

**B**  
one and one-half inches = one foot

C  
one inch = one foot

D  
Three-quarters inch = one foot

one-half inch = one foot

three-eighths inch = one foot

one-quarter inch = one foot

one-eighth inch = one foot

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one-eight

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3



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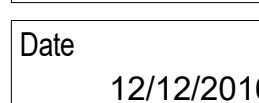
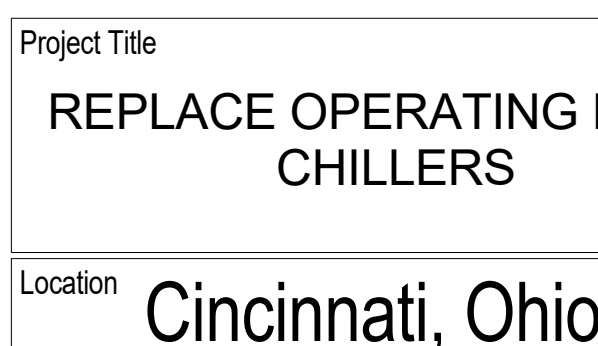
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 Department of  
Veterans Affairs

|               |             |
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| Drawing Title | COVER SHEET |
|---------------|-------------|

Approved: Project Director

|               |                                 |
|---------------|---------------------------------|
| Project Title | REPLACE OPERATING ROOM CHILLERS |
|---------------|---------------------------------|

☐ Checke

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Drawn

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G-001

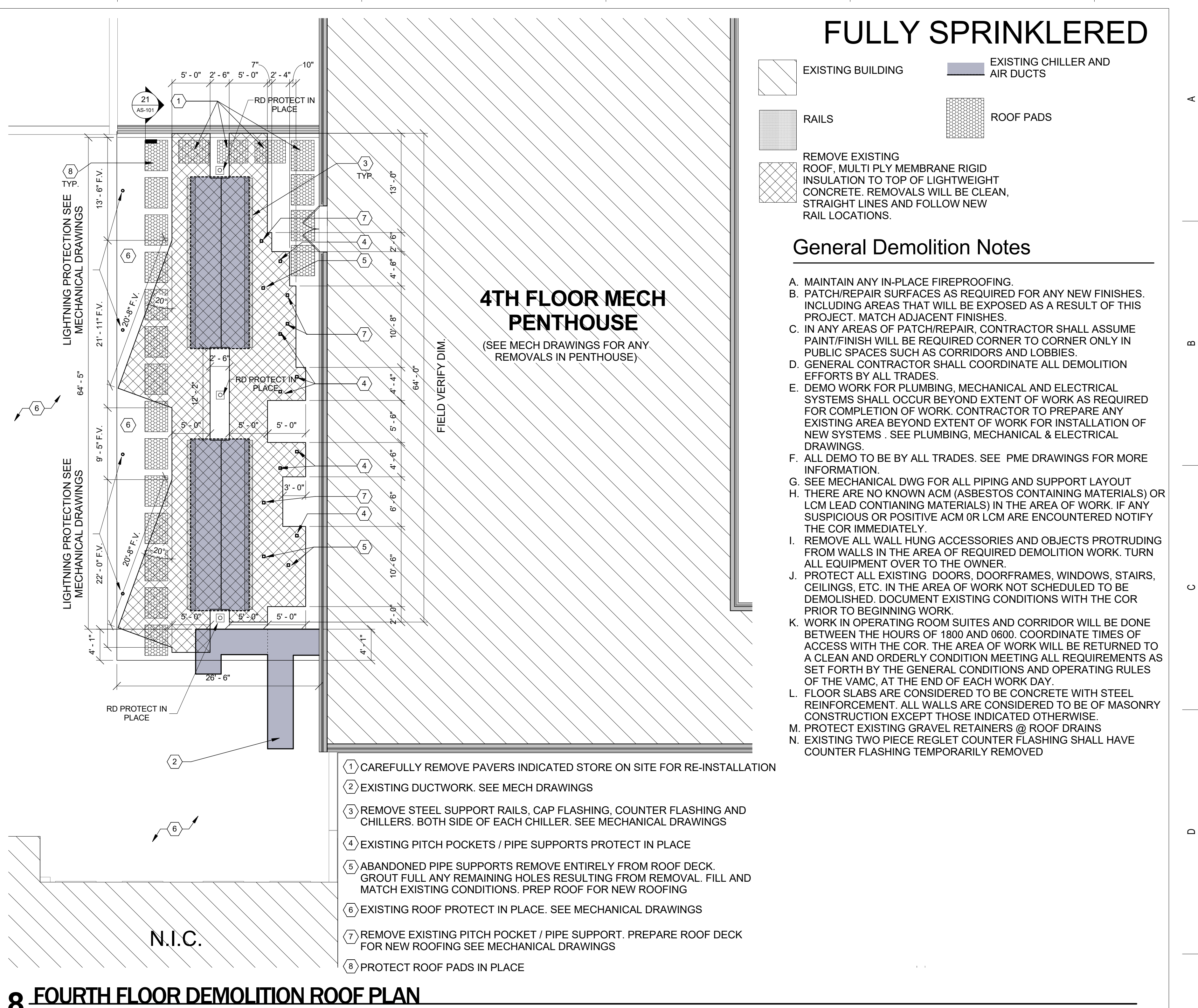
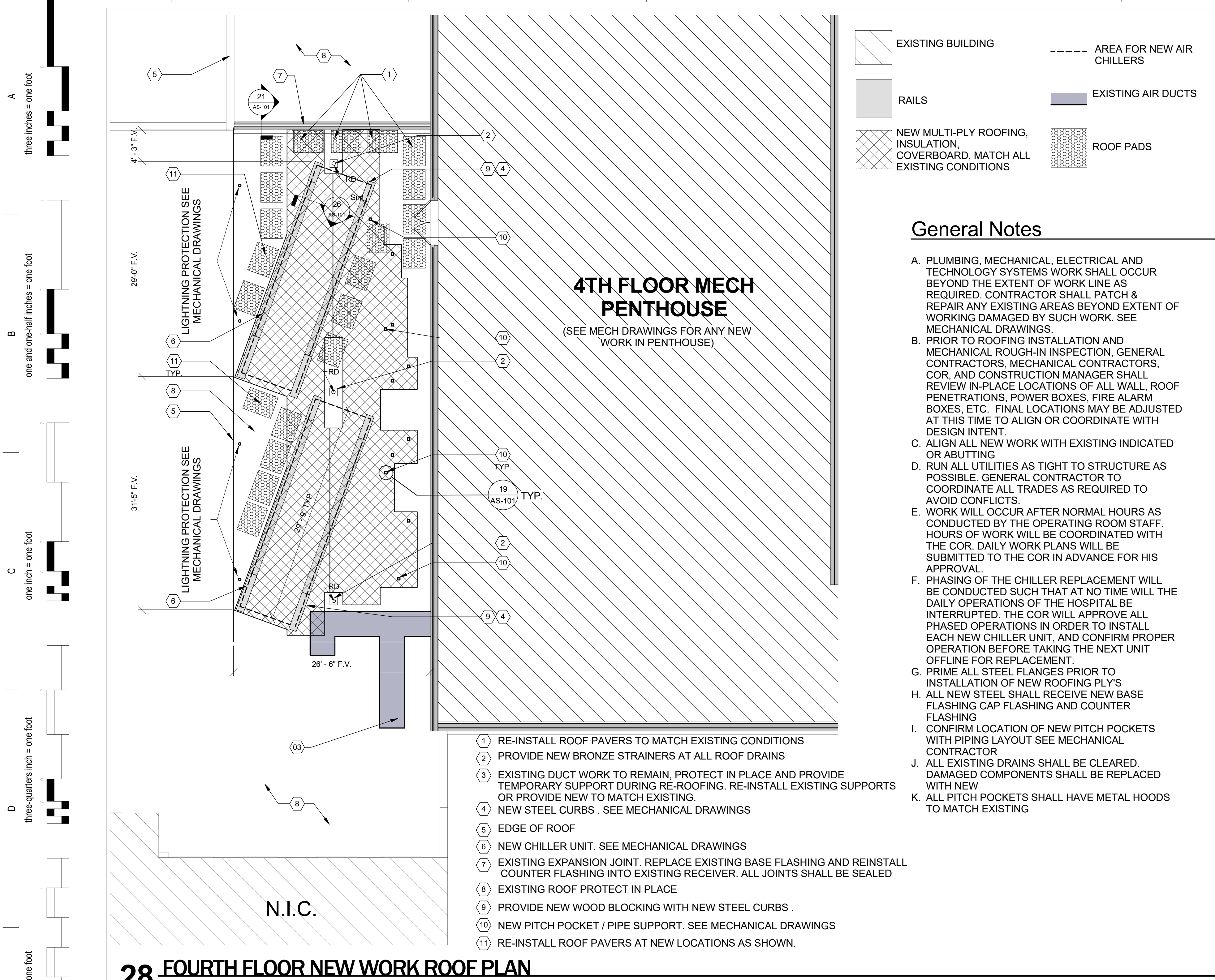
Dwg. of

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Office of  
Construction  
and Facilities  
Management

