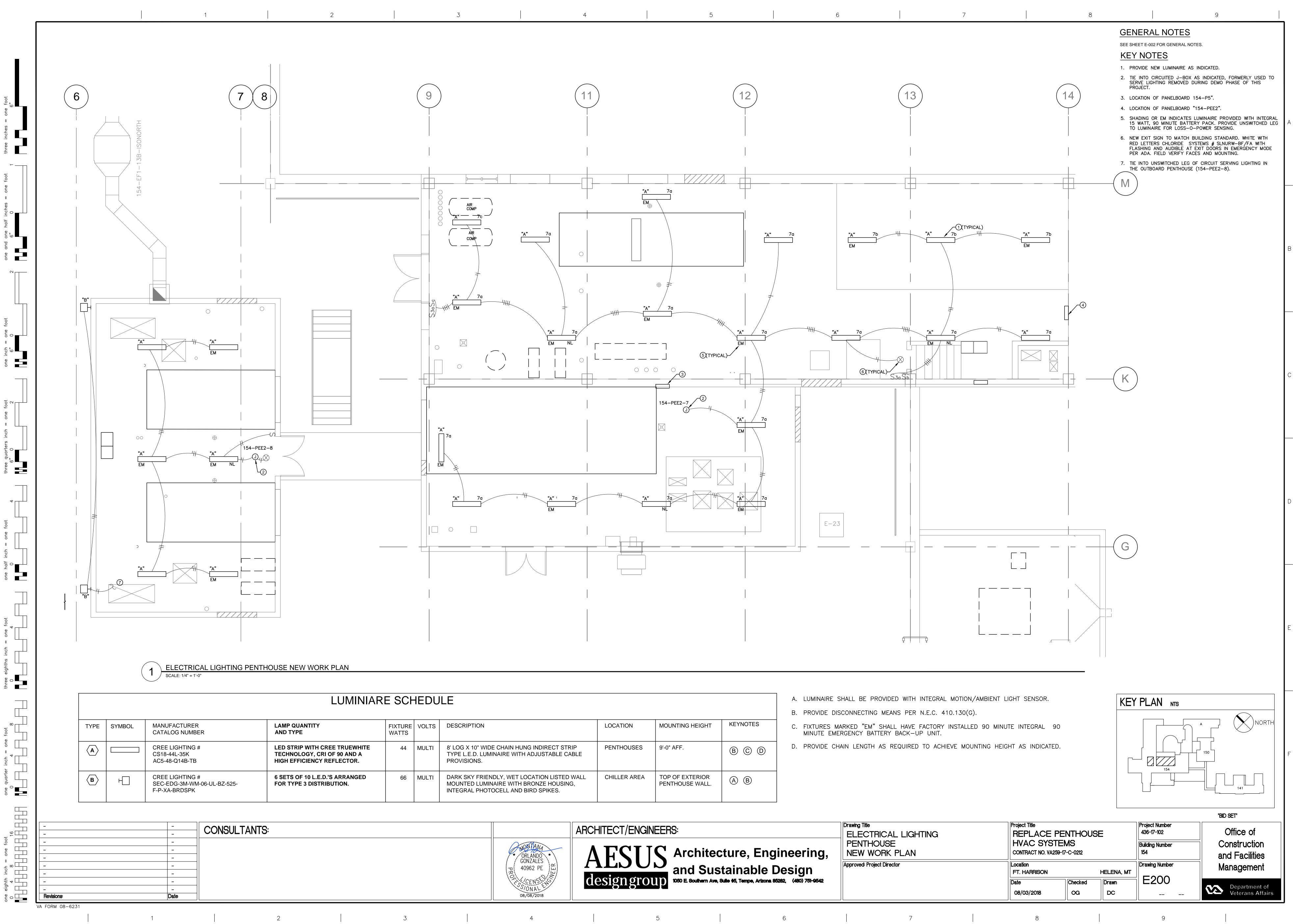
- 1. LOCATION OF EXI
- 2. PROPOSED LOCA 3. EXISTING GFCI PR
- MAINTENANCE REC COVER PER N.E.C. CIRCUIT 2.



| ineering, | Drawing Title ELECTRICAL POWER ROOF NEW WORK PLAN | HVAC SYS | Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212 | | |
|---------------------|--|------------------------------------|--|------------|----------------|
|)esign | Approved: Project Director | Location FT. HARRISON HELENA, M | | HELENA, MT | Drawing Number |
| 282, (480) 751-9542 | | Date | Checked | Drawn | E101 |
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| NOTES |] |
| DEVICES SHALL BE WEATHERPROOF AND GFCI | |
| IETRATION THROUGH WALLS SHALL BE PROTECTED IN WITH THE LATEST ADOPTED EDITION OF I.B.C. 712.32. BE PERFORMED IN STRICT ACCORDANCE WITH ALL LOCAL CODES, STANDARDS AND SAFE WORK | |
| N AND NEW WORK MUST BE PERFORMED SUCH THAT ES, EQUIPMENT, ETC. ARE TO BE PROTECTED SO AS FULLY FUNCTIONAL FOR CONTINUED USE. THE NTRACTOR IS RESPONSIBLE FOR MAINTAINING CIRCUIT LL EQUIPMENT AND DEVICES TO REMAIN. THE VILL REPAIR ANY DAMAGE TO EXISTING EQUIPMENT OR E SATISFACTION OF THE ENGINEER. | A |
| ITH MECHANICAL AND PLUMBING DRAWINGS AND OR ANY MECHANICAL OR PLUMBING EQUIPMENT WHICH E DEMOLISHED, RELOCATED OR NEW WORK TO BE I NEW CIRCUITS. | |
| OR IS RESPONSIBLE FOR COORDINATING WITH ALL OVIDING ALL EQUIPMENT, DEVICES, APPURTENANCES AS REQUIRED FOR A FULLY FUNCTIONAL SYSTEM. | |
| OR IS RESPONSIBLE FOR COORDINATING WITH ALL PROVIDING ALL CONNECTIONS AND APPURTENANCES AS A FULLY FUNCTIONING SYSTEM TO THE SATISFACTION , TENANT AND ENGINEER. | _ |
| VILL MAINTAIN CLEARANCES ABOUT ELECTRICAL R NEC 110.26. | |
| R EXTERIOR LIGHTING AND POWER DEVICES SHALL BE A A.W.G. COPPER WITH TYPE "THWN-2" INSULATION (UNO) DUND CIRCUITS RUN IN PVC. PROVIDE A 10 A.W.G. ND IN ADDITION TO CIRCUIT CONDUCTORS (UNO). | |
| ORK. NGE MAY BE MADE TO THE SYSTEM WITHOUT THE PRIOR HE DESIGN ELECTRICAL ENGINEER AND THE ELECTRICAL | В |
| ESIGNED USING INFORMATION AVAILABLE TO ENGINEER. ION MAY CONSIST OF ORIGINAL BUILDING PLANS, PRIOR /EMENT PLANS, EXISTING PANEL SCHEDULES, FIELD | |
| XISTING INFORMATION MAY BE INCOMPLETE OR MAY TAIN INACCURACIES, THE ENGINEER CANNOT CERTIFY ITIONS AS PERFORMED BY OTHERS. THEREFORE, THE HALL INCLUDE IN HIS BID ALL WORK AS REQUIRED TO KISTING CONDITIONS AND AVAILABLE CIRCUITS. OR WILL PROVIDE ENGINEER AND OWNER WITH ACCURATE "AS-BUILTS". | |
| S KISTING CHILLER 154-CHLR-05-AHU13-15. | |
| ATION OF NEW CHILLER 154-CHLR-05B-AHU13-15. PROTECTED ROOF MOUNTED EQUIPMENT RECEPTACLE WITH WEATHERPROOF WHILE-IN-USE | С |
| .C. 210.63, CIRCUITED THROUGH PANELBOARD A, | |
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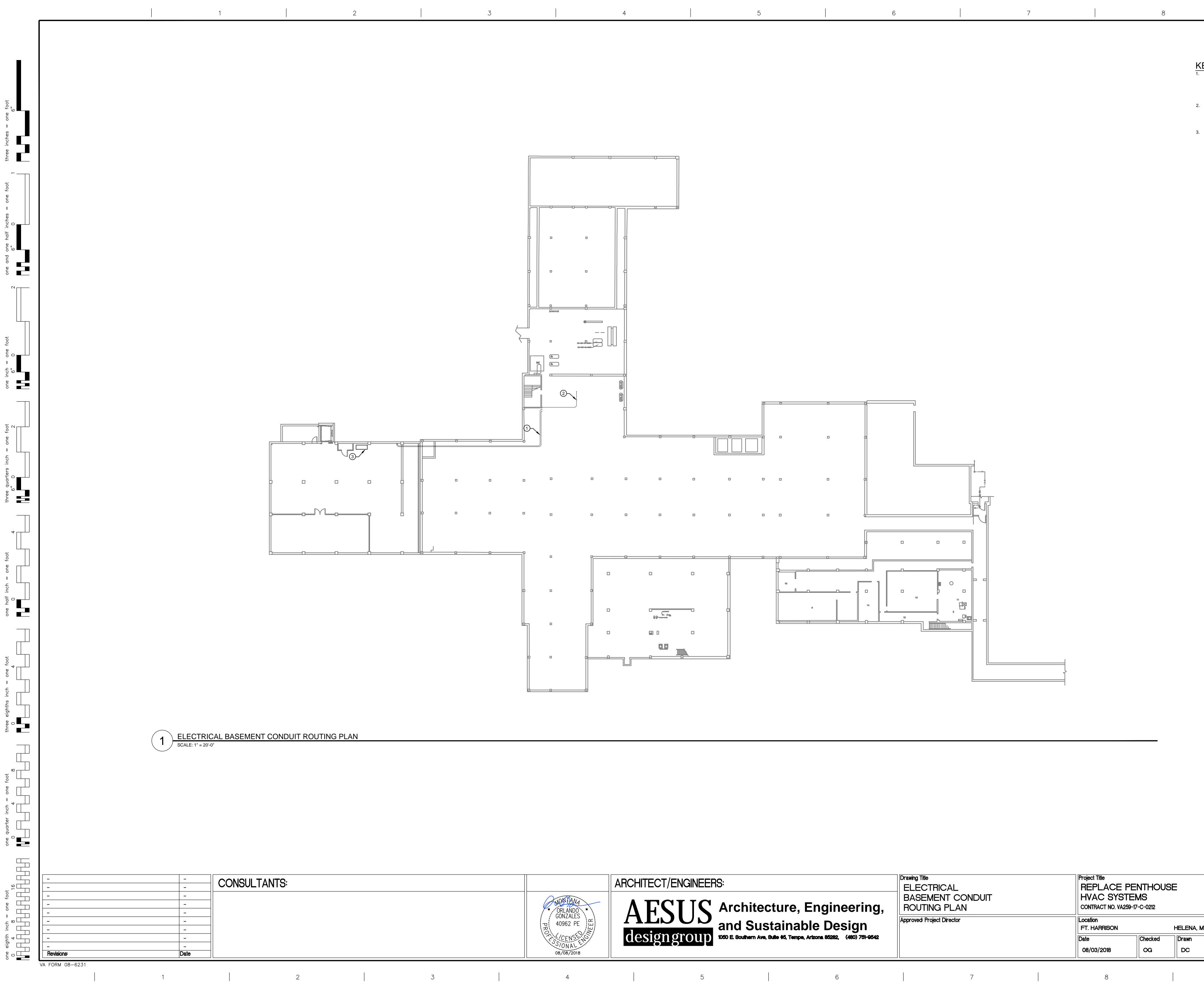


| FIXTURE WATTS | VOLTS | DESCRIPTION | LOCATION | MOUNTING HEIGHT | KEYNOTES |
|------------------|-------|--|--------------|------------------------------------|----------|
| 44 | MULTI | 8' LOG X 10" WIDE CHAIN HUNG INDIRECT STRIP TYPE L.E.D. LUMINAIRE WITH ADJUSTABLE CABLE PROVISIONS. | PENTHOUSES | 9'-0" AFF. | 8 C D |
| 66 | MULTI | DARK SKY FRIENDLY, WET LOCATION LISTED WALL MOUNTED LUMINAIRE WITH BRONZE HOUSING, INTEGRAL PHOTOCELL AND BIRD SPIKES. | CHILLER AREA | TOP OF EXTERIOR PENTHOUSE WALL. | A B |



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| | CONDUIT AND CO "154-CHLR-05B" TO ROUTE UP TO LE\ THORUGH EXISTII |
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| 2. | ROUTE CONDUIT BELOW MOP ROO PROVIDING NEW (PULL BOXES AT E |

E602 FOR DETAILS.

| gineering, Design | Drawing Title ELECTRICAL BASEMENT CONDUIT ROUTING PLAN | Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212 | | | | |
|--------------------------|---|--|--------------|-------|---------|--|
| | Approved: Project Director | Location FT. HARRISON | Drawing Numb | | | |
| na 85282, (480) 751-9542 | | Date | Checked | Drawn | ןׂ E300 | |
| | | 08/03/2018 | OG | DC | | |
| | | | | | | |

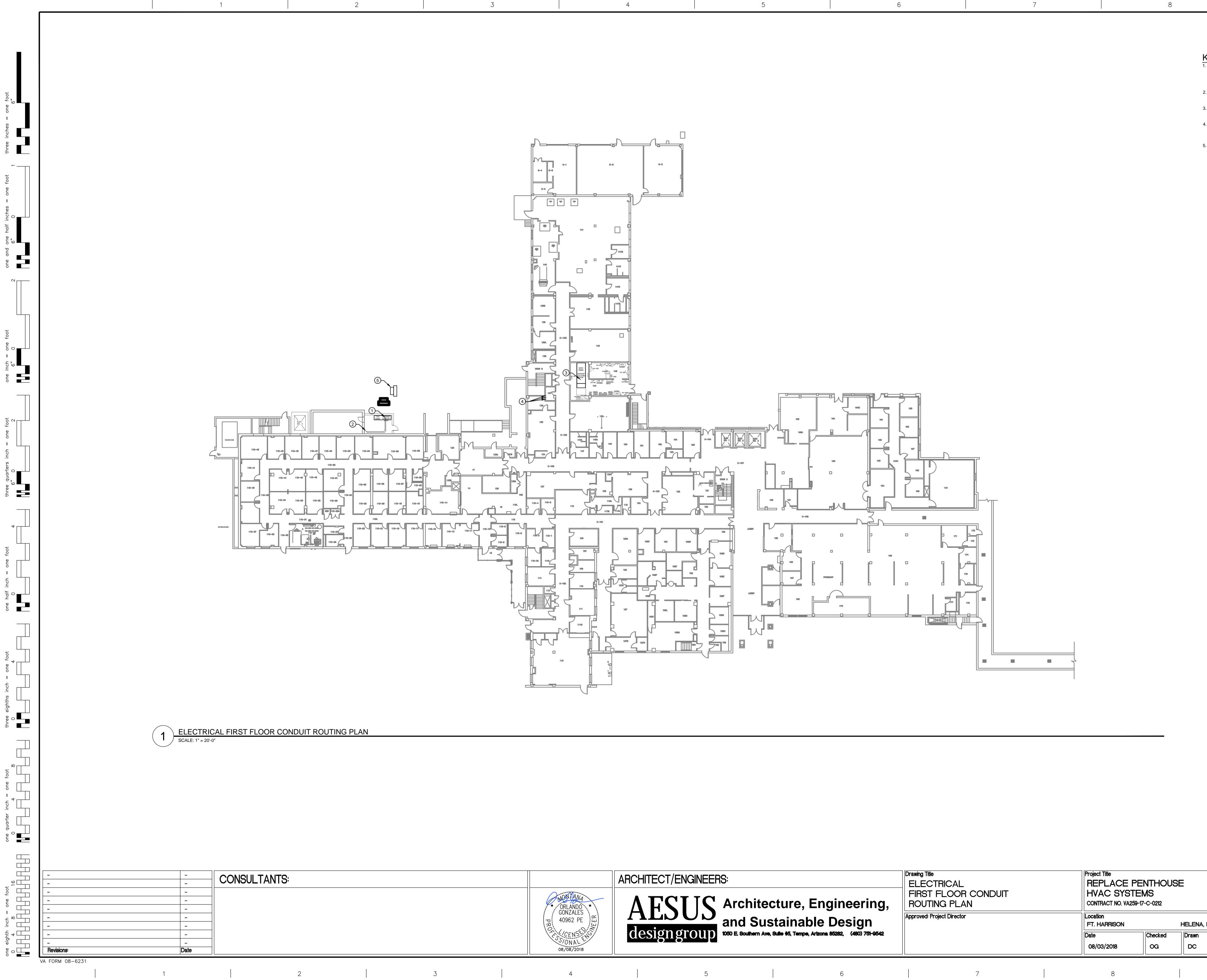
GENERAL NOTES

SEE SHEET E-002 FOR GENERAL NOTES.

KEY NOTES # 1. INTERCEPT EXISTING CONDUIT STUBS AT BASEMENT WALL AND ROUTE ONDUCTORS SERVING"154-DBPHN" AND NEW CHILLER TO AREA BELOW MOP ROOMS ADJACENT TO STAIRWAY. EVEL 4, PROVIDING NEW CONDUIT AND CONDUCTORS TING PULL BOXES AT EACH LEVEL. T AND CONDUCTORS SERVING "154-DBPHS" TO AREA DOMS ADJACENT TO STAIRWAY. ROUT UP TO LEVEL 3, V CONDUIT AND CONDUCTORS THROUGH EXISITING EACH LEVEL.

PROPOSED LOCATION FOR NEW DISTRIBUTION BOARD "SES-144C", TO BE BID AS PART OF A LINE ITEM. SEE ONE-LINE DIAGRAM ON SHEET

| | 'BID SET' |
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| ber | Office of |
| nber | Construction and Facilities |
| nber | Management |
| 0 | Department of |



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KEY NOTES # 1. CONDUITS AND CONDUCTORS SERVING NEW DISTRIBUTION BOARD THROUGH FLOOR TO BASEMENT.

- LEVEL.
 - FOR DETAILS.

| | Drawing Title ELECTRICAL | | Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212 | | | | |
|--------------------------|-------------------------------------|--------------------------|--|-------------|-------|--|--|
| ngineering, | FIRST FLOOR CONDUIT ROUTING PLAN | | | | | | |
| e Design | Approved: Project Director | Location FT. HARRISON | HELENA, MT | Drawing Num | | | |
| na 85282, (480) 751-9542 | | Date | Checked | Drawn | ∦E301 | | |
| | | 08/03/2018 | OG | DC | | | |
| | | 08/03/2018 | OG | DC | | | |

GENERAL NOTES

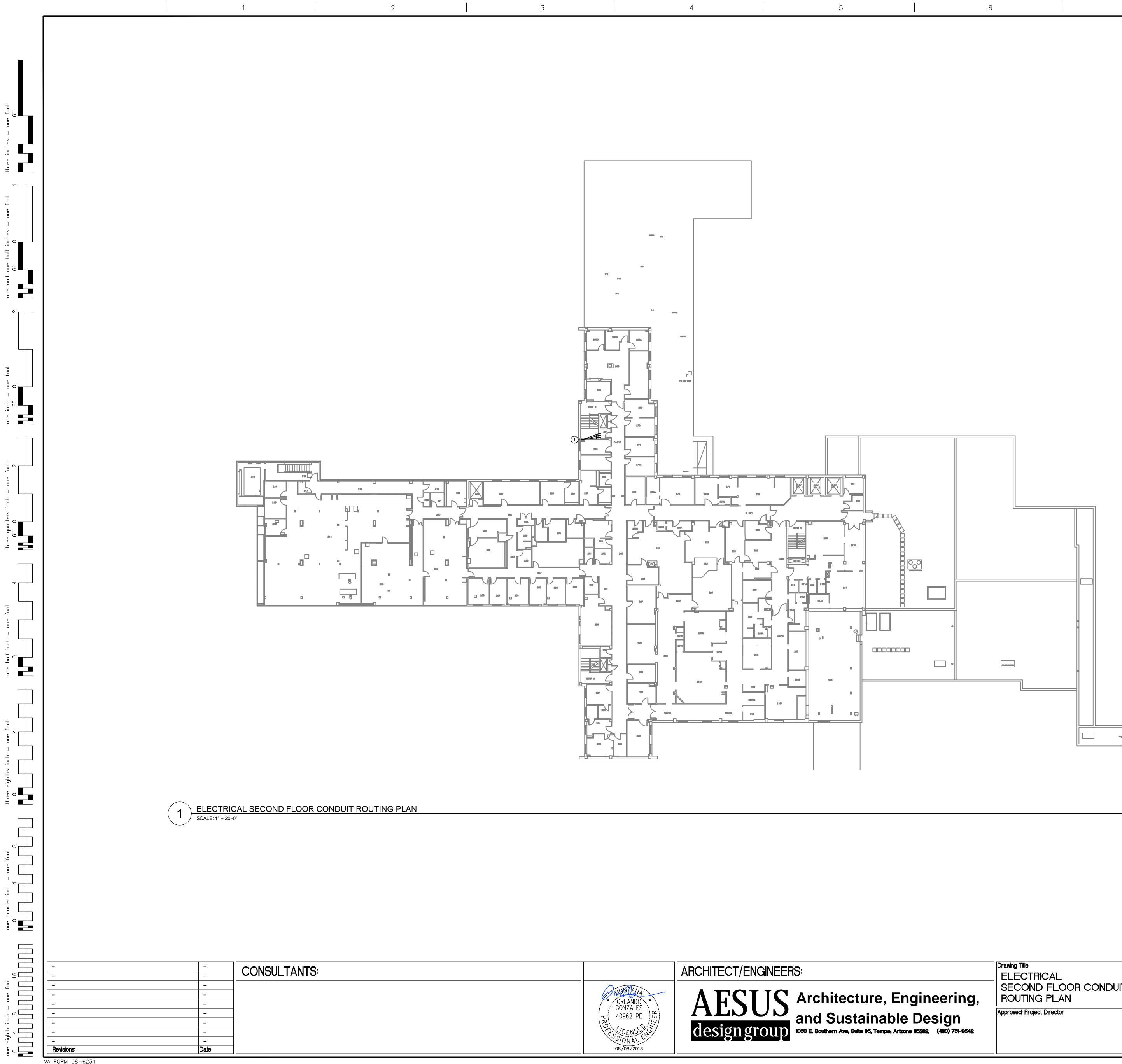
SEE SHEET E-002 FOR GENERAL NOTES.

"154-DBPHN" AND NEW CHILLER "154-CHLR-05B" TO BE ROUTED THROUGH TOP OF SES-144B TO CEILING AREA, TO WALL ACROSS FROM SES, TO CORNER ACROSS FROM SERVICE AND DOWN. 2. INTERCEPT TWO EXISTING 4" CONDUITS STUBBED INTO BASEMENT AND USE THESE TO ROUTE FEEDS INTO BASEMENT. SEE SHEET E300. 3. CONDUIT AND CONDUCTORS SERVING "154-DBPHS" TO BE ROUTED

(3) 4" CONDUITS AND CONDUCTORS ROUTED THROUGH MOP ROOM, ONE FROM BASEMENT TO THIRD LEVEL, 2 FROM BASEMENT TO FOURTH

5. PROPOSED LOCATION FOR NEW DISTRIBUTION TRANSFORMER, TO BE BID AS PART OF A LINE ITEM. SEE ONE-LINE DIAGRAM ON SHEET E602

| | 'BID SET' |
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| ber | Office of |
| Der | Construction and Facilities |
| ber | Management |
| | Department of |



VA FORM 08-6231

GENERAL NOTES

SEE SHEET E-002 FOR GENERAL NOTES.

KEY NOTES (#) (3) 4" CONDUITS AND CONDUCTORS ROUTED THROUGH MOP ROOM, ONE FROM BASEMENT TO THIRD LEVEL, 2 FROM BASEMENT TO FOURTH

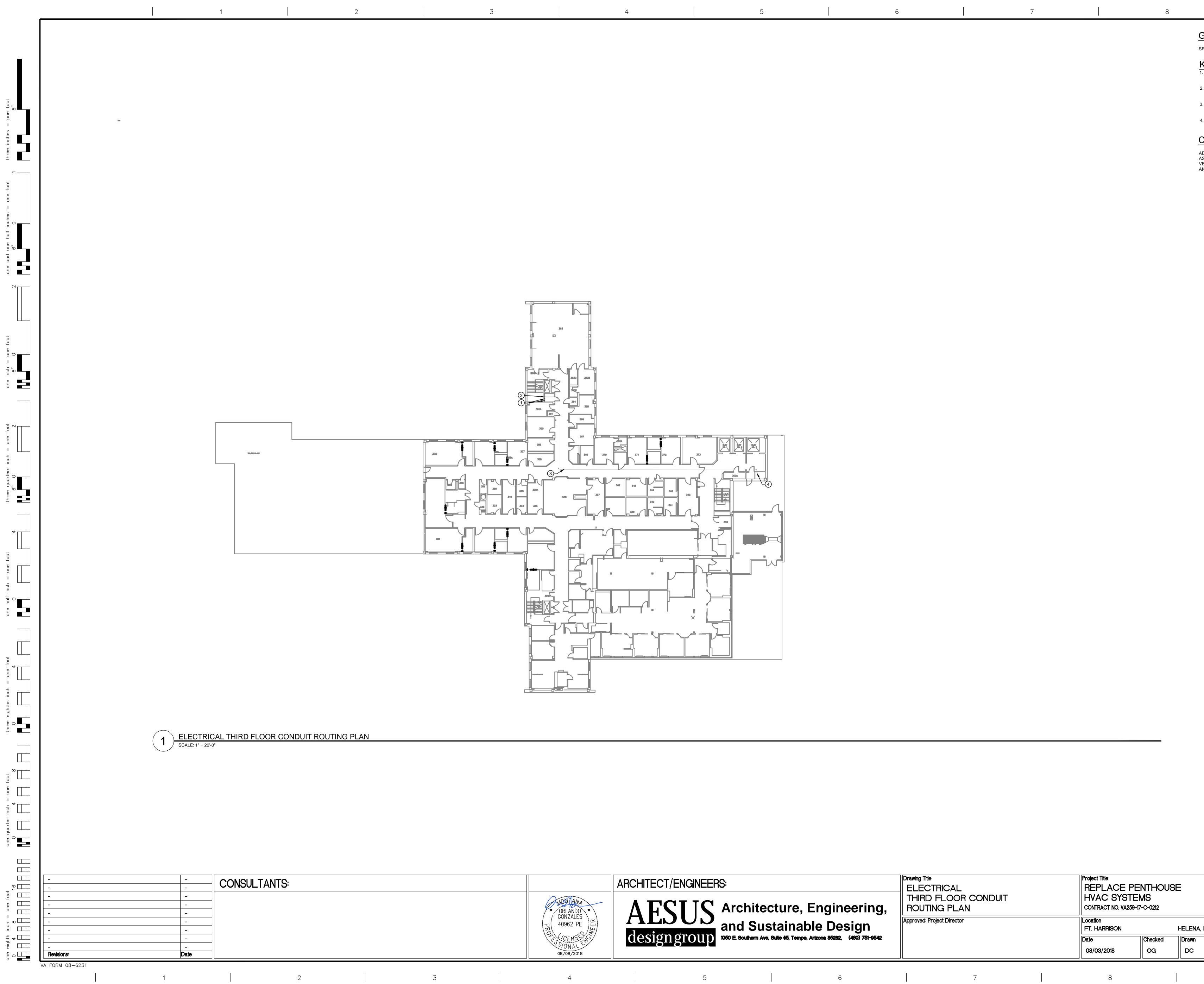
LEVEL.