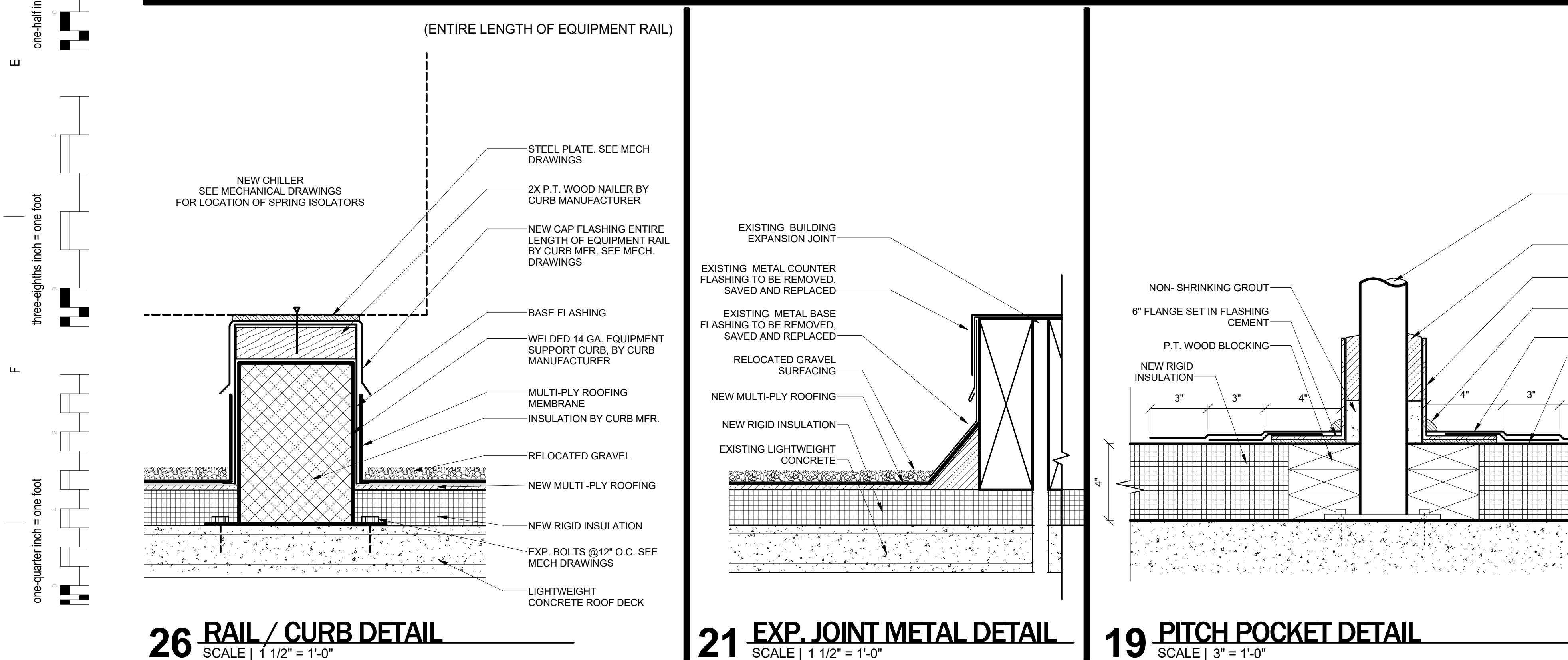
 Department of  
Veterans Affairs





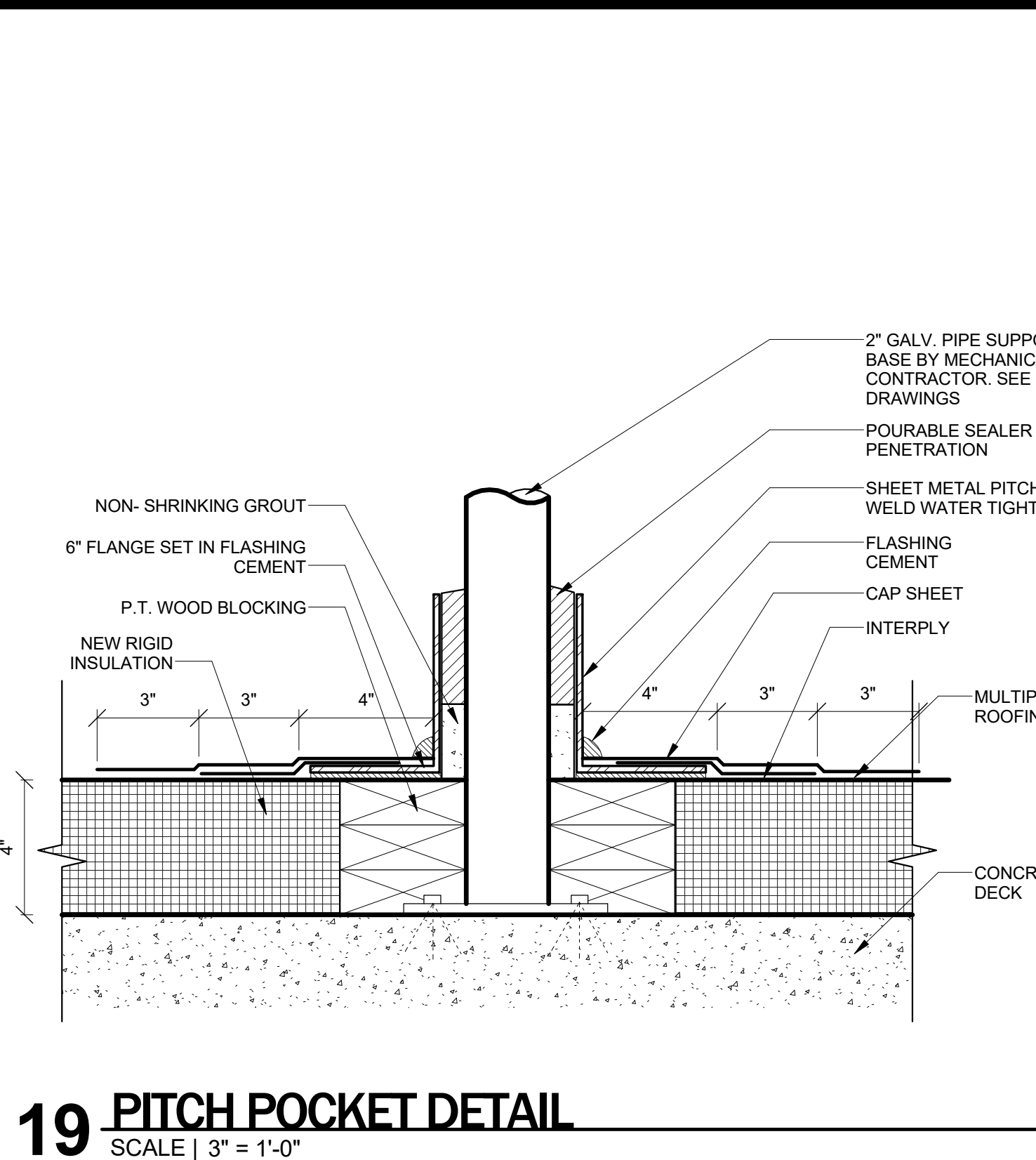
28 FOURTH FLOOR NEW WORK ROOF PLAN  
SCALE | 1/8" = 1'-0"

8 FOURTH FLOOR DEMOLITION ROOF PLAN  
SCALE | 1/8" = 1'-0"

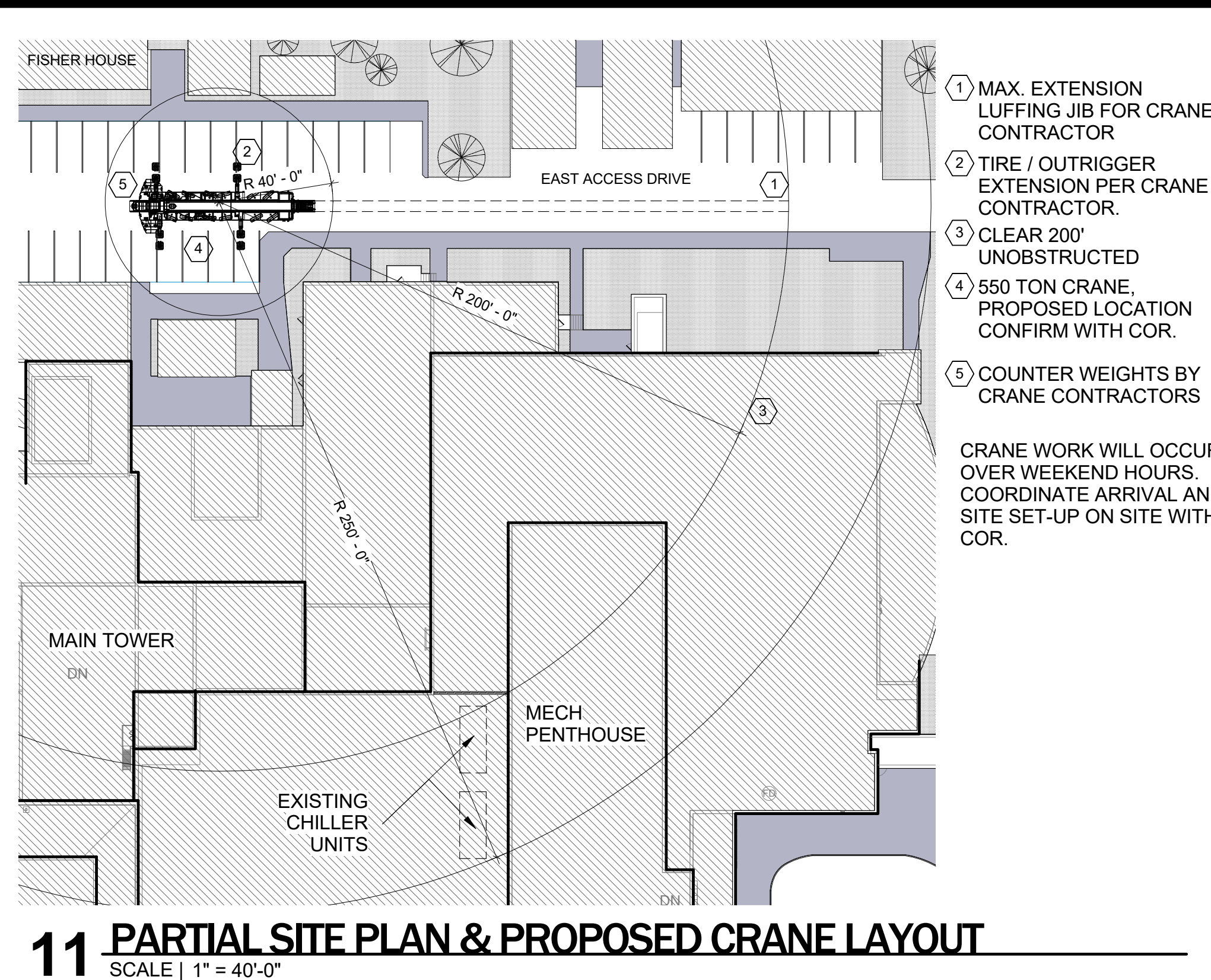


26 RAIL / CURB DETAIL  
SCALE | 1 1/2" = 1'-0"

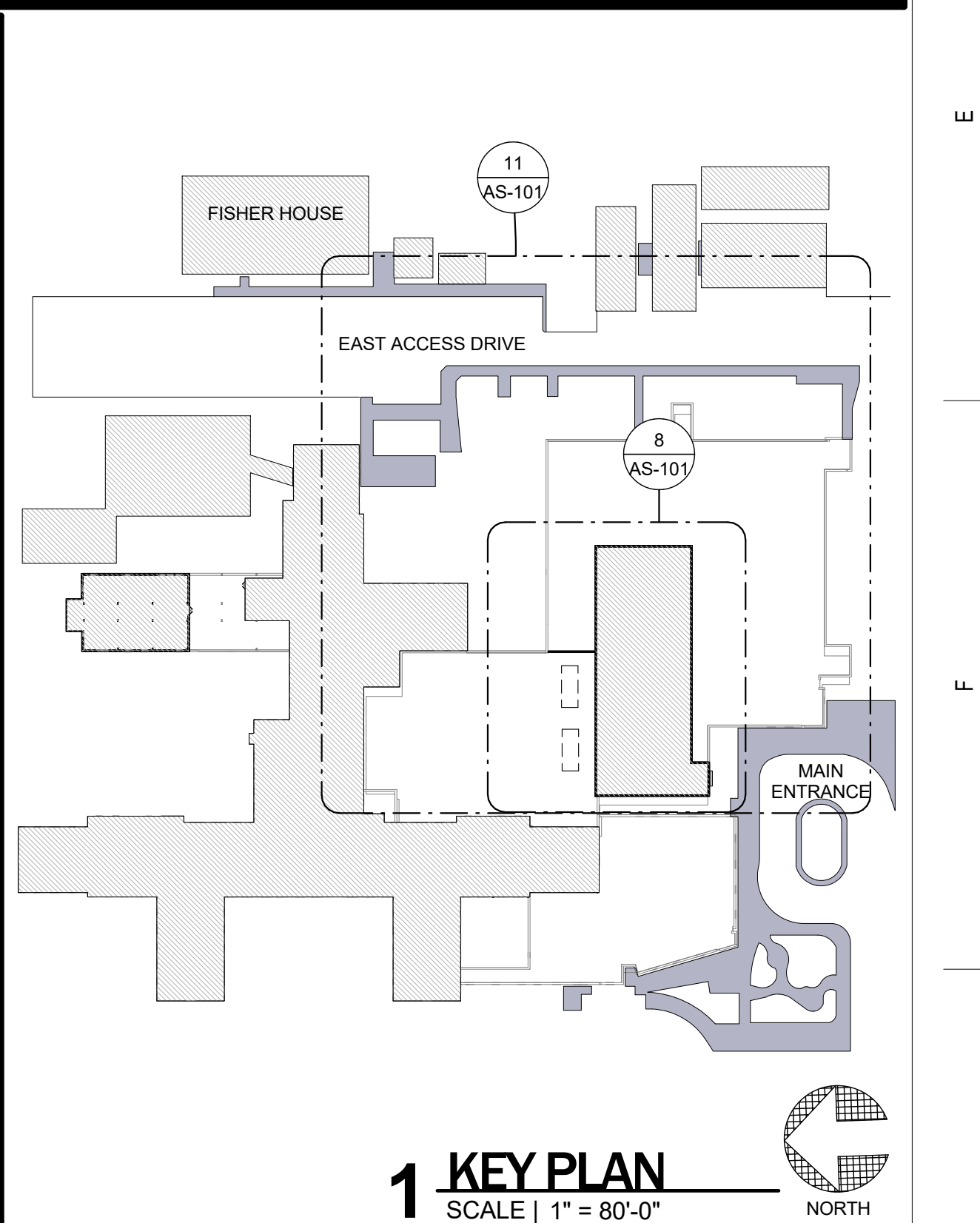
21 EXP. JOINT METAL DETAIL  
SCALE | 1 1/2" = 1'-0"



19 PITCH POCKET DETAIL  
SCALE | 3" = 1'-0"



11 PARTIAL SITE PLAN & PROPOSED CRANE LAYOUT  
SCALE | 1" = 40'-0"



1 KEY PLAN  
SCALE | 1" = 80'-0"

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| Revisions           |            |  |  |
| 00 SUBMITAL         | 8/10/2016  |  |  |
| 50% OWNER REVIEW    | 9/23/2016  |  |  |
| 100% BID DOCUMENTS  | 12/12/2016 |  |  |
| Date                |            |  |  |

CONSULTANTS:

**Heapy Engineering**  
MEP Design Technology Planning Commissioning Energy  
*Nationally Recognized Leader in Sustainability*  
1400 W Dorothy Lane, Dayton, OH 45409-1310  
Ph 937-224-0861 Fax 937-224-5777 www.heapy.com  
HEAPY PROJECT No.: 2016-04003 FIRM LICENSE No.: 01528

STATE OF OHIO  
JAMES W. WILLIAMS  
9266  
REGISTERED ARCHITECT  
James W. Williams, License #9266  
Expiration Date 12/31/2016

ARCHITECT/ENGINEERS:

**LEVIN PORTER ARCHITECTS**  
3011 NEUMARK DRIVE G: 937.224.1931  
MIAMI SBURG, OHIO 45342 F: 937.224.3091  
www.levin-porter.com  
Levin-Porter Associates Inc. (d/b/a Levin-Porter Architects)

Drawing Title  
**CHILLER DEMO PLAN AND NEW WORK PLAN**  
Approved: Project Director

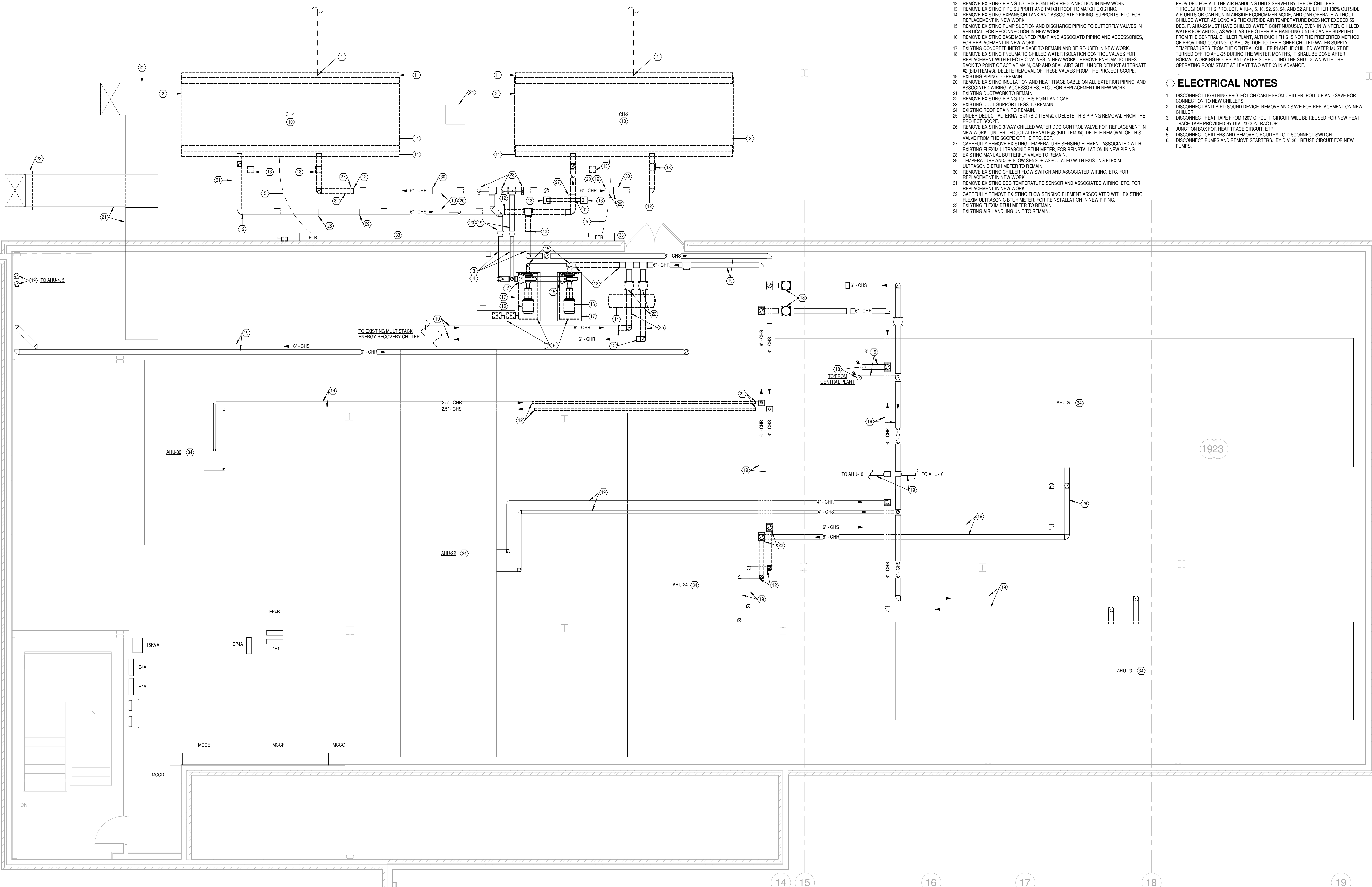
Project Title  
**REPLACE OPERATING ROOM CHILLERS**  
Location  
**Cincinnati, Ohio**  
Date  
12/12/2016  
Checked  
WS  
Drawn  
SS

Project No.  
52109.00  
VA Project No.  
539-18-203  
Building Number  
1  
Drawing Number  
**AS-101**  
Dwg. of

Office of Construction and Facilities Management  
Department of Veterans Affairs







○ HVAC NOTES

10. REMOVE EXISTING CHILLER FOR REPLACEMENT IN NEW WORK.
11. REMOVE EXISTING EQUIPMENT SUPPORT ROOF CURB FOR REPLACEMENT IN NEW WORK.
12. REMOVE EXISTING PIPING TO THIS POINT FOR RECONNECTION IN NEW WORK.
13. REMOVE EXISTING PIPE SUPPORT AND PATCH ROOF TO MATCH EXISTING.
14. REMOVE EXISTING EXPANSION TANK AND ASSOCIATED PIPING, SUPPORTS, ETC. FOR REPLACEMENT IN NEW WORK.
15. REMOVE EXISTING PUMP SUCTION AND DISCHARGE PIPING TO BUTTERFLY VALVES IN VERTICAL. FOR RECONNECTION IN NEW WORK.
16. REMOVE EXISTING BASE MOUNTED PUMP AND ASSOCIATED PIPING AND ACCESSORIES. FOR REPLACEMENT IN NEW WORK.
17. EXISTING CONCRETE INERTIA BASE TO REMAIN AND BE RE-USED IN NEW WORK.
18. REMOVE EXISTING PNEUMATIC CHILLED WATER ISOLATION CONTROL VALVES FOR REPLACEMENT WITH ELECTRIC VALVES IN NEW WORK. REMOVE PNEUMATIC LINES BACK TO POINT OF ACTIVE MAIN, CAP AND SEAL AIRTIGHT. UNDER DEDUCT ALTERNATE #2 (BID ITEM #3). DELETE REMOVAL OF THESE VALVES FROM THE PROJECT SCOPE.
19. EXISTING PIPING TO REMAIN.
20. REMOVE EXISTING INSULATION AND HEAT TRACE CABLE ON ALL EXTERIOR PIPING, AND ASSOCIATED WIRING, ACCESSORIES, ETC., FOR REPLACEMENT IN NEW WORK.
21. EXISTING DUCTWORK TO REMAIN.
22. REMOVE EXISTING PIPING TO THIS POINT AND CAP.
23. EXISTING DUCT SUPPORT LEGS TO REMAIN.
24. EXISTING ROOF DRAIN TO REMAIN.
25. UNDER DEDUCT ALTERNATE #1 (BID ITEM #2), DELETE THIS PIPING REMOVAL FROM THE PROJECT SCOPE.
26. REMOVE EXISTING 3-WAY CHILLED WATER DDC CONTROL VALVE FOR REPLACEMENT IN NEW WORK. UNDER DEDUCT ALTERNATE #3 (BID ITEM #4), DELETE REMOVAL OF THIS VALVE FROM THE SCOPE OF THE PROJECT.
27. CAREFULLY REMOVE EXISTING TEMPERATURE SENSING ELEMENT ASSOCIATED WITH EXISTING FLEXIM ULTRASONIC BTUH METER, FOR REINSTALLATION IN NEW PIPING.
28. EXISTING MANUAL BUTTERFLY VALVE TO REMAIN.
29. TEMPERATURE AND/OR FLOW SENSOR ASSOCIATED WITH EXISTING FLEXIM ULTRASONIC BTUH METER TO REMAIN.
30. REMOVE EXISTING CHILLER FLOW SWITCH AND ASSOCIATED WIRING, ETC. FOR REPLACEMENT IN NEW WORK.
31. REMOVE EXISTING DDC TEMPERATURE SENSOR AND ASSOCIATED WIRING, ETC. FOR REPLACEMENT IN NEW WORK.
32. CAREFULLY REMOVE EXISTING FLOW SENSING ELEMENT ASSOCIATED WITH EXISTING FLEXIM ULTRASONIC BTUH METER, FOR REINSTALLATION IN NEW PIPING.
33. EXISTING FLEXIM BTUH METER TO REMAIN.
34. EXISTING AIR HANDLING UNIT TO REMAIN.