ADDITIONAL CONDUIT STUBS BETWEEN FLOORS ARE BEING PROVIDED AS PART OF A SEPARATE PROJECT. SPARE CONDUITS MAY EXIST. FIELD VERIFY NUMBER, SIZES AND AVAILABILITY OF SPARE PENETRATIONS AND CONDUIT STUBS BETWEEN FLOORS PRIOR TO BID.

| | CONSULTANTS: | | | | cture, Engineering, | Drawing Title ELECTRICAL SECOND FLOOR CONDUIT ROUTING PLAN Approved: Project Director | | Project Title REPLACE P HVAC SYSTE CONTRACT NO. VA259 Location FT. HARRISON Date | EMS -17-C-0212 Checked | HELENA, MT | Project Number 436-17-102 Building Number 154 Drawing Number E302 | Office Constru and Fac Manage |
|------|--------------|---|------------|---|---------------------|---|--|--|------------------------------|------------|--|--|
| Date | | | 08/08/2018 | | | | | 08/03/2018 | OG | DC | | Vetera |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | | 8 | | | 9 | |

CONDUIT PENETRATION NOTE

| | 'BID SET' |
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| ber | Office of |
| ber | Construction |
| | and Facilities |
| nber | Management |
| 2 | Department of Votorous Affairs |



GENERAL NOTES

SEE SHEET E-002 FOR GENERAL NOTES.

KEY NOTES

4. ROUTE UP IN CHASE AREA TO FOURTH LEVEL.

CONDUIT PENETRATION NOTE

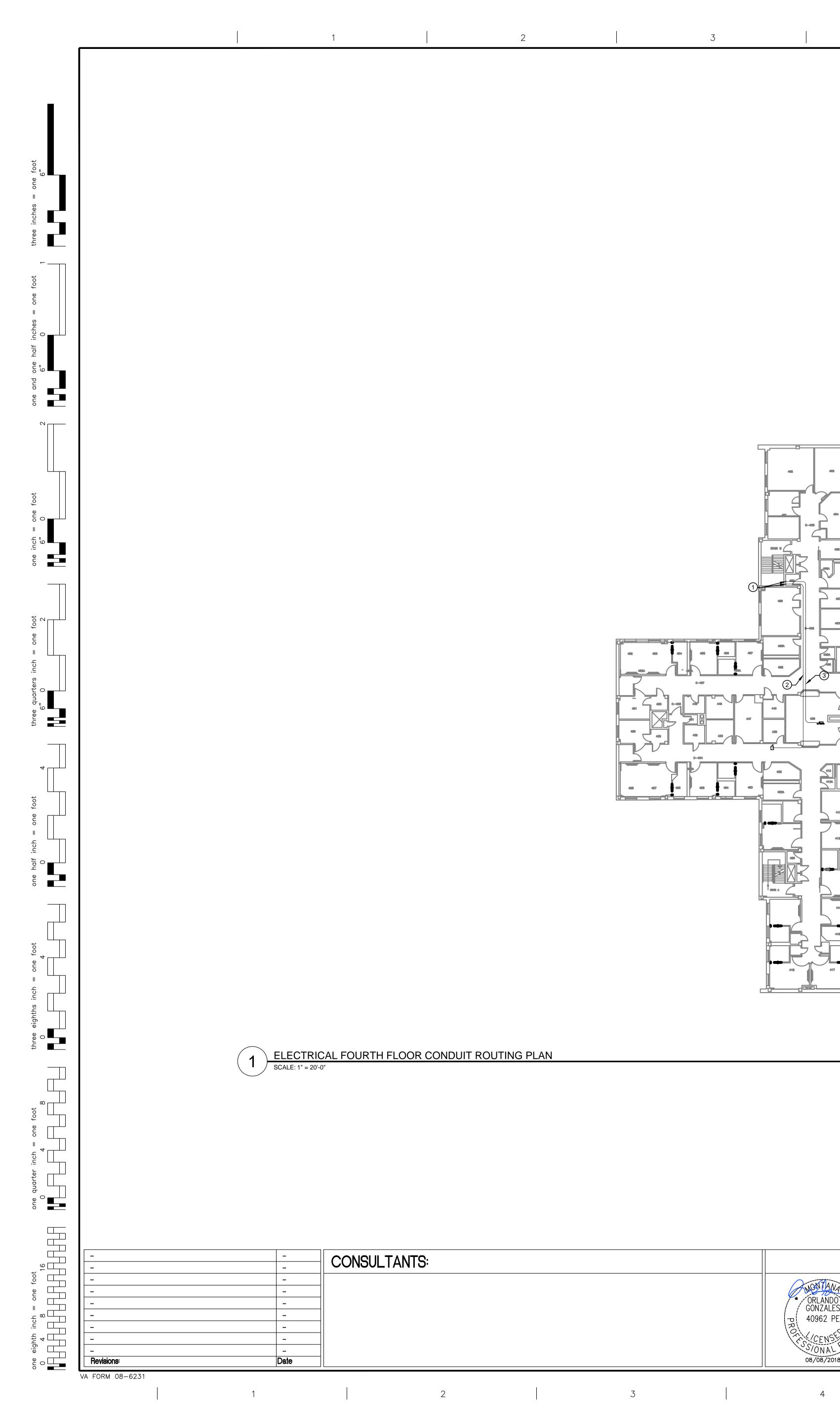
ADDITIONAL CONDUIT STUBS BETWEEN FLOORS ARE BEING PROVIDED AS PART OF A SEPARATE PROJECT. SPARE CONDUITS MAY EXIST. FIELD VERIFY NUMBER, SIZES AND AVAILABILITY OF SPARE PENETRATIONS AND CONDUIT STUBS BETWEEN FLOORS PRIOR TO BID.

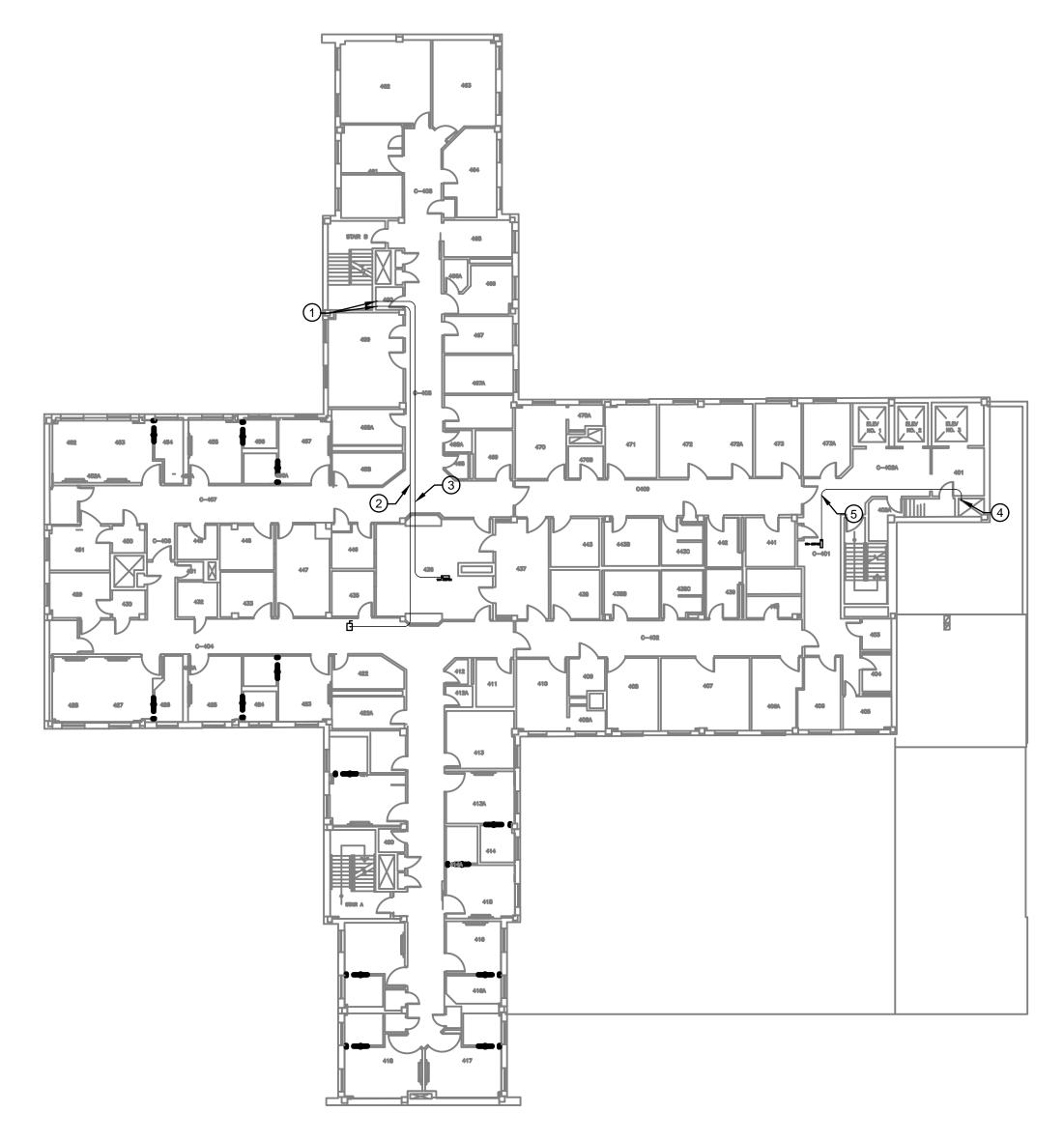
| gineering, | Drawing Title ELECTRICAL THIRD FLOOR CO ROUTING PLAN | HVAC SYST | Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212 | | | | |
|-----------------------------------|---|-----------|--|---------------|---------------------------|----------------|--|
| Design 1 85282, (480) 751-9542 | Approved: Project Director | | Location FT. HARRISON Date 08/03/2018 | Checked OG | HELENA, MT Drawn DC | Drawing Number | |
| 6 | 7 | | | | | 9 | |

 (2) 4" CONDUITS AND CONDUCTORS ROUTED THROUGH MOP ROOM, FROM BASEMENT TO FOURTH LEVEL. (1) 4" CONDUIT AND CONDUCTORS ROUTED THROUGH MOP ROOM FROM BASEMENT LEVEL TO THIS LEVEL.

3. ROUTE CONDUIT FROM MOP ROOM THROUGH CORRIDORS TO UTILITY CHASE ACROSS FROM ELEVATOR BANK.

| | 'BID SET' | | | | | | |
|-----|-----------------------------------|--|--|--|--|--|--|
| er | Office of | | | | | | |
| er | Construction and Facilities | | | | | | |
| Der | Management | | | | | | |
| 3 | Department of Veterans Affairs | | | | | | |







AESUS Architecture, Engi and Sustainable L designgroup 1050 E. Bouthern Ave, Suite #5, Tempe, Arizona 852

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GENERAL NOTES

SEE SHEET E-002 FOR GENERAL NOTES.

KEY NOTES

2. ROUTE 4" CONDUIT AND CONDUCTORS SERVING CHILLER

4. (1) 4" CONDUIT ROUTED THROUGH UTILITY CHASE FROM LEVEL THREE.

| | Drawing Title | Project Title | | | Project Numl 436-17-102 | |
|-------------------------|--------------------------------------|-------------------------------------|---------|-------|----------------------------|--|
| | _ ELECTRICAL FOURTH FLOOR CONDUIT | REPLACE PENTHOUSE | | | | |
| gineering, | ROUTING PLAN | CONTRACT NO. VA259-17-C-0212 | | | | |
| Design | Approved: Project Director | Location FT. HARRISON HELENA, MT | | | Drawing Nun | |
| a 85282, (480) 751-9542 | | Date | Checked | Drawn | ∦ E304 | |
| | | 08/03/2018 | OG | DC | | |
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1. (2) 4" CONDUITS AND CONDUCTORS ROUTED THROUGH MOP ROOM, FROM BASEMENT TO FOURTH LEVEL.

"154-CHLR-05B" THROUGH FOURTH FLOOR CHASE AREA AS INDICATED TO SPACE IMMEDIATELY BELOW CHILLER DISCONNECT AND UP THROUGH ROOF DIRECTLY INTO CHILLER DISCONNECT. SEE SHEET E305 FOR LOCATION OF CHILLER AND CHILLER DISCONNECT.