GENERAL NOTES

- A. REFER TO SHEET ME001 FOR INDEX, LEGEND AND ADDITIONAL GENERAL NOTES.
- B. REFER TO DEMO PIPING SCHEMATIC ON SHEET M602 FOR ADDITIONAL REMOVAL DETAILS.
- C. DURING CONSTRUCTION, THE CONTRACTOR SHALL WORK WITH THE COR AND THE CINCINNATI VAMC MAINTENANCE STAFF TO ENSURE THE PROPER COOLING CAN BE PROVIDED FOR ALL THE AIR HANDLING UNITS SERVED BY THE OR CHILLERS THROUGHOUT THIS PROJECT. AHU-4, 5, 10, 22, 23, 24, AND 32 ARE EITHER 100% OUTSIDE AIR UNITS OR CAN RUN IN AIRSIDE ECONOMIZER MODE, AND CAN OPERATE WITHOUT CHILLED WATER AS LONG AS THE OUTSIDE AIR TEMPERATURE DOES NOT EXCEED 55 DEG. F. AHU-25 MUST HAVE CHILLED WATER CONTINUOUSLY, EVEN IN WINTER. CHILLED WATER FOR AHU-25, AS WELL AS THE OTHER AIR HANDLING UNITS CAN BE SUPPLIED FROM THE CENTRAL CHILLER PLANT, ALTHOUGH THIS IS NOT THE PREFERRED METHOD OF PROVIDING COOLING TO AHU-25, DUE TO THE HIGHER CHILLED WATER SUPPLY TEMPERATURES FROM THE CENTRAL CHILLER PLANT. IF CHILLED WATER MUST BE TURNED OFF TO AHU-25 DURING THE WINTER MONTHS, IT SHALL BE DONE AFTER NORMAL WORKING HOURS, AND AFTER SCHEDULING THE SHUTDOWN WITH THE OPERATING ROOM STAFF AT LEAST TWO WEEKS IN ADVANCE.

○ ELECTRICAL NOTES

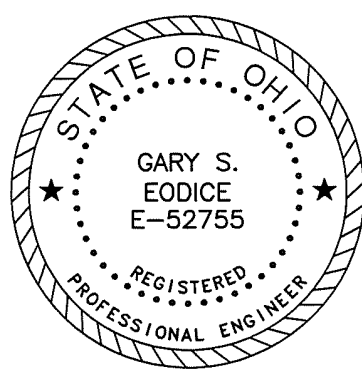
1. DISCONNECT LIGHTNING PROTECTION CABLE FROM CHILLER. ROLL UP AND SAVE FOR CONNECTION TO NEW CHILLERS.
2. DISCONNECT ANTI-BIRD SOUND DEVICE. REMOVE AND SAVE FOR REPLACEMENT ON NEW CHILLER.
3. DISCONNECT HEAT TAPE FROM 120V CIRCUIT. CIRCUIT WILL BE REUSED FOR NEW HEAT TRACE TAPE PROVIDED BY DIV. 23 CONTRACTOR.
4. JUNCTION BOX FOR HEAT TRACE CIRCUIT. ETR.
5. DISCONNECT CHILLERS AND REMOVE CIRCUITRY TO DISCONNECT SWITCH.
6. DISCONNECT PUMPS AND REMOVE STARTERS. BY DIV. 26. REUSE CIRCUIT FOR NEW PUMPS.

① FOURTH FLOOR-REMOVALS

SCALE: 1/4" = 1'-0"

CONSULTANTS:

**Heapy Engineering**  
MEP Design Technology Planning Commissioning Energy  
*Nationally Recognized Leader in Sustainability*  
1400 W Dorothy Lane, Dayton, OH 45409-1310  
Ph 937-224-0861 Fax 937-224-5777 www.heapy.com  
Heapy Project No.: 2016-04003 Firm License No.: 01528



ARCHITECT/ENGINEERS:

**LEVIN PORTER ARCHITECTS**  
3011 NEWMARK DRIVE MIAMI SBURG, OHIO 45342  
0: 937.224.1931 F: 937.224.3091  
www.levin-porter.com  
Levin Porter Associates Inc. dba Levin Porter Architects

Drawing Title

FOURTH FLOOR-REMOVALS

Approved: Project Director

Project Title

Replace Operating Room Chillers

Location

Cincinnati, Ohio

Date

5/1/2017

Checked

MSG/BGA

Drawn

JB/JAC

Project No.

VA Project No. 539-18-203

LPA Project No. 62131.00

Building Number

1

Drawing Number

MED104

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Construction  
and Facilities  
Management



1. PROVIDE TWO INJECTION DOD CHANGEOVER CONTROL VALVES. REFER TO CHILLED WATER PIPING SCHEMATIC ON SHEET M000-0000. SEQUENCES ON SHEET M001. UNDER PROJECT ALTERNATE #2 (BID ITEM #3), DELETE THESE CONTROL VALVES FROM THE DESIGN.
2. EXISTING BYPASS TO REMAIN.
3. REMOVE EXISTING 3-WAY MODULATING DOD CONTROL VALVE AND REPLACE WITH 2-WAY MODULATING DOD CONTROL VALVE PER SPECIFICATION SECTION 28.09.23 FOR EXISTING CHILLED WATER BYPASS. PROVIDE VALVE FOR 7 PSI PRESSURE DROP AT DESIGN FLOW. DESIGN FLOW SHALL BE GREATER OF MINIMUM FLOW REQUIRED BY MANUFACTURER OF CHILLERS OR PUMPS. COORDINATE WITH MANUFACTURERS. REFER TO CHILLED WATER PIPING SCHEMATIC ON SHEET M000-0000. SEQUENCES ON SHEET M001.
4. EXISTING AIR HANDLING UNIT TO REMAIN.
5. REMOVE EXISTING 3-WAY VALVE BYPASS PIPING TO THIS POINT AND CAP.
6. PROVIDE BASE-MOUNTED CHILLED WATER ROSE PUMP SERVING AHU-3 & AHU-5 TO REMAIN.
7. PROVIDE DIFFERENTIAL PRESSURE SENSOR. REFER TO CHILLED WATER PIPING SCHEMATIC ON SHEET M000-0000.

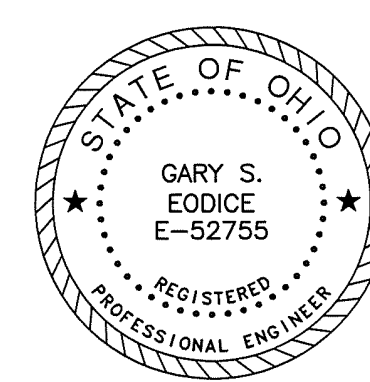
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CONSULTANTS:

**Heapy Engineering**  
MEP Design Technology Planning Commissioning Energy

***Nationally Recognized Leader in Sustainability***

1400 W Dorothy Lane, Dayton, OH 45409-1310  
Ph 937-224-0861 Fax 937-224-5777 [www.heapy.com](http://www.heapy.com)  
Heapy Project No.: 2016-04003 Firm License No.: 01528



ARCHITECT/ENGINEERS:

 **LEVIN PORTER  
ARCHITECTS**  
3011 NEWMARK DRIVE  
MARIETTA, OHIO 45342  
www.levin-porter.com  
www.FirmDesigncredit.org: dpl | levin-porter.com/levents

O: 937.224.1931  
F: 937.224.3091

|  |               |
|--|---------------|
|  | Drawing Title |
|--|---------------|

## SUB-BASEMENT AND THIRD FLOOR - NEW WORK

Approved: Project Director

Project Title

### Replace Operating Room Chillers

|          |                  |
|----------|------------------|
| Location | Cincinnati, Ohio |
|----------|------------------|

|      |          |
|------|----------|
| Date | 5/1/2017 |
|------|----------|

|         |     |
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| Checked | BGA |
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| Drawn | JAC |
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| Project No.     |            |
| VA Project No.  | 539-18-203 |
| LPA Project No. | 62131.00   |