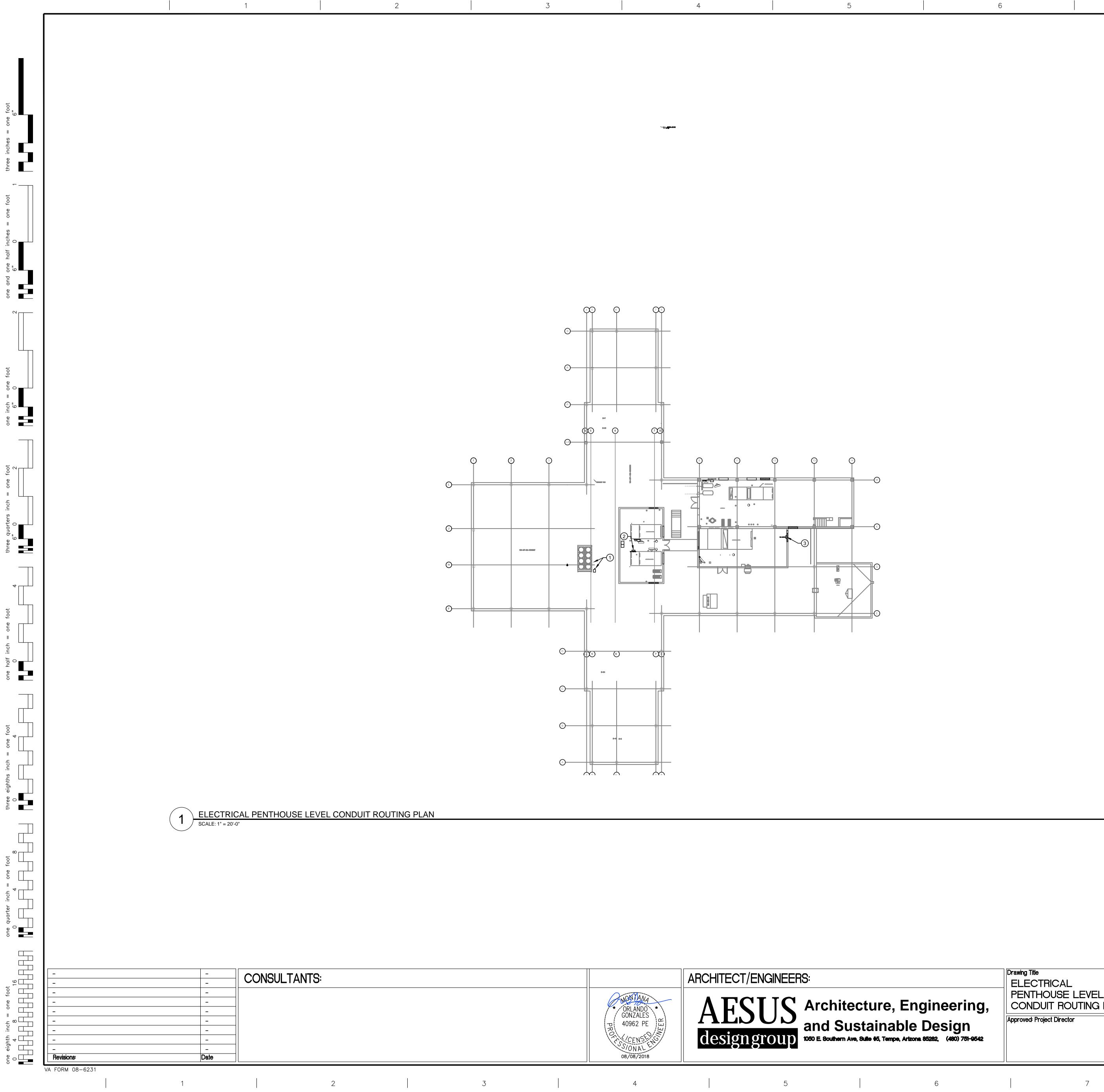
3. ROUTE 4" CONDUIT AND CONDUCTORS SERVING DISTRIBUTION BOARD "154-DBPHN" THROUGH FOURTH FLOOR CHASE AREA AS INDICATED TO SPACE IMMEDIATELY BELOW DISTRIBUTION BOARD AND UP THROUGH PENTHOUSE FLOOR DIRECTLY INTO DISTRIBUTION BOARD. SEE SHEET E305 FOR LOCATION OF DISTRIBUTION BOARD "154-DBPHN"

5. ROUTE 4" CONDUIT AND CONDUCTORS SERVING DISTRIBUTION BOARD "154-DBPHS" THROUGH FOURTH FLOOR CHASE AREA AS INDICATED TO SPACE IMMEDIATELY BELOW DISTRIBUTION BOARD AND UP THROUGH PENTHOUSE FLOOR DIRECTLY INTO DISTRIBUTION BOARD. SEE SHEET E305 FOR LOCATION OF DISTRIBUTION BOARD "154-DBPHS".

CONDUIT PENETRATION NOTE

ADDITIONAL CONDUIT STUBS BETWEEN FLOORS ARE BEING PROVIDED AS PART OF A SEPARATE PROJECT. SPARE CONDUITS MAY EXIST. FIELD VERIFY NUMBER, SIZES AND AVAILABILITY OF SPARE PENETRATIONS AND CONDUIT STUBS BETWEEN FLOORS PRIOR TO BID.

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| 4 | Department of Veterans Affairs | | | | | | |



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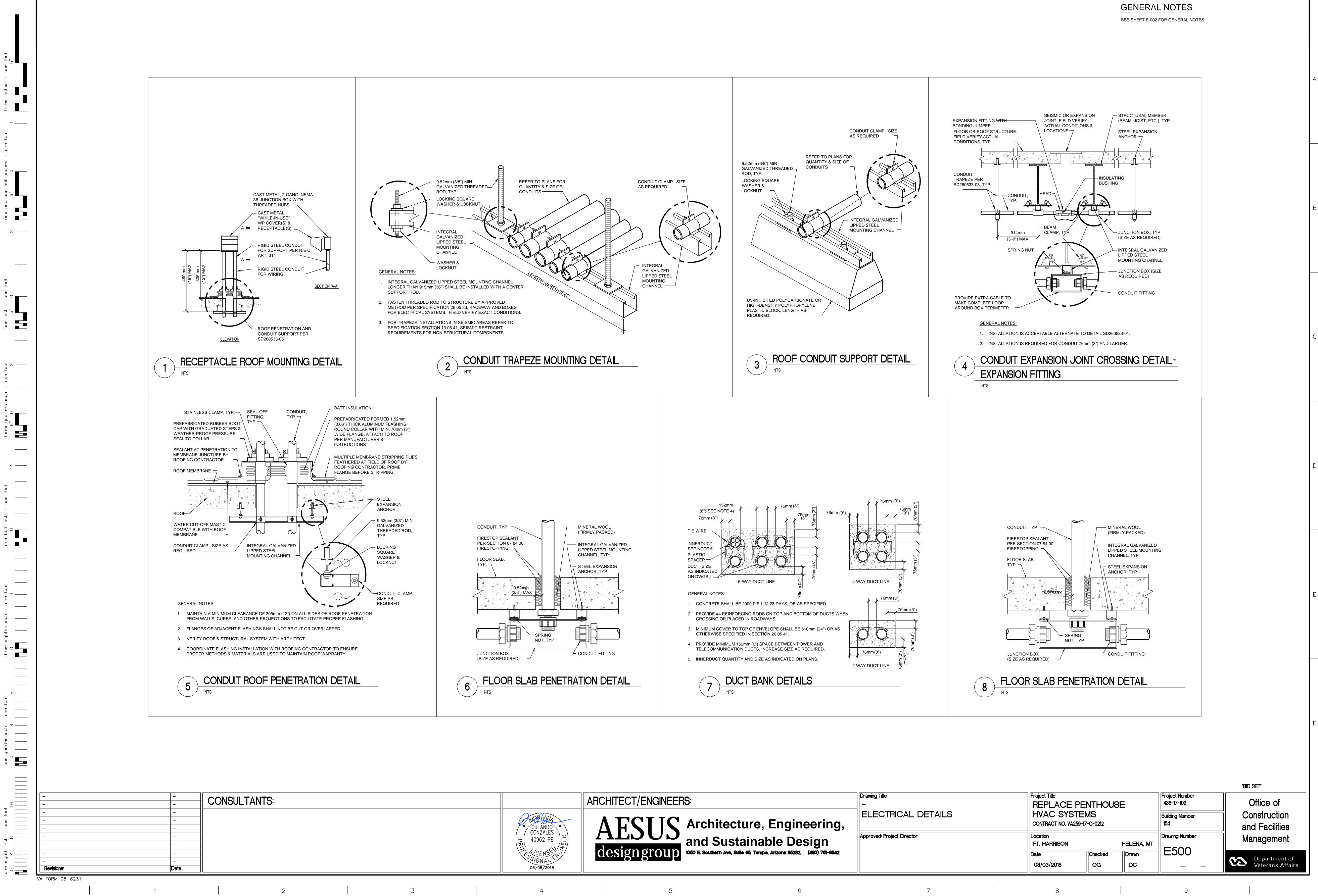
| | Drawing Title ELECTRICAL | Project Title REPLACE I | PENTHOU | SE | Project Number 436-17-102 |
|----------------------|---|------------------------------|---------------|-------------|------------------------------|
| gineering, | PENTHOUSE LEVEL CONDUIT ROUTING PLAN | HVAC SYS CONTRACT NO. VA2 | | | Building Number 154 |
| Design | Approved: Project Director | Location FT. HARRISON | | HELENA, MT | Drawing Number |
| 85282, (480)751-9542 | | Date 08/03/2018 | Checked OG | Drawn DC | E305 |

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R GENERAL NOTES.

154-CHLR-05B" AND CHILLER DISCONNECT. UNIT ROUTED TO AREA DIRECTLY BELOW UNIT THROUGH NEW PENETRATION THROUGH ROOF. ETAILS. UTION BOARD "154-DBPHN". ELECTRICAL FEED TO A DIRECTLY BELOW UNIT UNDER ROOF AND FED TRATION THROUGH ROOF. SEE SHEET E304 FOR UTION BOARD "154-DBPHS". ELECTRICAL FEED TO A DIRECTLY BELOW UNIT UNDER ROOF AND FED TRATION THROUGH ROOF. SEE SHEET E304 FOR

'BID SET' mber Office of Construction nber and Facilities umber Management 5 Department of Veterans Affairs



| E Design HELENA, MT | Drawing Numb |
|--|--------------|
| na 85282, (480) 751-9542 Date Checked Drawn 08/03/2018 OG DC | E500 |



| | <u> </u> | | |
|--|-------------|---------------------------------|---|
| "MCC-3": LOAD REMOVED: S2 RETURN FAN S2 SUPPLY FAN TOTAL LOAD REMOVED | = = = | 93.5 | A @ 208 V., 3Ø. A @ 208 V., 3Ø. A @ 208 V., 3Ø. |
| "154-PEE4": LOAD REMOVED: AC2 TOTAL LOAD REMOVED | = = | | A @ 208 V., 3Ø. A @ 208 V., 3Ø. |
| "154-DEE": LOAD REMOVED: THROUGH "154-PEE4" TOTAL LOAD REMOVED | = = | | A @ 208 V., 3Ø. A @ 208 V., 3Ø. |
| ADDED LOAD: THROUGH "154-PEE4A" TOTAL ADDED LOAD NET ADDED LOAD | = = = | 80.7 | A @ 208 V., 3Ø. A @ 208 V., 3Ø. A @ 208 V., 3Ø. |
| EXISTING LOAD ADDED LOAD TOTAL LOAD | = = = | | A @ 208 V., 3Ø. A @ 208 V., 3Ø. A @ 208 V., 3Ø. |
| "154-GSBD": ADDED LOAD: THROUGH "154-DEE" TOTAL ADDED LOAD | = = | | A @ 208 V., 3Ø. A @ 208 V., 3Ø. |
| EXISTING LOAD ADDED LOAD TOTAL LOAD | = = = | 50.4 | A @ 208 V., 3Ø. A @ 208 V., 3Ø. A @ 208 V., 3Ø. |
| "154-MSBD": LOADS REMOVED: THROUGH "MCC3" TOTAL LOAD REMOVED | = = | 123.8 123.8 | A @ 208 V., 3Ø. A @ 208 V., 3Ø. |
| NET ADDED LOADS: THROUGH "154-DBPHS" THROUGH "154-DEE" TOTAL ADDED LOAD NET ADDED LOAD | = = = | 255.9 50.4 306.3 182.5 | A @ 208 V., 3Ø. A @ 208 V., 3Ø. |
| EXISTING LOAD ADDED LOAD TOTAL LOAD | = = = | | A @ 208 V., 3Ø. A @ 208 V., 3Ø. A @ 208 V., 3Ø. |

FROM SOURCE

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NOTES:

EXISTING LOADS SHOWN ABOVE PER LOAD TESTS ON RESPECTIVE DISTRIBUTION GEAR. SEE SHEETS ED-600 AND ED-601 FOR LOAD TEST REQUIREMENTS.

LIGHTING IN OUTBOARD PENTHOUSE SERVED THROUGH PANEL "154-PEE2", CIRCUIT #8. LIGHTING LOAD REMOVED FROM THIS DISCONNECT DURING DEMO PHASE IS 256 WATTS. LIGHTING ADDED TO THIS DISCONNECT DURING NEW CONSTRUCTION PHASE IS 252 WATTS. NET LOAD REDUCTION OF 4 WATTS RESULTS FROM THIS PORTION OF THE LIGHITNG PROJECT.