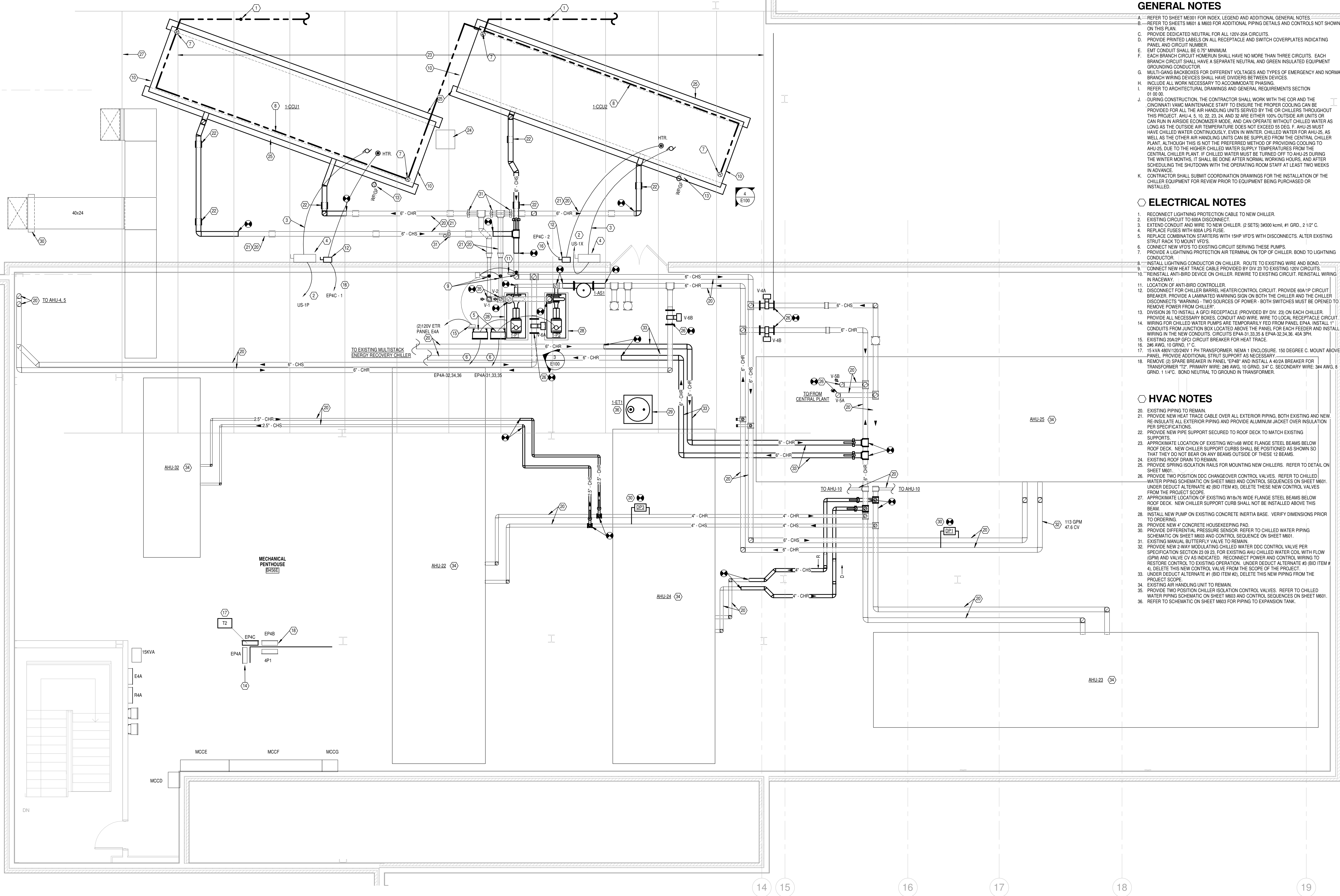
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| Building Number |
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| Drawing Number |
| M100           |

Office of  
Construction  
and Facilities  
Management





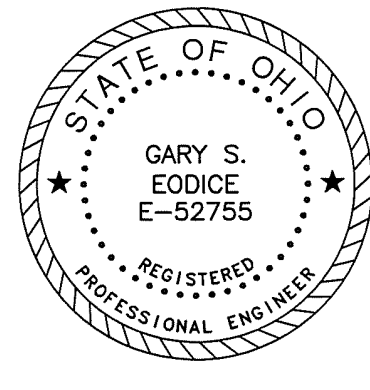


- ### GENERAL NOTES
- A. REFER TO SHEET ME001 FOR INDEX, LEGEND AND ADDITIONAL GENERAL NOTES.
  - B. REFER TO SHEETS M601 & M603 FOR ADDITIONAL PIPING DETAILS AND CONTROLS NOT SHOWN ON THIS PLAN.
  - C. PROVIDE DEDICATED NEUTRAL FOR ALL 120V 20A CIRCUITS.
  - D. PROVIDE PRINTED LABELS ON ALL RECEPTACLE AND SWITCH COVERPLATES INDICATING PANEL AND CIRCUIT NUMBER.
  - E. EMT CONDUIT SHALL BE 0.75" MINIMUM.
  - F. EACH BRANCH CIRCUIT DOWNERIN SHALL HAVE NO MORE THAN THREE CIRCUITS. EACH BRANCH CIRCUIT SHALL HAVE A SEPARATE NEUTRAL AND GREEN INSULATED EQUIPMENT GROUNDING CONDUCTOR.
  - G. MULTI-GANG BACKBOXES FOR DIFFERENT VOLTAGES AND TYPES OF EMERGENCY AND NORMAL BRANCH WIRING DEVICES SHALL HAVE DIVIDERS BETWEEN DEVICES.
  - H. INCLUDE ALL WORK NECESSARY TO ACCOMMODATE PHASING.
  - I. REFER TO ARCHITECTURAL DRAWINGS AND GENERAL REQUIREMENTS SECTION 01 00 00.
  - J. DURING CONSTRUCTION, THE CONTRACTOR SHALL WORK WITH THE COR AND THE CINCINNATI VANC MAINTENANCE STAFF TO ENSURE THE PROPER COOLING CAN BE PROVIDED FOR ALL THE AIR HANDLING UNITS SERVED BY THE OR CHILLERS THROUGHOUT THIS PROJECT. AHU-4, 5, 10, 22, 23, 24, 26, 32 ARE EITHER 100% OUTSIDE AIR UNITS OR CAN RUN IN AIRSIDE ECONOMIZER MODE, AND CAN OPERATE WITHOUT CHILLED WATER AS LONG AS THE OUTSIDE AIR TEMPERATURE DOES NOT EXCEED 95 DEG. F. AHU-25 MUST HAVE CHILLED WATER CONTINUOUSLY. EVEN IN WINTER, CHILLED WATER FOR AHU-25, AS WELL AS THE OTHER AIR HANDLING UNITS CAN BE SUPPLIED FROM THE CENTRAL CHILLER PLANT. ALTHOUGH THIS IS NOT THE PREFERRED METHOD OF PROVIDING COOLING TO AHU-25 DUE TO THE HIGHER CHILLED WATER SUPPLY TEMPERATURES FROM THE CENTRAL CHILLER PLANT. IF CHILLED WATER MUST BE TURNED OFF TO AHU-25 DURING THE WINTER MONTHS, IT SHALL BE DONE AFTER NORMAL WORKING HOURS, AND AFTER SCHEDULING THE SHUTDOWN WITH THE OPERATING ROOM STAFF AT LEAST TWO WEEKS IN ADVANCE.
  - K. CONTRACTOR SHALL SUBMIT COORDINATION DRAWINGS FOR THE INSTALLATION OF THE CHILLER EQUIPMENT FOR REVIEW PRIOR TO EQUIPMENT BEING PURCHASED OR INSTALLED.
- ### ELECTRICAL NOTES
- 1. RECONNECT LIGHTNING PROTECTION CABLE TO NEW CHILLER.
  - 2. EXISTING CIRCUIT TO 600A DISCONNECT.
  - 3. EXTEND CONDUIT AND WIRE TO NEW CHILLER. (2 SETS) 3/8" O.D. #1 GRD. 2 1/2" C.
  - 4. REPLACE FUSES WITH 600A LPS FUSE.
  - 5. REPLACE COMBINATION STARTERS WITH 15HP VFD'S WITH DISCONNECTS. ALTER EXISTING STRUT RACK TO MOUNT VFD'S.
  - 6. CONNECT NEW VFD'S TO EXISTING CIRCUIT SERVING THESE PUMPS.
  - 7. PROVIDE A LIGHTNING PROTECTION AIR TERMINAL ON TOP OF CHILLER. BOND TO LIGHTNING CONDUCTOR.
  - 8. INSTALL LIGHTNING CONDUCTOR ON CHILLER. ROUTE TO EXISTING WIRE AND BOND.
  - 9. CONNECT NEW HEAT TRACE CABLE PROVIDED BY DIV 23 TO EXISTING LOW CIRCUITS.
  - 10. REINSTALL ANTI-BIRD DEVICE ON CHILLER. REWIRE TO EXISTING CIRCUIT. REINSTALL WIRING IN RACEWAY.
  - 11. LOCATION OF ANTI-BIRD CONTROLLER.
  - 12. DISCONNECT FOR CHILLER BARREL HEATER/CONTROL CIRCUIT. PROVIDE 60A/1P CIRCUIT BREAKER. PROVIDE A LAMINATED WARNING SIGN ON BOTH THE CHILLER AND THE CHILLER DISCONNECTS "WARNING - TWO SOURCES OF POWER - BOTH SWITCHES MUST BE OPENED TO REMOVE POWER FROM CHILLER".
  - 13. DIVISION 28 TO INSTALL A GFCI RECEPTACLE (PROVIDED BY DIV. 23) ON EACH CHILLER. PROVIDE ALL NECESSARY BOXES, CONDUIT AND WIRE. WIRE TO LOCAL RECEPTACLE CIRCUIT.
  - 14. WIRING FOR CHILLED WATER PUMPS ARE TEMPORARILY FED FROM PANEL EP4A. INSTALL 17 CONDUITS FROM JUNCTION BOX LOCATED ABOVE THE PANEL FOR EACH FEEDER AND INSTALL WIRING IN THE NEW CONDUITS. CIRCUITS EP4A-31, 33, 35 & EP4A-32, 34, 36. 40A 3PH. EXISTING 20A/2P GFCI CIRCUIT BREAKER FOR HEAT TRACE.
  - 15. 96 AWG, 10 GRD, 1" C.
  - 16. 15 kVA 480V/120/240V 1 PH TRANSFORMER, NEMA 1 ENCLOSURE. 150 DEGREE C. MOUNT ABOVE PANEL. PROVIDE ADDITIONAL STRUT SUPPORT AS NECESSARY.
  - 17. REMOVE (2) SPARE BREAKER IN PANEL 'EP4B' AND INSTALL A 402A BREAKER FOR TRANSFORMER 'T2'. PRIMARY WIRE: 288 AWG, 10 GRD, 3/4" C. SECONDARY WIRE: 384 AWG, 8 GRD, 1 1/4" C. BOND NEUTRAL TO GROUND IN TRANSFORMER.
- ### HVAC NOTES
- 20. EXISTING PIPING TO REMAIN.
  - 21. PROVIDE NEW HEAT TRACE CABLE OVER ALL EXTERIOR PIPING. BOTH EXISTING AND NEW RE-INSULATE ALL EXTERIOR PIPING AND PROVIDE ALUMINUM JACKET OVER INSULATION PER SPECIFICATIONS.
  - 22. PROVIDE NEW PIPE SUPPORT SECURED TO ROOF DECK TO MATCH EXISTING SUPPORTS.
  - 23. APPROXIMATE LOCATION OF EXISTING W18x68 WIDE FLANGE STEEL BEAMS BELOW ROOF DECK. NEW CHILLER SUPPORT CURBS SHALL BE POSITIONED AS SHOWN SO THAT THEY DO NOT BEAR ON ANY BEAMS OUTSIDE OF THESE 12 BEAMS.
  - 24. EXISTING ROOF DRAIN TO REMAIN.
  - 25. PROVIDE SPRING ISOLATION RAILS FOR MOUNTING NEW CHILLERS. REFER TO DETAIL ON SHEET M601.
  - 26. PROVIDE TWO POSITION DDC CHANGEOVER CONTROL VALVES. REFER TO CHILLED WATER PIPING SCHEMATIC ON SHEET M603 AND CONTROL SEQUENCES ON SHEET M601.
  - 27. APPROXIMATE LOCATION OF EXISTING W18x76 WIDE FLANGE STEEL BEAMS BELOW ROOF DECK. NEW CHILLER SUPPORT CURBS SHALL NOT BE INSTALLED ABOVE THIS BEAM.
  - 28. INSTALL NEW PUMP ON EXISTING CONCRETE INERTIA BASE. VERIFY DIMENSIONS PRIOR TO ORDERING.
  - 29. PROVIDE NEW 4" CONCRETE HOUSEKEEPING PAD.
  - 30. PROVIDE DIFFERENTIAL PRESSURE SENSOR. REFER TO CHILLED WATER PIPING SCHEMATIC ON SHEET M603 AND CONTROL SEQUENCES ON SHEET M601.
  - 31. EXISTING MANUAL BUTTERFLY VALVE TO REMAIN.
  - 32. PROVIDE NEW 2-WAY MODULATING CHILLED WATER DDC CONTROL VALVE PER SPECIFICATION SECTION 23 09 29. FOR EXISTING AHU CHILLED WATER COIL WITH FLOW (GPM) AND VALVE CV AS INDICATED. RECONNECT POWER AND CONTROL WIRING TO RESTORE CONTROL TO EXISTING OPERATION. UNDER DEDUCT ALTERNATE #3 (BID ITEM # 4), DELETE THIS NEW CONTROL VALVE FROM THE SCOPE OF THE PROJECT.
  - 33. UNDER DEDUCT ALTERNATE #1 (BID ITEM #2), DELETE THIS NEW PIPING FROM THE PROJECT SCOPE.
  - 34. EXISTING AIR HANDLING UNIT TO REMAIN.
  - 35. PROVIDE TWO POSITION CHILLER ISOLATION CONTROL VALVES. REFER TO CHILLED WATER PIPING SCHEMATIC ON SHEET M603 AND CONTROL SEQUENCES ON SHEET M601. REFER TO SCHEMATIC ON SHEET M603 FOR PIPING TO EXPANSION TANK.