LIGHTING IN MAIN PENTHOUSE IS SERVED THROUGH "154-PEE2", CIRCUIT #7. LIGHTING REMOVED DURING DEMO PHASE IS 956 WATTS. LIGHITNG ADDED TO THIS CIRCUIT BREAKER DURING NEW CONSTRUCTION PHASE IS 680 WATTS.NET LOAD REDUCTION OF 276 WATTS RESULTS FROM THIS PORTION OF THE LIGHTING PROJECT.

"154-CHP-1 PUMP AND "154-CHP-2" PUMP ARE NON-SIMULTANEOUS.

"154-HWP-1 PUMP AND "154-HWP-2" PUMP ARE

NON-SIMULTANEOUS.

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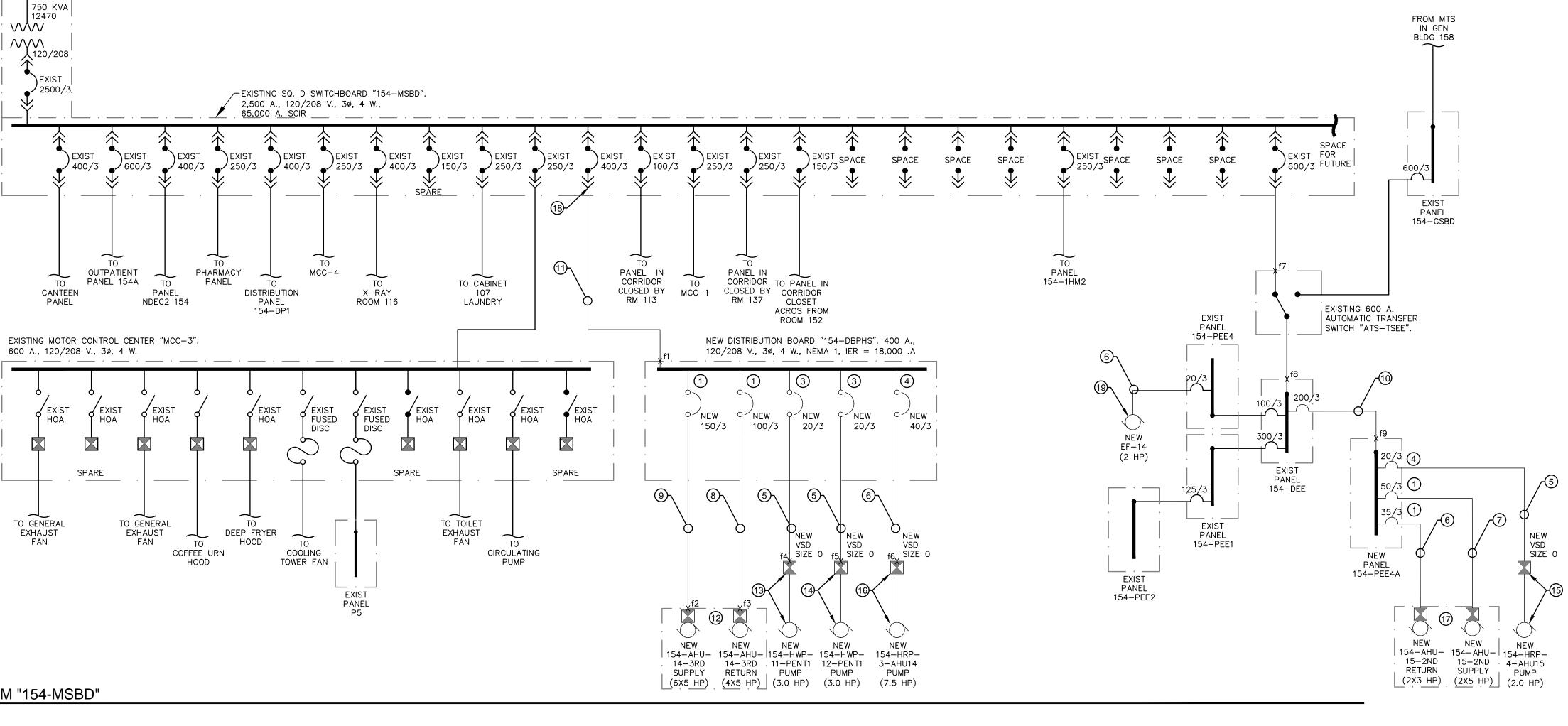
ELECTRICAL NEW ONE-LINE DIAGRAM "154-MSBD" SCALE: NOT TO SCALE CONSULTANTS:



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| | | | EL-L | | | CURRENT CONDUCTORS PER PHASE | | | | TRANSFORMER | | ER | |
|----------------|-------------------------|--------------------------------------|------|------------------|-----|------------------------------------|-------|--------------------------------------|-------------------|---|-----|-----------|--------------------------|
| FAULT POINT | EQUIPMENT | SHORT CURRENT AT BEGINNING OF RUN | | LENGTH OF RUN | NO. | SIZE | "C" | f= <mark>Ух L х I</mark> ш С х Ец | $M=\frac{1}{1+f}$ | f= <u>Isc. рв. х Vра х 7 х Z%</u> 100,000 х KVA пола | KVA | Z% | SHORT CIRCUIT CURRENT |
| AFC | "154-MSBD" | _ | - | - | _ | _ | - | - | _ | - | - | - | 22,805 A. |
| f1 | "154-DBPHS" | 22,805 | 208 | 310 | 1 | 600 | 28033 | 1.212 | 0.452 | - | _ | - | 7,356 A |
| f2 | "154-AHU-14-3RD-SUPPLY" | 7,356 | 208 | 52 | 1 | 2/0 | 11423 | 0.391 | 0.719 | - | _ | - | 5,752 A. |
| f3 | "154-AHU-14-3RD-RETURN" | 7,356 | 208 | 54 | 1 | 1 | 7493 | 0.619 | 0.618 | - | - | - | 5,103 A. |
| f4 | "154-HWP-11-PENT1" | 7,356 | 208 | 39 | 1 | 10 | 981 | 3.414 | 0.227 | - | - | - | 2,141 A. |
| f5 | "154-HWP-12-PENT1" | 7,356 | 208 | 41 | 1 | 10 | 981 | 3.589 | 0.218 | - | _ | - | 2,066 A. |
| f6 | "154-HRP-3-AHU14 PUMP" | 7,356 | 208 | 43 | 1 | 10 | 981 | 3.764 | 0.210 | _ | _ | - | 1,996 A. |
| f7 | "ATS-TSEE" | 22,805 | 208 | 27 | 2 | 400 | 24296 | 0.106 | 0.905 | - | - | - | 20,628 A. |
| f8 | "154–DEE" | 20,628 | 208 | 25 | 2 | 400 | 24296 | 0.088 | 0.919 | _ | - | - | 18,953 A. |
| f9 | "154-PEE4A" | 18,953 | 208 | 205 | 1 | 300 | 20867 | 1.688 | 0.372 | _ | - | - | 7,675 A. |





ARCHITECT/ENGINEERS:



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 ORLANDO
 GONZALES PR 40962 PE HI 08/08/2018

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GENERAL NOTES

SEE SHEET E-002 FOR GENERAL NOTES.

VOLTAGE DROP NOTE EQUIPMENT FEEDER CONDUCTORS HAVE BEEN SIZED TO MAINTAIN VOLTAGE DROP OF NO MORE THAN 3% TO PROVIDE REASONABLE EFFICIENCY OF OPERATIONS PER N.E.C. 215.2 (A)(4) INFORMATIONAL

NOTE #2.

KEY NOTES

- SERVE NEW AIR HANDLING UNIT.
- SERVE NEW CHILLED WATER PUMP.
- SERVE NEW HOT WATER PUMP.
- SERVE NEW HEAT RECOVERY PUMP.
- 21mm (3/4)") C.
- 27mm (1") C.
- 35mm (1-1/4") C.
- 41mm (1-1/2") C.
- 53mm (2") C.
- 63 mm (2-1/2") C.
- MOTORS. CIRCUIT AS INDICATED.

- INDICATED THROUGH NEW VARIABLE SPEED DRIVE. VARIABLE
- CIRCUIT AS INDICATED.
- CONTINUOUSLY. CIRCUIT AS INDICATED.

| | Drawing Title ELECTRICAL NEW | Project Title REPLACE | PENTHOU | SE | Project Number 436-17-102 |
|-------------------------|---------------------------------------|--|---------------|-------------|------------------------------|
| gineering, | ONE-LINE DIAGRAM "154-MSBD" | HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212 | | | Building Number 154 |
| Design | Approved: Project Director - | Location FT. HARRISON | | HELENA, MT | Drawing Number |
| a 85282, (480) 751-9542 | - VAPAHCS PLANNING AND ENGINEERING | Date 08/03/2018 | Checked OG | Drawn DC | E600 |

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1. PROVIDE NEW CIRCUIT BREAKER, SIZED AS INDICATED TO 2. PROVIDE NEW CIRCUIT BREAKER SIZED AS INDICATED TO 3. PROVIDE NEW CIRCUIT BREAKER SIZED AS INDICATED TO 4. PROVIDE NEW CIRCUIT BREAKER SIZED AS INDICATED TO 5. CONDUCTORS TO BE (3) 10 A.W.G. CU., (1) 10 A.W.G. CU GND., 6. CONDUCTORS TO BE (3) 8 A.W.G. CU., (1)10 A.W.G. CU GND., 7. CONDUCTORS TO BE (3) 4 A.W.G. CU., (1) 10 A.W.G. CU. GND., 8. CONDUCTORS TO BE (3) 1 A.W.G. CU., (1) 6 A.W.G. CU. GND., 9. CONDUCTORS TO BE (3) 1/0 A.W.G. CU., (1) 6 A.W.G. CU. GND., 10. CONDUCTORS TO BE (4) 300 KCMIL CU., (1) 1 A.W.G. CU. GND., 11. CONDUCTORS TO BE (3) 600 KCMIL CU., (1) 3/0 A.W.G. CU. NEUTRAL, (1) 2/0 A.W.G. CU. GND., 104mm (4") C. 12. NEW AIR HANDLING UNIT "154-AHU-14-3RD" WITH INTEGRAL DUAL VFD'S CONTROLLING THE SUPPLY AND RETURN 13. NEW HOT WATER PUMP "154-HWP-11-PENT1. CIRCUIT AS INDICATED THROUGH NEW VARIABLE SPEED DRIVE. VARIABLE SPEED DRIVE PROVIDED BY MECHANICAL, INSTALLED AND CIRCUITED BY ELECTRICAL. CIRCUIT AS INDICATED.

14. NEW HOT WATER PUMP "154-HWP-12-PENT1. CIRCUIT AS INDICATED THROUGH NEW VARIABLE SPEED DRIVE. VARIABLE SPEED DRIVE PROVIDED BY MECHANICAL, INSTALLED AND CIRCUITED BY ELECTRICAL. CIRCUIT AS INDICATED.

15. NEW HEAT RECOVERY PUMP "154-HRP-4-AHU15. CIRCUIT AS INDICATED THROUGH NEW VARIABLE SPEED DRIVE. VARIABLE SPEED DRIVE PROVIDED BY MECHANICAL, INSTALLED AND CIRCUITED BY ELECTRICAL. CIRCUIT AS INDICATED. 16. NEW HEAT RECOVERY PUMP "154-HRP-3-AHU14. CIRCUIT AS

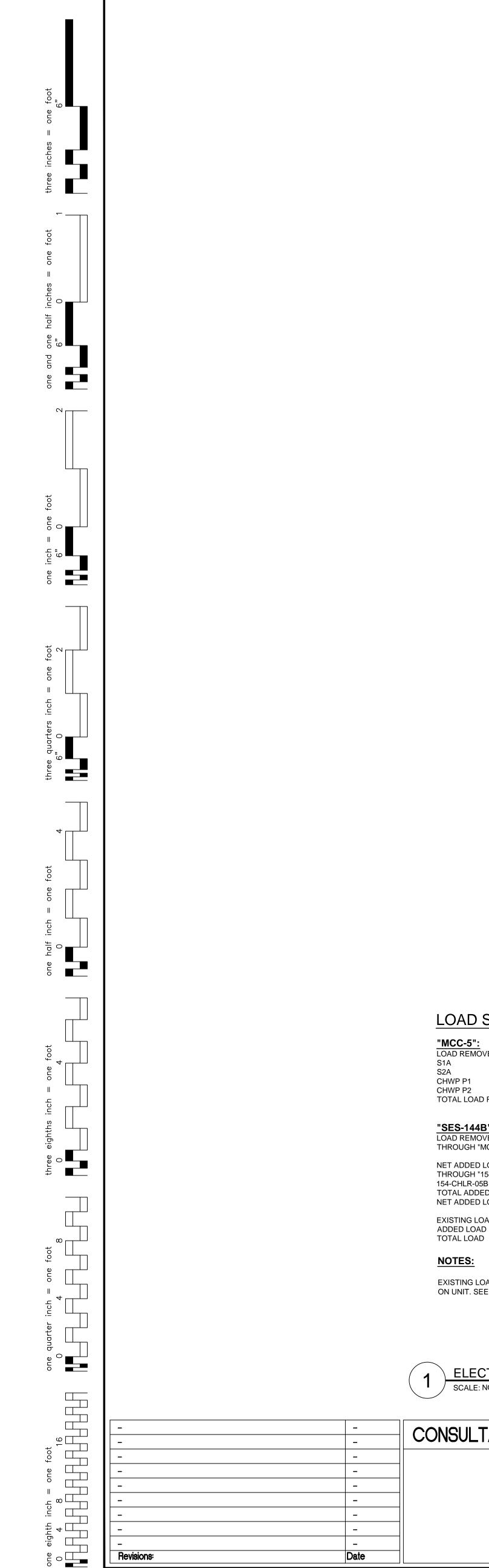
SPEED DRIVE PROVIDED BY MECHANICAL, INSTALLED AND CIRCUITED BY ELECTRICAL. CIRCUIT AS INDICATED. 17. NEW AIR HANDLING UNIT "154-AHU-15-2ND" WITH INTEGRAL DUAL VFD'S SERVING THE SUPPLYAND RETURN MOTORS.