1 FOURTH FLOOR-NEW WORK  
SCALE: 1/4" = 1'-0"

CONSULTANTS:

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MEP Design Technology Planning Commissioning Energy  
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1400 W Dorothy Lane, Dayton, OH 45409-1310  
Ph 937-224-0861 Fax 937-224-5777 www.heapy.com  
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**LEVIN PORTER ARCHITECTS**  
3011 NEWMARK DRIVE  
MIAMI, OHIO 45342  
0: 937.224.1931  
F: 937.224.3091  
www.levin-porter.com  
Levin Porter Associates Inc. dba Levin Porter Architects

Drawing Title

FOURTH FLOOR-NEW WORK

Approved: Project Director

Project Title

Replace Operating Room Chillers

Location

Cincinnati, Ohio

Date

5/1/2017

Checked

MSG/BGA

Drawn

JB/JAC

Project No.

VA Project No. 539-18-203

LPA Project No. 62131.00

Building Number

1

Drawing Number

ME104

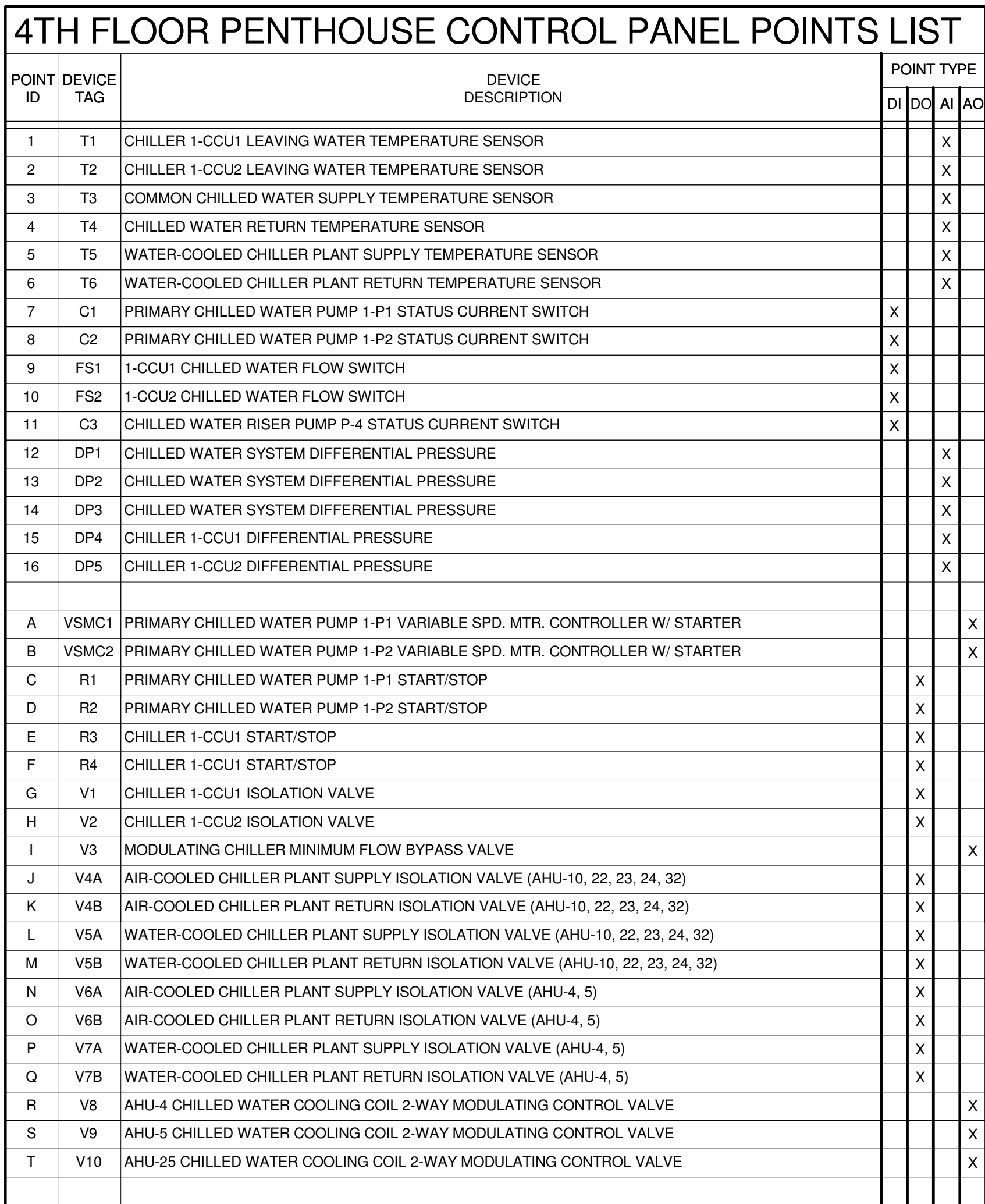
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and Facilities  
Management