18. EXISTING SPARE 400 AMPERE, 3 POLE CIRCUIT BREAKER TO BE USED TO SERVE NEW DISTRIBUTION BOARD "154-DBPHS". EXERCISE UNIT AND VERIFY IN GOOD WORKING ORDER. COORDINATE WITH OWNER FOR SCHEDULING. 19. NEW EXHAUST FAN EF-14. EXHAUST FAN TO RUN

> 'BID SET' nber mber *Imber*)()

Office of Construction and Facilities Management

Department of Veterans Affairs



LOAD SUMMARY:

| 'MCC-5": | | | |
|-------------------|---|---------|---------------------------------|
| OAD REMOVED: | | | |
| 51A | = | 49.1 | A @ 208 V., 3Ø. |
| 52A | = | 49.1 | A @ 208 V., 3Ø. |
| CHWP P1 | = | 30.3 | A @ 208 V., 3Ø. |
| CHWP P2 | = | 30.3 | A @ 208 V., 3Ø. |
| OTAL LOAD REMOVED | = | | A @ 208 V., 3Ø. |
| | | | |
| | | | |
| 'SES-144B": | | | |
| OAD REMOVED: | | | |
| THROUGH "MCC-5" | = | 158.8 | A @ 208 V., 3Ø. |
| NET ADDED LOADS: | | | |
| | = | 246 7 | A @ 208 V., 3Ø. |
| | | - | |
| | = | | A @ 208 V., 3Ø. |
| | = | | A @ 208 V., 3Ø. |
| IET ADDED LOAD | = | 531.9 | |
| EXISTING LOAD | = | 1 060 0 | A @ 208 V., 3Ø. |
| ADDED LOAD | = | | A @ 208 V., 3Ø. |
| | _ | 551.9 | $\pi \cong 200 \text{ V.}, 50.$ |

NOTES:

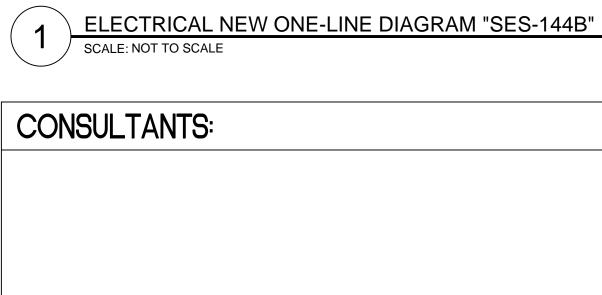
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Date

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EXISTING LOADS SHOWN ABOVE FOR "SES-144B" PER LOAD TEST ON UNIT. SEE SHEET ED-601 FOR LOAD TEST REQUIREMENTS.

= 1,591.9 A @ 208 V., 3Ø.



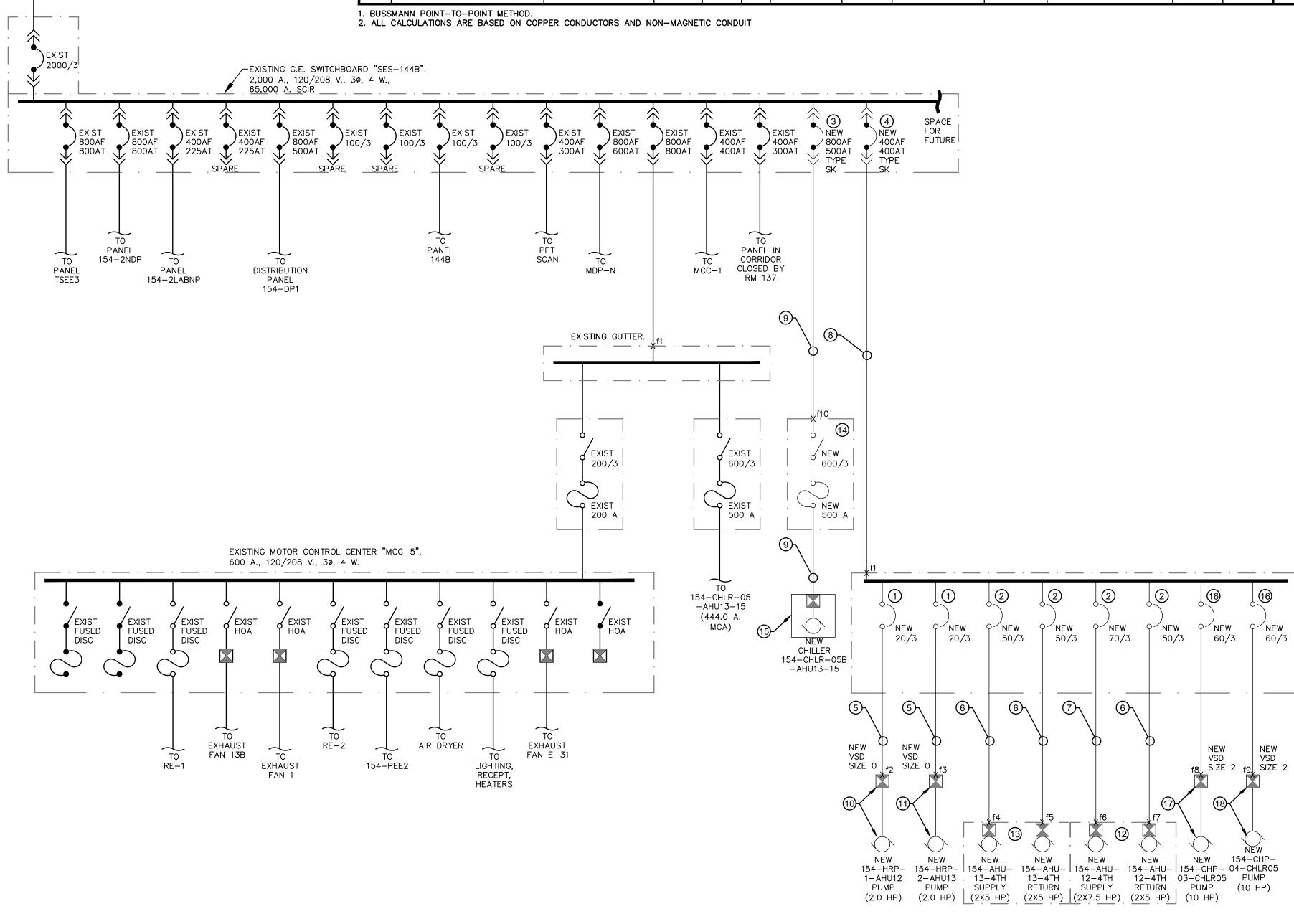
VA FORM 08-623

Revisions:

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| | | lu. | EL-L | L | | CONDUCTO PER PHAS | | | | TRANSFORMER | | | Isc. |
|----------------|------------------------------|--------------------------------------|-----------------|------------------|---|----------------------|-------|-------------------|-------------------|---|-----|-----------|--------------------------|
| FAULT POINT | EQUIPMENT | SHORT CURRENT AT BEGINNING OF RUN | LINE VOLTAGE | LENGTH OF RUN | | SIZE | "C" | f= <mark> </mark> | $M=\frac{1}{1+f}$ | f= <u>I sc. pr. x Vpr. x 3 x Z%</u> 100,000 x KVA maas | KVA | Z% | SHORT CIRCUIT CURRENT |
| AFC | "SES-144B" | - | - | - | - | _ | - | - | - | - | - | - | 26,752 A. |
| f1 | "154–DBPHN" | 26,752 | 208 | 150 | 1 | 600 | 28033 | 0.626 | 0.615 | - | - | - | 12,204 A. |
| f2 | "154-HRP-1-AHU12 PUMP" | 12,204 | 208 | 30 | 1 | 10 | 981 | 3.837 | 0.207 | - | _ | - | 2,971 A. |
| f3 | "154-HRP-2-AHU13 PUMP" | 12,204 | 208 | 30 | 1 | 10 | 981 | 3.837 | 0.207 | - | _ | - | 2,971 A. |
| f4 | "154-HRP-12-4TH SUPPLY" | 12,204 | 208 | 15 | 1 | 2 | 6044 | 0.311 | 0.763 | - | _ | - | 9,746 A. |
| f5 | "154-HRP-12-4TH RETURN" | 12,204 | 208 | 17 | 1 | 4 | 3825 | 0.558 | 0.642 | - | _ | - | 8,407 A. |
| f6 | "154-HRP-13-4TH SUPPLY" | 12,204 | 208 | 15 | 1 | 2 | 6044 | 0.311 | 0.763 | - | _ | - | 9,746 A. |
| f7 | "154-HRP-13-4TH RETURN" | 12,204 | 208 | 17 | 1 | 4 | 3825 | 0.558 | 0.642 | - | - | - | 8,407 A. |
| f8 | "154-CHWP-03-CHLR05" | 12,204 | 208 | 35 | 1 | 4 | 3825 | 0.930 | 0.518 | - | _ | - | 6,322 A. |
| f9 | "154-CHP-04-CHLR05" | 12,204 | 208 | 37 | 1 | 4 | 3825 | 0.983 | 0.504 | - | _ | - | 6,151 A. |
| f10 | "154–CHLR–05B–AHU13–15" DISC | 26,752 | 208 | 220 | 2 | 250 | 18593 | 2.636 | 0.275 | _ | _ | _ | 7,358 A. |



ARCHITECT/ENGINEERS: ORLANDO
 GONZALES AESUS Architecture, Eng designgroup and Sustainable 1 1050 E. Southern Ave, Suite 45, Tempe, Arizona 84 PR 40962 PE HI 08/08/2018 2 3 4 6 5

GENERAL NOTES

SEE SHEET E-002 FOR GENERAL NOTES.

VOLTAGE DROP NOTE

EQUIPMENT FEEDER CONDUCTORS HAVE BEEN SIZED TO MAINTAIN VOLTAGE DROP OF NO MORE THAN 3% TO PROVIDE REASONABLE EFFICIENCY OF OPERATIONS PER N.E.C. 215.2 (A)(4) INFORMATIONAL NOTE #2.

| | Drawing Title ELECTRICAL NEW | Project Title | PENTHOUS | 6E | Project Numk 436-17-102 |
|--------------------------|---------------------------------|------------------------------|---------------|-------------|----------------------------|
| gineering, | ONE-LINE DIAGRAM "SES-144B" | HVAC SYS CONTRACT NO. VA2 | | | Building Numk 154 |
| Design | Approved: Project Director | Location FT. HARRISON | | HELENA, MT | Drawing Num |
| na 85282, (480) 751-9542 | | Date 08/03/2018 | Checked OG | Drawn DC | E601 |

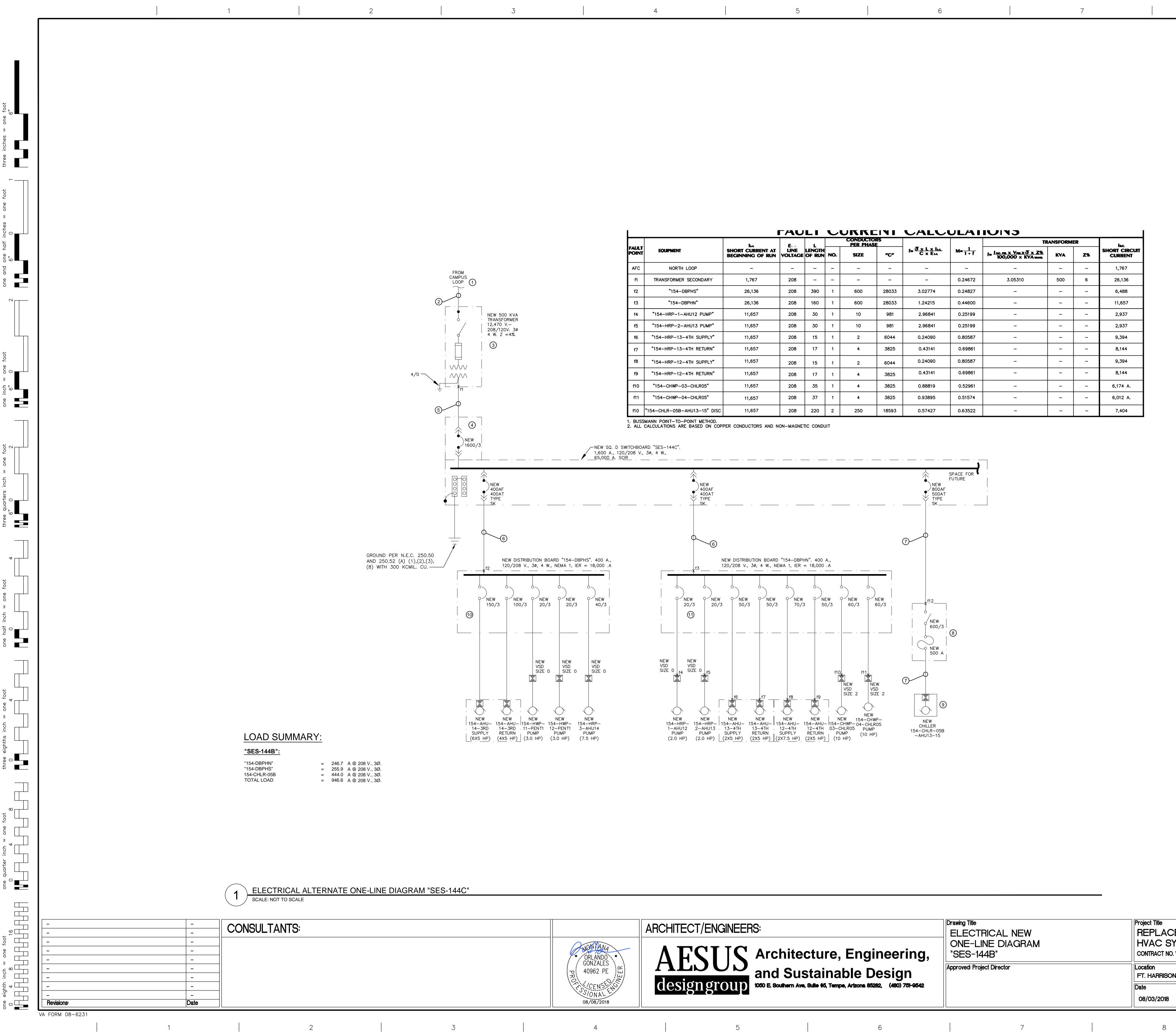
| KEY | NO | FES | (#) |
|-----|----|------------|-----|
| | | | |