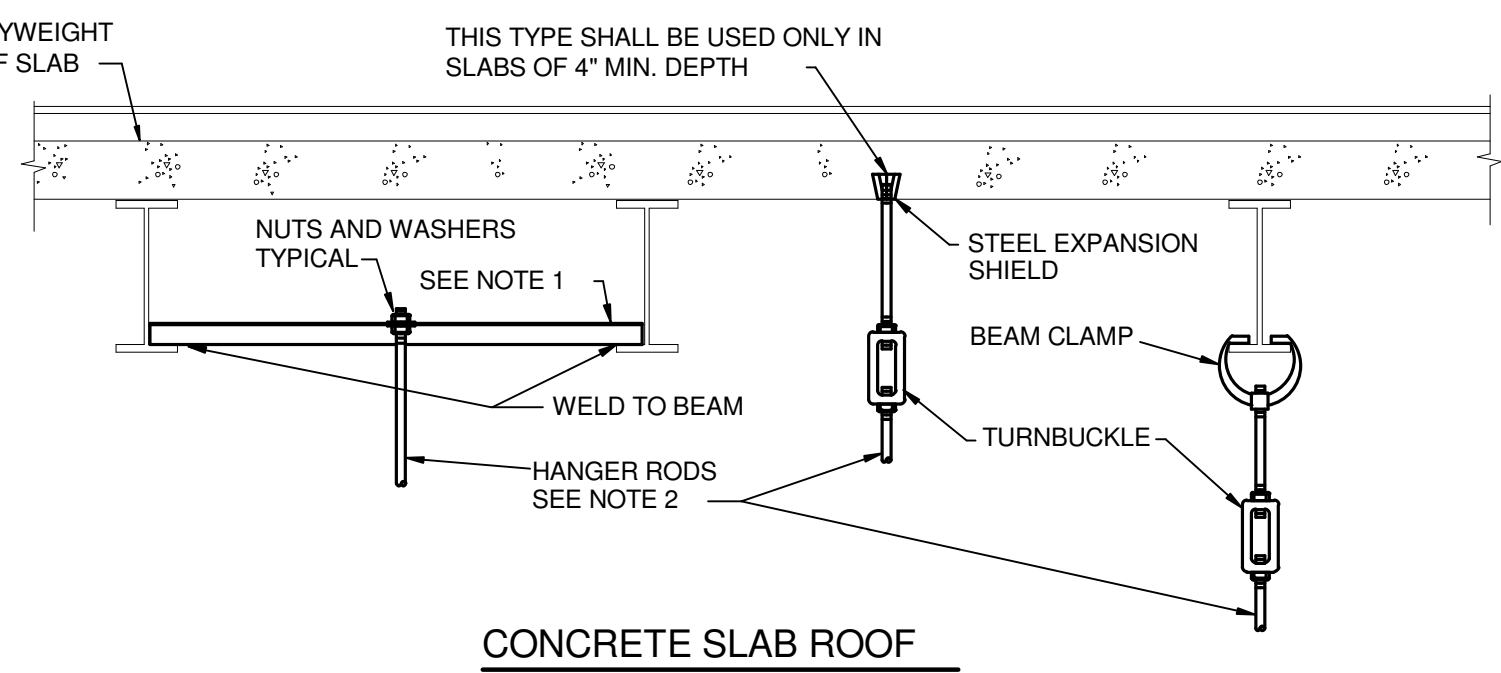




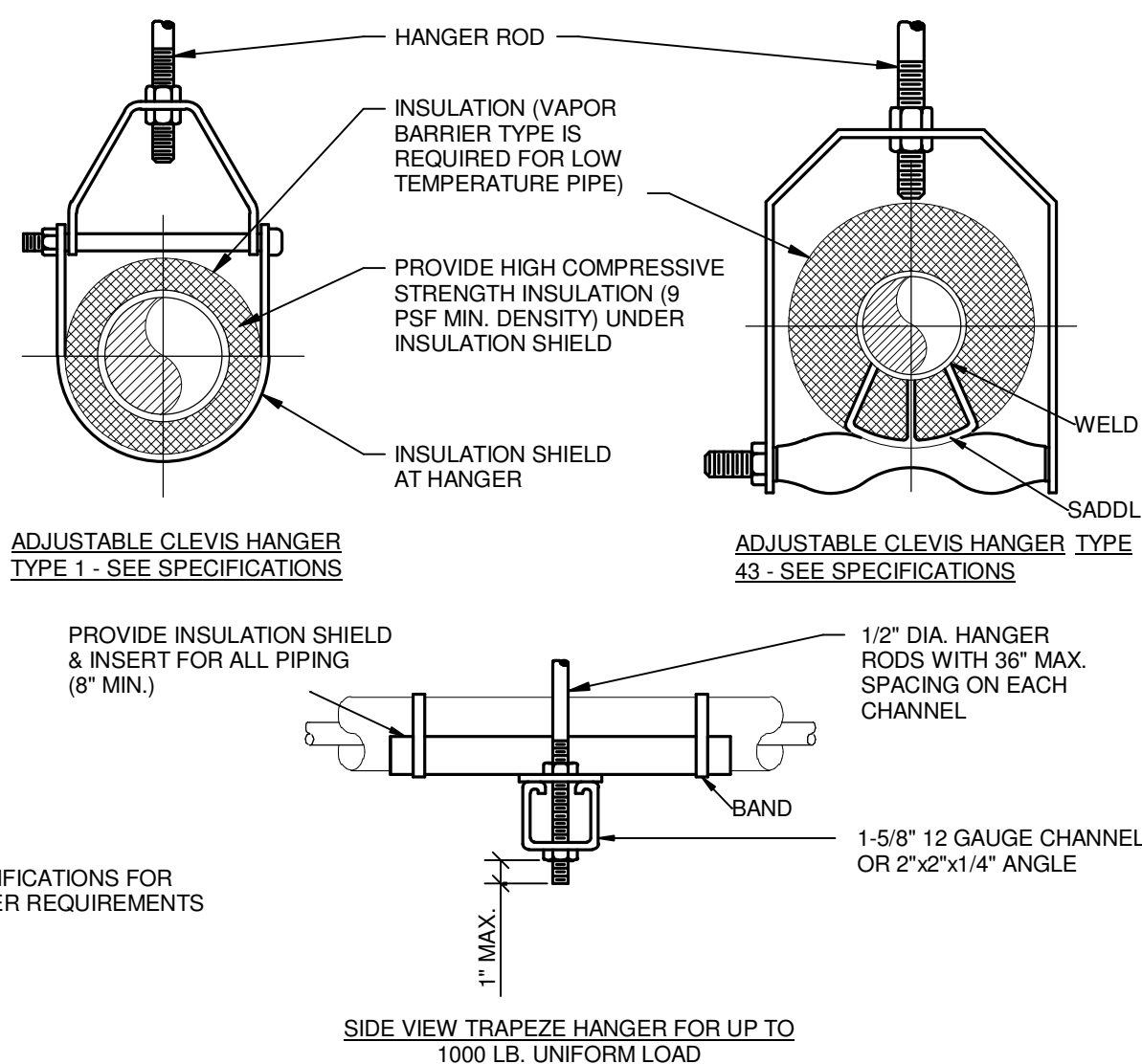
1. A COMPLETE SYSTEM OF AUTOMATIC TEMPERATURE CONTROLS SHALL BE INSTALLED UNDER THIS CONTRACT AS REQUIRED TO ACCOMPLISH THE SEQUENCE OF CONTROL. THE FOLLOWING TERMS OF REFERENCE SHALL APPLY TO THE SEQUENCE OF OPERATION AFTER THE SYSTEM SHALL BE A DIRECT DIGITAL CONTROL SYSTEM UTILIZING ELECTRIC ACTUATION.
2. ELECTRICAL WORK INCLUDES A POWER SOURCE TO THE MOTOR STARTERS, ALL HVAC POWER SOURCES REQUIRED BEYOND THESE STARTERS OR BEYOND SOURCES EXISTING. IT SHALL SHOW OUT OF THE ELECTRICAL DRAWINGS TO BE PROVIDED UNDER THE A/T WORK. THIS WORK SHALL INCLUDE BUT NOT BE LIMITED TO WIRING, CONDUIT, TRANSFORMERS, RELAYS AND FUSES.
3. BULB WELLS FOR TEMPERATURE SENSING AS INDICATED SHALL BE FURNISHED UNDER THE A/T WORK AND INSTALLED AS PART OF THE HVAC PIPING WORK. THE A/T WORK SHALL INCLUDE PROPERLY SIZED WELDELOOT OR THE TROLOLET FITTINGS PLACED AS DIRECTED BY THE CONTROL SYSTEM SUPPLIER.
4. POINTS LIST IS SHOWN AS AN AID TO THE CONTRACTOR INDICATING THE MINIMUM POINTS REQUIRED FOR CONTROL AND MONITORING. ALL INPUT AND OUTPUT POINTS, AND THEIR REQUIRED INTERFACE AND ADDRESSING HARDWARE SHALL BE PROVIDED BY A COMPLETE AND FUNCTIONAL CONTROL SYSTEM. IF OR WHEN ADDITIONAL POINTS ARE REQUIRED TO ACCOMPLISH THE SEQUENCES OF CONTROL SPECIFIED, THESE POINTS, ALONG WITH AN ADDITIONAL DIRECT DIGITAL CONTROL PANEL(S) IF REQUIRED, SHALL ALSO BE PROVIDED.
5. REFER TO FLOOR PLANS AND PIPING SCHEMATICS FOR MORE INFORMATION.
6. KV USE OF ALL VFDs PROVIDED UNDER THIS PROJECT SHALL BE REPORTED TO EXISTING "EDART" SOFTWARE. COORDINATE WITH VA COR.



- NOTES: 1 REFER TO SHEET M603 FOR CONTROL DIAGRAM ASSOCIATED WITH POINTS AND SEQUENCES SHOWN ON THIS SHEET
- 2 INTEGRATE ALL NEW DDC CONTROLS BEING PROVIDED UNDER THIS PROJECT TO EXISTING BAS HEAD-END. CHILLER CONTROL VARIABLES TO BE INTEGRATED TO BAS VIA BACNET INTERFACE ARE INDICATED IN SPEC SECTION 23 09 23. PROVIDE GRAPHICS AT BAS HEAD-END FOR ALL NEW EQUIPMENT AND CONTROL DEVICES BEING PROVIDED UNDER THIS PROJECT.
- 3 THIS POINT SHALL BE DELETED UNDER BID ITEM #3 (DEDUCT ALTERNATE #2).
- 4 THIS POINT SHALL BE DELETED UNDER BID ITEM #4 (DEDUCT ALTERNATE #3).



- NOTES
- 1 FOR PIPES UNDER 2" IN SIZE, USE 1-1/2"x1-1/2"x1/4" ANGLE. FOR PIPES 2" TO 4" USE 3"x3"x1/4" ANGLE. ALL PIPES 5" AND LARGER USE 4"x4"x1/4" ANGLE.
- 2 HANGER ROD SIZES SHALL BE 3/8" FOR 3" AND SMALLER PIPE SIZES; 1/2" FOR 4" TO 6"; 5/8" FOR 8"; 3/4" FOR 10" AND 1" FOR 12" TO 16".



| MAXIMUM PIPE/TUBING SUPPORT SPACING |     |          |   |       |       |    |       |    |    |    |    |    |    |    |    |    |    |    |    |
|-------------------------------------|-----|----------|---|-------|-------|----|-------|----|----|----|----|----|----|----|----|----|----|----|----|
| NOM. SIZE                           | IN. | THRU 3/4 | 1 | 1 1/4 | 1 1/2 | 2  | 2 1/2 | 3  | 4  | 5  | 6  | 8  | 10 | 12 | 14 | 16 | 18 | 20 | 24 |
| PIPE                                | FT. | 7        | 7 | 7     | 9     | 10 | 11    | 12 | 14 | 16 | 17 | 19 | 22 | 23 | 25 | 27 | 28 | 30 | 32 |
| TUBING                              | FT. | 5        | 7 | 6     | 7     | 8  | 8     | 9  | 10 | 12 | 13 | 14 | 16 | -  | -  | -  | -  | -  | -  |

NOTE: FOR TRAPEZE HANGER TAKE SPACING OF SMALLEST SIZE ON TRAPEZE.

## PIPE HANGERS

GENERAL

1.1. TWO NEW AIR-COOLED CHILLERS WITH VARIABLE SPEED SCREW COMPRESSORS & VARIABLE SPEED CONDENSER FANS, AND ASSOCIATED VARIABLE SPEED PRIMARY PUMPS SHALL BE PROVIDED UNDER THIS PROJECT, AND SHALL OPERATE IN A LEAD-LAG ARRANGEMENT.

1.2. SEQUENCE SHALL HAVE THE ABILITY TO BE INITIATED BY THE DCP OR REMOTELY AT THE ECG. EACH CHILLER AND ASSOCIATED PUMPS ARE SIZED FOR APPROXIMATELY 50% OF THE MAXIMUM POSSIBLE CONNECTED LOAD. LEAD AND LAG CHILLER & PUMP SHALL BE ROTATED ON A DAILY BASIS, ENSURING EACH LEAD CHILLER AND PUMP PRIOR TO DISABLING THE CURRENT LEAD CHILLER AND PUMP.

1.3. LOADS CONNECTED TO THIS AIR-COOLED CHILLER SYSTEM CONSIST OF COOLING COILS FOR THE FOLLOWING AIR HANDLING UNITS: AHU-4 (E.D.), AHU-5 (M.C.U.), AHU-10 (I.V. PREP), AHU-22 (NUC. MED.), AHU-23 (BLOOD LAB), AHU-24 (P.A.C.U.), AHU-25 (O.R.), AND AHU-32 (CAT SCAN).

1.4. THE NORMAL MODE OF OPERATION IS CHILLED WATER FOR AHU-4, AHU-5, AND AHU-25 SUPPLIED FROM THE AIR-COOLED CHILLER SYSTEM, AND CHILLED WATER FOR ALL OTHER AIR HANDLING UNITS LISTED ABOVE SUPPLIED BY THE CHILLED WATER PLANT. CHILLED WATER (WATER-COOLED) CHILLED WATER PLANT. THIS IS ACCOMPLISHED BY THE FOLLOWING CONTROL VALVE POSITIONS: VALVES V4 & V4B CLOSED, VALVES V5 & V5B OPEN, VALVES V6 & V6B OPEN, AND VALVES V7 & V7B CLOSED. VALVES ARE THE NORMAL VALVE POSITIONS. ALL CONTROL VALVES SHALL INCLUDE END SWITCHES TO MONITOR AND PROVE POSITION. UNDER NORMAL OPERATION, EXISTING SUB-BASEMENT CHILLED WATER RISER PUMP 4 SERVING AHU-4 & AHU-5 SHALL BE DISABLED THRU THE DDC SYSTEM (EXISTING VFD).