- 1. PROVIDE NEW CIRCUIT NEW HEAT RECOVERY
- 2. PROVIDE NEW CIRCUIT F NEW AIR HANDLING UNI
- 3. PROVIDE NEW CIRCUIT E NEW CHILLER.
- 4. PROVIDE NEW CIRCUIT I NEW DISTRIBUTION BOA
- 5. CONDUCTORS TO BE (3) 21mm (3/4)") C.
- 6. CONDUCTORS TO BE (3) 35mm (1-1/4") C.
- 7. CONDUCTORS TO BE (3) 41mm (1-1/2") C.
- 8. CONDUCTORS TO BE (3) NEUTRAL, (1) 2/0 A.W.G.
- 9. CONDUCTORS TO BE 2 S 1/0 A.W.G. CU. GND., IN (1 10. NEW HEAT RECOVERY F
- INDICATED THROUGH N SPEED DRIVE PROVIDED CIRCUITED BY ELECTRIC
- 11. NEW HEAT RECOVERY F INDICATED THROUGH N SPEED DRIVE PROVIDED CIRCUITED BY ELECTRIC
- 12. NEW AIR HANDLING UNIT DUAL VFD'S CONTOLLING CIRCUIT AS INDICATED.
- 13. NEW AIR HANDLING UNIT DUAL VFD'S CONTOLLING CIRCUIT AS INDICATED.
- 14. PROVIDE NEW WEATHER FUSES SIZED PER MANU SERVE NEW CHILLER. PI REQUIRED. MAINTAIN N.E UNIT.
- 15. NEW CHILLER "154-CHLR INTEGRAL VSD. CIRCUIT
- 16. PROVIDE NEW CIRCUIT E SERVE NEW CHILLED WA
- AS INDICATED THROUGH VARIABLE SPEED DRIVE INSTALLED AND CIRCUIT INDICATED.
- 18. NEW CHILLED WATER PL AS INDICATED THROUGH VARIABLE SPEED DRIVE INSTALLED AND CIRCUIT INDICATED.

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8

| 2. | - | NEW CIRCUIT BREAKER AS INDI HANDLING UNIT. | CATED TO SERVE | C |
|------|-----------------------|---|---|---|
| 3. | PROVIDE NEW CHIL | NEW CIRCUIT BREAKER AS INDI LER. | CATED TO SERVE | |
| 4. | | NEW CIRCUIT BREAKER AS INDI RIBUTION BOARD "154-DBPHN" | CATED TO SERVE | |
| 5. | CONDUCT 21mm (3/4 | TORS TO BE (3) 10 A.W.G. CU., (1)") C. |) 10 A.W.G. CU GND., | |
| 6. | CONDUCT 35mm (1-1 | ORS TO BE (3) 6 A.W.G. CU., (1) /4") C. | 10 A.W.G. CU. GND., | |
| 7. | CONDUCT 41mm (1-1 | ORS TO BE (3) 4 A.W.G. CU., (1) /2") C. | 8 A.W.G. CU. GND., | |
| 8. | | ORS TO BE (3) 600 KCMIL CU., ((1) 2/0 A.W.G. CU. GND., 104mm | | |
| 9. | | ORS TO BE 2 SETS OF (3) 300 K CU. GND., IN (1) 103mm (4") C. | CMIL XHHW-2 CU., (1) | |
| 10. | INDICATEI SPEED DF | T RECOVERY PUMP "154-HRP-1- D THROUGH NEW VARIABLE SPE RIVE PROVIDED BY MECHANICAI D BY ELECTRICAL. CIRCUIT AS I | EED DRIVE. VARIABLE _, INSTALLED AND | D |
| 11. | INDICATEI SPEED DF | T RECOVERY PUMP "154-HRP-2- D THROUGH NEW VARIABLE SPE RIVE PROVIDED BY MECHANICAI D BY ELECTRICAL. CIRCUIT AS I | EED DRIVE. VARIABLE _, INSTALLED AND | |
| 12. | DUAL VFD | HANDLING UNIT "154-AHU-12-4TH 'S CONTOLLING THE SUPPLY AN IS INDICATED. | | |
| 13. | DUAL VFD | HANDLING UNIT "154-AHU-13-4TH 'S CONTOLLING THE SUPPLY AN \S INDICATED. | - | |
| 14. | FUSES SIZ | NEW WEATHERPROOF DISCONI ZED PER MANUFACTURERS SPE EW CHILLER. PROVIDE SUPPOR D. MAINTAIN N.E.C. REQUIRED C | CIFICATIONS TO FING MEANS AS | |
| 15. | | LER "154-CHLR-05B-AHU13-15", . VSD. CIRCUIT AS INDICATED. | PROVIDED WITH | |
| 16. | | NEW CIRCUIT BREAKER SIZED A W CHILLED WATER PUMP. | AS INDICATED TO | E |
| 17. | AS INDICA VARIABLE | LED WATER PUMP "154-CHWP-0 TED THROUGH NEW VARIABLE SPEED DRIVE PROVIDED BY MI D AND CIRCUITED BY ELECTRIC D. | SPEED DRIVE. ECHANICAL, | |
| 18. | AS INDICA VARIABLE | LED WATER PUMP "154-CHWP-0 TED THROUGH NEW VARIABLE SPEED DRIVE PROVIDED BY MI D AND CIRCUITED BY ELECTRIC D. | SPEED DRIVE. ECHANICAL, | |
| | | | | F |
| | | | 'BID SET' | |
| | | Project Number 436-17-102 | Office of | |
| | | Building Number | Construction | |
| | | 154 Drawing Number | and Facilities | |
| ELE | NA, MT | | Management | |
| Draw | | E601 | Department of | |
| DC | ; | | Veterans Affairs | |



GENERAL NOTE

SEE SHEET E-002 FOR GENERAL

VOLTAGE DROF

EQUIPMENT FEEDER CONDUCT DROP OF NO MORE THAN 3% TO OPERATIONS PER N.E.C. 215.2 (/

ALTERNATE SER

PROVIDE LINE ITEM TO BID FOR THE TRANSFORMER SECONDAR "SES-144C". THIS EQUIPMENT SH DETERMINED THAT EXISTING SE "154-MSBD" DO NOT HAVE SPARE ADDED LOADS. BID SHALL INCLU CONDUCTORS, TRENCHING, CON ENSURE A FULLY FUNCTIONAL ENGINEER AND THE AHJ.

THE FOLLOWING PROJECT SPEC THIS PROJECT AND APPLY TO T 26 05 13 MEDIUM VOLTAGE 26 05 26 GROUNDING AND B 26 05 41 UNDERGROUND EL 26 12 19 PAD MOUNTED, LIG 26 24 13 DISTRIBUTION SWIT

KEY NOTES (#)

- 1. TIE INTO EXISTING MEDIUM
- 2. CONDUCTORS TO BE (3) 1/0 5"C.
- 3. PROVIDE NEW TRANSFORM LOCATION.
- 4. PROVIDE NEW DISTRIBUTION LOCATION.
- 5. CONDUCTORS TO BE (5 SET (1) 300 KCMIL CU. GND., EACH
- 6. CONDUCTORS TO BE (3) 600 A.W.G. CU. GND., 104mm (4")
- 7. CONDUCTORS TO BE 2 SETS CU. GND., IN (1) 103mm (4") C
- 8. PROVIDE NEW WEATHERPRO SIZED PER MANUFACTURE PROVIDE SUPPORTING MEA CLEARANCES ABOUT UNIT.
- 9. NEW CHILLER "154-CHLR-05E CIRCUIT AS INDICATED. CHIL
- 10. SEE SHEET E600 FOR COND DEVICES SERVED THROUGH
- 11. SEE SHEET E601 FOR COND DEVICES SERVED THROUGH

| gineering, | Drawing Title ELECTRICAL NEW ONE-LINE DIAGRAM "SES-144B" | Project Title REPLACE HVAC SYS CONTRACT NO. VA2 | TEMS | SE | Project Numl 436-17-102 Building Num 154 |
|--------------------------------------|---|--|---------|------------|---|
| Design | Approved: Project Director | Location FT. HARRISON | | HELENA, MT | Drawing Num |
| a 85282, (480) 75 1-95 42 | | Date | Checked | Drawn | ןׂ E60 |
| | | 08/03/2018 | OG | DC | |

| 600 | 28033 | 1.24215 | 0.44600 | - | - | |
|-----|-------|----------------------------------|-----------|---|---|--|
| 10 | 981 | 2.96841 | 0.25199 | - | - | |
| 10 | 981 | 2.96841 | 0.25199 | - | - | |
| 2 | 6044 | 0.24090 | 0.80587 | - | - | |
| 4 | 3825 | 0.43141 | 0.69861 | _ | - | |
| 2 | 6044 | 0.24090 | 0.80587 | - | - | |
| 4 | 3825 | 0.43141 | 0.69861 | - | - | |
| 4 | 3825 | 0.88819 | 0.52961 | _ | - | |
| 4 | 3825 | 0.93895 | 0.51574 | _ | _ | |
| 250 | 18593 | 0.57427 | 0.63522 | - | _ | |
| | | | SPACE FOR | | | |
| | | ● 800AF 500AT TYPE . SK | | | | |

| 9 | |
|---|---|
| ES AL NOTES. | |
| P NOTE TORS HAVE BEEN SIZED TO MAINTAIN VOLTAGE TO PROVIDE REASONABLE EFFICIENCY OF (A)(4) INFORMATIONAL NOTE #2. | А |
| R THE PROVISION OF THE 500 KVA TRANSFORMER, RY DISCONNECT AND DISTRIBUTION BOARD SHALL ONLY BE PROVIDED AND INSTALLED IF IT IS SERVICE ENTRANCE SECTIONS "SES-144B" AND RE POWER AVAILABLE TO ACCOMMODATE THE LUDE ALL APPRUTENANCES (IE: CONDUITS, ONCRETE PADS, VAULTS, ETC) AS REQUIRED TO SYSTEM TO THE SATISFACTION OF THE | |
| ECIFICATION SECTIONS HAVE BEEN ADDED TO THIS ADD/ALT ONLY: E CABLES D BONDING FOR ELECTRICAL SYSTEMS ELECTRICAL CONSTRUCTION IQUID FILLED, MEDIUM-VOLTAGE TRANSFORMERS VITCHBOARDS | В |
| M VOLTAGE NORTH LOOP. 10 MV-105, 15kV, 133%EPR,(1) 1 AWG XHHW GND., MER AS INDICATED. SEE SHEET E301 FOR ON BOARD AS INDICATED. SEE SHEET E300 FOR | |
| ETS) 103mm (4"), WITH (4) 600 KCMIL XHHW-2 CU., ACH. D0 KCMIL CU., (1) 3/0 A.W.G. CU. NEUTRAL, (1) 2/0 ") C., TS OF (3) 300 KCMIL XHHW-2 CU., (1) 1/0 A.W.G. C. ROOF DISCONNECT WITH LPNRKSP FUSES ERS SPECIFICATIONS TO SERVE NEW CHILLER. ANS AS REQUIRED. MAINTAIN N.E.C. REQUIRED 5B-AHU13-15", PROVIDED WITH INTEGRAL VSD. HILLER IS RATED @ 65,000 A. SCIR. | С |
| IDUIT AND CONDUCTOR SIZING FOR ALL GH "154-DBPHS". IDUIT AND CONDUCTOR SIZING FOR ALL GH "154-DBPHN". | |
| | D |

| | 'BID SET' |
|------|-----------------------------------|
| lber | Office of |
| nber | Construction |
| | and Facilities |
| nber | Management |
| 2 | |
| | Department of Veterans Affairs |

| VOLTAGE: 120/240 V., 1ø, 3 W. | | | | | NTIN | TING: SURFACE TYPE: SQUARE D NQ | | |
|--------------------------------------|------|-----------|-----------------|----------|------|---------------------------------|---|--|
| USE and/or AREA SERVED | С/В | CIR NO | LO ØA | AD øB | | С/В | USE AND/OR AREA SERVED | |
| (E) HEAT TRACE CHILLER | 20 | 1 | - | | 2 | 20/1 | (E) RECEPT CHILLER AREA | |
| (E) HEAT TRACE EXT PIPE | 20/1 | 3 | | _ | 4 | 20 | SPARE | |
| (E) CHEMICAL PUMP | 20/1 | 5 | - | | 6 | 20 | SPARE | |
| SPARE | 20/1 | 7 | | - | | 20/1 | SPARE | |
| SPACE | - | 9 | - | | 10 | _ | SPACE | |
| SPACE | - | 11 | | - | 12 | - | SPACE | |
| SPACE | - | 13 | | | 14 | - | SPACE | |
| SPACE | - | 15 | | - | 16 | - | SPACE | |
| SPACE | - | 17 | - | | 18 | - | SPACE | |
| SPACE | - | 19 | | - | 20 | | SPACE | |
| SPACE | - | 21 | - | | 22 | - | SPACE | |
| SPACE | - | 23 | | - | 24 | - | SPACE | |
| SPACE | - | 25 | - | | 26 | - | SPACE | |
| SPACE | - | 27 | | - | 28 | _ | SPACE | |
| SPACE | - | 29 | - | | 30 | - | SPACE | |
| TOTAL LOAD PER PHAS | E: | | _ | _ | | - | • VA ÷ 120V = - AMPS | |
| * LOAD AT 125% PER N.E.C. | | - | _ | O PROV | /IDE | MECH | N C.B.'S \triangle NEW C.B.'S IANICAL INTERLOCK PER N.E.C. 210.4(F | |

| NEW PANELBOARD SCHEDU VOLTAGE: 120/208 V., 3ø, 4 W. | M | | S: 225 / | 4. M.L.O. | MOU | NTIN | lG: | SURFACE TYPE: GE AQ OR EQUA |
|---|------|-----|-----------------|--------------|--------------|-----------|------|------------------------------------|
| USE and/or AREA SERVED | С/В | CIR | ØA | LOAD ØB | ØC | CIR NO | С/В | USE and/or AREA SERVED |
| SPARE | 20 | 1 | | - | | | 20 | CONTROLS 154-AHU-15-2ND |
| SPARE | 20 | 3 | | | | 4 | 20 | SPARE |
| SPARE | 20 | 5 | | | _ | 6 | 20 | SPARE |
| SPARE | 20 | 7 | - | - | | | 20/1 | SPARE |
| SPARE | 20 | 9 | | | | | 20/1 | SPARE |
| SPARE | 20 | 11 | | | - | | 20 | SPARE |
| SPARE | 20 | 13 | |] | | | 20 | SPARE |
| SPARE | 20/1 | 15 | | | | | 20 | SPARE |
| SPARE | 20/1 | 17 | | | _ | | 20 | SPARE |
| SPARE | 20/1 | 19 | |] | | | 20 | SPARE |
| SPACE | - | 21 | | | | 22 | - | SPACE |
| SPACE | - | 23 | | | - | 24 | - | SPACE |
| SPACE | - | 25 | |] | | 26 | - | SPACE |
| SPACE | - | 27 | | | | 28 | - | SPACE |
| SPACE | - | 29 | | L | - | 30 | - | SPACE |
| | 20 | 31 | 1128 |] | | 32 | - | SPACE |
| 154-HRP-4-AHU15 | | 33 | | 1128 | | 34 | - | SPACE |
| PUMP | 3 | 35 | | | 1128 | 36 | - | SPACE |
| 154-AHU-15-2ND | 70 | 37 | 5010 3180 | | | 38 | 50 | 154-AHU-15-2ND |
| SUPPLY FANS | | 39 | 0100 | 5010 3180 | | 40 | | RETURN FANS |
| (2 X 5.0 HP, EACH) | 2 | 41 | | | 5010 3180 | | 3 | (2 X 3.0 HP, EACH) |
| TOTAL LOAD PER PHAS | | | 9678 | 9318 | 9318 | | | 0 VA ÷120V = 80.7 AMPS |
| ₩ LOAD AT 125% PER N.E.C. | | (| ⊃тоск с | DN/OFF DE | VICES ON | L C.B. | s | |

SCALE: NOT TO SCALE

| - | - | |
|------------|------|--|
| | - | |
| - | - | |
| - | _ | |
| _ | - | |
| - | - | |
| - | - | |
| Revisions: | Date | |



| VOLTAGE: 120/208 V., 3ø, 4 W. | | NS: 125 A | | MOU | NTIN | G: s | URFACE | TYPE: (| S.E. TYPE | Α |
|--------------------------------------|------|------------------|------------|-----|-----------|-------------|--------|-------------|-----------|-----|
| USE and/or AREA SERVED | C/B | R ØA | LOAD ØB | ØC | CIR NO | с/в | USE A | nd/or Af | REA SE | RVE |
| EXIST AC2 LTG, FIRE DAMPERS | 20 1 | - | - | • | 2 | 20/1 | | SPA | RE | |
| SPARE | 2013 | | _ | } | | 20/1 | EXIST | RECEPT B | ELOW PAN | NEL |
| EXIST RECEPT RADIO, FIRE DAMPER | 20 5 | | L | | <u> </u> | 20 | | | | |
| (1) REPLACEMENT LTG PENTHOUSE | 20 7 | 880 396 |] | | 8 | | | EMENT LTG, | | |
| EXIST FIRE DAMPER AC-2 | 20 9 | | - |] | | / 3 | 0 | UTBOARD F | ENTHOUS | Е (|
| EXIST LTG ABOVE ELEV CONTROLS | 20 1 | | L | - | | 20/1 | EXIS | T ELEV FIRE | E SERVICE | - |
| LOAD REMOVED (PER PHASE): | | 1412 | - | - | | 1412 | 2 VA÷ | 120V = | 11.7 A | MPS |
| ADDED LOAD (PER PHAS | 1276 | - | - | | 127 | 6 VA÷ | 120V = | 10.6 A | MPS | |
| NET LOAD REDUCTION | : | 136 | _ | _ | | 136 | VA÷ | 120V = | 1.1 A | MPS |

Ӿ LOAD AT 125% PER N.E.C.



PANELBOARD SCHEDULE "154-PEE2" SCALE: NOT TO SCALE 2

| NEW DIST. BOARD SCHEDU VOLTAGE: 120/208 V., 3ø, 4 W. | MAINS: 40 | 0 A. M.L.O. | MOUN | TING: S | SURFACE TYPE: SQUARE D NQ |
|--|--|----------------|-------|---|--|
| USE and/or AREA SERVED | | LOAD ØB | ØC I | CIR NO С/В | USE and/or AREA SERVED |
| 154–AHU–14–3RD RETURN | 100/1 1002 3 5 3 | 0 | 10020 | | 154-HWP-11-PENT1 PUMP |
| SPARE | 60 7 <u>-</u> 9 <u>11</u> 3 | 0 | | 20 8 10 12 3 | 154-HPW-12-PENT1 PUMP (NON-SIMULTANEOUS LOAD) |
| 154-HRP-3-AHU14 PUMP | 40 13 3630 0 15 17 3 |) 3630 0 | 3630 | 60 14 16 18 3 | SPARE |
| CONTROLS 154-AHU-14-3RD 154-UH-1, 154-UH-2 SPARE | 20 <u>19 360</u> 1 <u>-</u> 20 <u>21</u> 1 <u>-</u> 23 | 432 | | $\begin{array}{c c} 20 \\ 20 \\ 22 \\ 24 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3$ | SPARE |
| SPARE | _ 25 _ | | | 26 - | SPARE |
| SPARE | _ 27 | - | | 28 - | SPARE |
| SPARE | _ 29 | | _ | 30 - | SPARE |
| | 1503 | 0 | 15030 | CINEREED SUBFEED | 154-AHU-14-3RD SUPPLY |

PANELBOARD SCHEDULE "154-DBPHS"

ARCHITECT/ENGINEERS:



5

AESUS Architecture, Eng and Sustainable L designgroup 1050 E. Southern Ave, Suite #5, Tempe, Arizona 85.



5

SCALE: NOT TO SCALE

1 2 3 4

GENERAL NOT

SEE SHEET E-002 FOR GENERAL NOTES.

KEY NOTES (#)

| EXISTING PANELBOARD SCHEDL | ILE | 154 | -PE | <u> </u> | LOCA C.B. | TION: MAIN PENTHOUSE RATING: 10,000 A.I.C. |
|--------------------------------------|--------------|------------------|-----------|----------|---------------|---|
| VOLTAGE: 120/208 V., 3ø, 4 W. | MAIN | IS: 125 A | A. M.L.O. | MOUN | NTING: SU | RFACE TYPE: GE NQB |
| USE and/or AREA SERVED | C/B CIR | ØA | | ØC | CIR NO C/B | USE AND/OR AREA SERVED |
| (1) REPLACEMENT EXHAUST FAN EF-14 | 20 1 | 900 | 900 | 900 | 2 | SPARE |
| EXISTING AC-2 | 30 3 3 | | | | 4 | EXISTING EXHAUST FAN ISOLATION ROOMS HRF-1 |
| LOAD REMOVED (PER PHA | SE): | 900 | 900 | 900 | 900 | VA ÷ 120V = 7.5 AMPS |
| ADDED LOAD (PER PHAS | E): | 900 | 900 | 900 | 900 | VA ÷ 120V = 7.5 AMPS |
| NET LOAD REDUCTION | : | 0 | 0 | 0 | 0 | $VA \div 120V = 0$ AMPS |

3 PANELBOARD SCHEDULE "154-PEE4" SCALE: NOT TO SCALE

| EW IST. BOARD SCHEDUI | LE″15 | 54- | DB | PH | | CATION: SOUTH ROOF PENTHOUSE B. RATING:18,000 A.I.C. | |
|-------------------------------------|------------------------|-----------------|-------------------|---------------------|---------------------------|---|---|
| OLTAGE: 120/208 V., 3ø, 4 W. | MAIN | S: 400 # | A. M.L.O. | MOU | NTING: S | SURFACE TYPE: SQUARE D NQ | |
| JSE and/or AREA SERVED | C/B CIR | ØA | LOAD ØB | ØC | CIR NO C/B | USE and/or AREA SERVED |) |
| 154-AHU-12-4TH SUPPLY | 80 1 3 5 3 | 5010 7260 | 5010 7260 | 5010 7260 | 2 80 2 4 6 3 | 154-AHU-13-4TH SUPPLY | |
| 154–AHU–12–4TH RETURN | 50 7 9 11 3 | 5010 5010 | 5010 5010 | 5010 5010 | 50 8 10 12 3 | 154–AHU–13–4TH RETURN | |
| 154-HRP-1-AHU12 PUMP | 20 13 15 17 3 | 1128 1128 | 1128 1128 | <u>1128</u> 1128 | 20 14 16 18 3 | 154-HRP-2-AHU13 PUMP | |
| | 60 19 | 4620 360 | - | 1120 | 20 20 1 | CONTROLS 154-AHU-12-4TH | |
| 154-CHWP-03-CHLR05 PUMP | 21 | | 4620 360 |] | 20 1 | CONTROLS 154-AHU-13-4TH | |
| | 3 23 | | | 4620 432 | 20 | 154-UH-3, 154-UH-4 | |
| 154-CHWP-04-CHLR05 PUMP | 60 25 | 0 | | | 26 - | SPARE | |
| (NON-SIMULTANEOUS LOAD) | 27 | | - 0 | | 28 - | SPARE | |
| (NON-SIMULTANEOUS LOAD) | 3 29 | | | 0 | 30 - | SPARE | |
| SPARE | _ 31 | _ | | | 32 - | SPARE | |
| SPARE | _ 33 | | | | 34 - | SPARE | |
| SPARE | _ 35 | | · | _ | 36 - | SPARE | |
| | | 29526 | 29536 | 29598 | 295 | 98 VA ÷120V = 246.7AMPS | |

load at 125% per n.e.c.

LOCK ON/OFF DEVICES ON C.B.'s

PANELBOARD SCHEDULE "154-DBPHN" 6 SCALE: NOT TO SCALE

| | Drawing Title PANELBOARD | Project Title REPLACE P | Project Numb 436-17-102 | | |
|--------------------------|-----------------------------|----------------------------------|----------------------------|-------------|----------------------|
| gineering, | SCHEDULES | HVAC SYSTE CONTRACT NO. VA259 | | | Building Numb 154 |
| Design | Approved: Project Director | Location FT. HARRISON | | HELENA, MT | Drawing Numb |
| na 85282, (480) 751-9542 | | Date 08/03/2018 | Checked OG | Drawn DC | E700 |

6 7 8

| TE | S |
|----|---|
| | |

1. EXCERCISE CIRCUIT BREAKER PRIOR TO RE-USING TO VERIFY IN GOOD CONDITION. REPLACE AS REQUIRED.

'BID SET' nber Office of Construction nber and Facilities Management umber)() Department of Veterans Affairs --