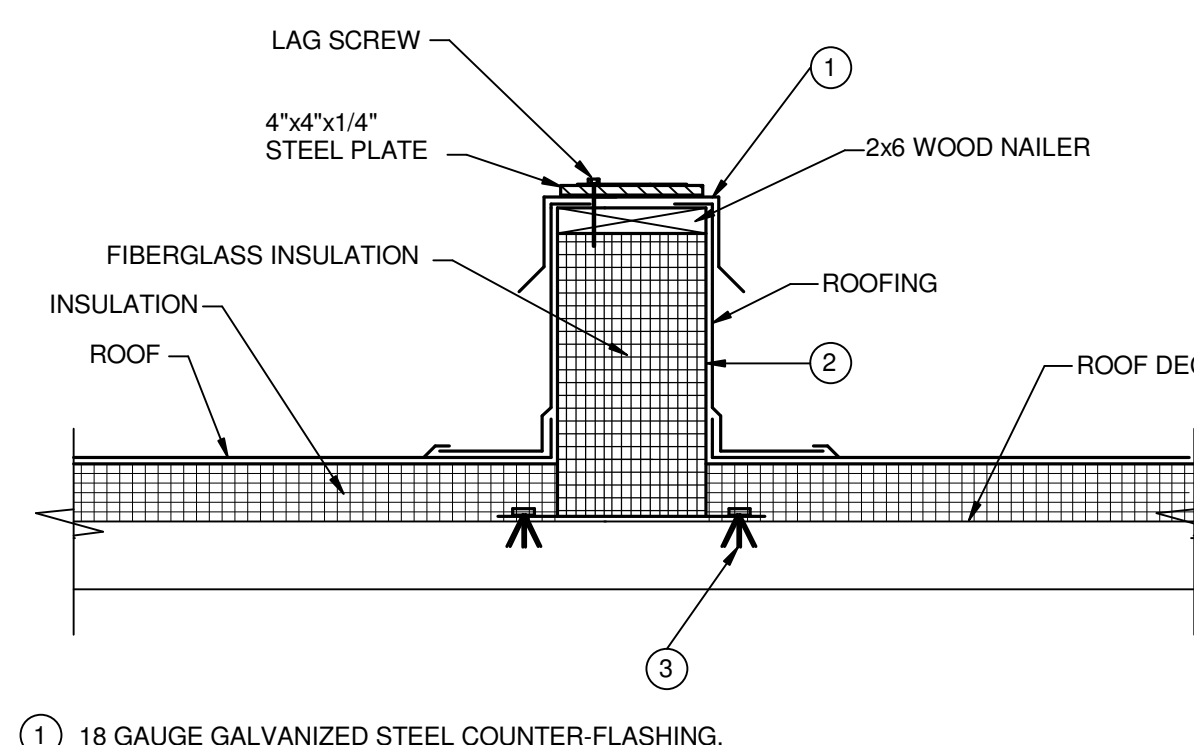
1.5. AIR COOLED CHILLER SYSTEM SHALL BE ENABLED WHENEVER AHU-4, AHU-5, OR AHU-25 CALLING FOR MECHANICAL COOLING (I.E. AIR SIDE ECONOMIZER OPERATION FOR ANY OF THESE UNITS) CANNOT MAINTAIN REQUIRED DISCHARGE AIR TEMPERATURE, TO SATISFY CHILLED WATER SETPOINT OF 40 DEG F AS SENSED BY T1 OR T2. NEW ISOLATION CONTROL VALVE T2 SHALL BE INSTALLED TO MONITOR CHILLED WATER TEMPERATURE. OPERATOR PRIOR TO RESPECTIVE CHILLER & PUMP STARTING, AND CLOSE WHEN ASSOCIATED CHILLER & PUMP IS OFF.

1.6. A FLOW SWITCH SHALL BE PROVIDED FOR EACH CHILLER TO PROVE FLOW BEFORE THE COMPRESSOR OPERATES. FURNISH ALL NECESSARY FLOW SWITCHES, AUXILIARY CONTACTS, EXTERNAL RELAYS AND ALL WIRING TO ACCOMPLISH THE DESCRIBED START-UP, OPERATING AND SHUT-DOWN SEQUENCE. THE CHILLER AND PUMP SHALL BE INSTALLED AND SET-UP FURNISHED WITH THE CHILLERS. ALL CHILLER CONTROL DEVICE INSTALLATION AND SET-UP SHALL BE PROVIDED AS PART OF THE CONTROL WORK.

1.7. IF THE CHILLED WATER SUPPLY TEMPERATURE SETPOINT AS SENSED BY LEAD CHILLER SUPPLY TEMPERATURE SENSOR T1 (OR T2) CANNOT BE MAINTAINED FOR 30 CONSECUTIVE MINUTES, THE LAG CHILLER ISOLATION VALVE SHALL OPEN, THE LAG PUMP SHALL START AND THE LEAD CHILLER SHALL STOP. THE CHILLER AND PUMP SHALL BE DISABLED/STOPPED WHEN THE TEMPERATURE DIFFERENCE BETWEEN THE COMMON SUPPLY T1 (OR T2) AND COMMON RETURN T4 (IS) LESS THAN 5 DEG.F. PROVIDE A 15 MINUTE RESTART TIME DELAY UNDER CONDITIONS TO STABILIZE BEFORE RE-ENABLEING STARTING THE LAG CHILLER AND PUMP.

2.1 MODULATE VARIABLE FREQUENCY DRIVES ASSOCIATED WITH PRIMARY CHILLED WATER PUMP TO MAINTAIN THE DIFFERENTIAL WATER PRESSURE AT SET POINT AS DETECTED BY NEW PRESSURE TRANSDUCER. WHEN THE DIFFERENTIAL WATER PRESSURE FALLS BELOW THE SET POINT, THE NORMAL MODE OF OPERATION DESCRIBED ABOVE, DP3 SHALL BE REMOVED FROM THE TRIP SEQUENCE SINCE THE CHILLED WATER PUMP WILL BE STOPPED DUE TO THE STOP OPERATION. WHENEVER VALUES V44 & V45 ARE PROVEN OPEN AND VALUES V54 & V56 ARE PROVEN CLOSED, DP3 SHALL BE ADDED TO THIS SEQUENCE. CHILLED WATER PUMP VFD SHALL BE STOPPED SINCE THE CHILLED WATER PUMP WILL BE STOPPED DUE TO THE STOP OPERATION. IF THERE IS A CONTINUED DECREASE IN DEMAND FOR CHILLED WATER, VERIFY MINIMUM FLOW ON THE CHILLED WATER PUMP. WHEN THE MINIMUM FLOW ON THE CHILLED WATER PUMP IS ACCOMPLISHED IN NORMAL OPERATION BY MODULATING BYPASS VALVE, MINIMUM FLOW TO MAINTAIN CHILLER DIFFERENTIAL PRESSURE SETPOINT FOR ALL ACTIVE CHILLERS SHALL BE SENSIBLY BY DP4. WHEN THE DIFFERENTIAL WATER PRESSURE CORRESPONDING TO MINIMUM FLOW ACROSS THE CHILLER SHALL BE CALCULATED USING DEMAND FLOW AND PRESSURE DROP AND DP SETPOINT SHALL BE VERIFIED BY CHILLER MANUFACTURER.

- |     |   |
|-----|---|
| 2   | CHANGE IN FLOW RATE SHALL NOT EXCEED 10% PER MINUTE, OR AS OTHERWISE SPECIFIED/RECOMMENDED BY CHILLER MANUFACTURER.   |
| 3   | WHEN THE CHILLER AND PUMP ARE STOPPED, THE CHILLER SHALL STOP FIRST, THEN AFTER A 5 MINUTE TIME DELAY (ADJUSTABLE), THE ASSOCIATED PRIMARY PUMP SHALL STOP.   |
| 3   | ALARMS & SAFETIES   |
| 3.1 | IF THE CHILLER IS COMMANDED ON AND FLOW STOPS, AN ALARM SHALL BE GENERATED BY THE DDC SYSTEM  |
| 3.2 | WHEN A CHILLED WATER SYSTEM PUMP IS ENABLED AND STATUS IS NOT PROVEN FOR ADJUSTABLE TIME DELAY (30 SEC.) OR WHEN PUMP IS NOT ENABLED AND STATUS IS PROVEN AN ALARM SHALL BE GENERATED AT THE DDC.   |
| 3.3 | CHILLED WATER SUPPLY TEMPERATURE SENSORS ASSOCIATED WITH EXISTING GTUW CHILLERS FOR THE AIR-COOLED CHILLERS SHALL BE CONTINUOUSLY COMPARED TO CONTINUING NEW DDC SUPPLY TEMPERATURE SENSORS ASSOCIATED WITH THE SAME CHILLER. IF THE TEMPERATURES DIFFER BY MORE THAN 1 DEGREE FOR MORE THAN 5 CONSECUTIVE MINUTES, AN ALARM MESSAGE SHALL BE GENERATED AT THE ECC.   |
| 3.4 | IF ANY CHILLED WATER SUPPLY OR RETURN TEMPERATURE SENSORS (EITHER THOSE ASSOCIATED WITH EXISTING GTUW CHILLERS OR NEW DDC CHILLERS OR NEW DDC SENSORS ASSOCIATED WITH EACH CHILLER) SENSES A PIPE FLOW TEMPERATURE OF LESS THAN 3 DEGREES FOR MORE THAN 5 CONSECUTIVE MINUTES, A CRITICAL ALARM SHALL BE GENERATED AT THE ECC. IF THE ASSOCIATED CHILLER IS OFF WHEN THIS HAPPENS, ITS ISOLATION VALVE SHALL OPEN AND ASSOCIATED PRIMARY PUMP SHALL START AND RUN AT MINIMUM SPEED. IF THE ASSOCIATED CHILLER IS ON WHEN THIS HAPPENS, THE AMBIENT AIR TEMPERATURE AND PIPE FLOW TEMPERATURE ARE ABOVE 40 DEGREES F, AT WHICH POINT CHILLER SHALL AUTOMATICALLY RETURN TO NORMAL MODE OF OPERATION ABOVE. |



- ① 18 GAUGE GALVANIZED STEEL COUNTER-FLASHING.
- ② WELDED 14 GAUGE EQUIPMENT SUPPORT CURB, MEETING ASTM A-466, 525, 526 AND 527 REQUIREMENTS, WITH WELDED CORNERS WITH SEAMS JOINED BY CONTINUOUS WELDS. CURB SHALL BE INTERNALLY REINFORCED WITH BULKHEADS AND SPREADERS 2" ON CENTER TO MEET LOAD RATING OF DUCT SYSTEM. CURB TO EXTEND 6" BEYOND DUCT. MINIMUM HEIGHT SHALL BE 12" ABOVE FINISHED ROOF.
- ③ SECURE CURB TO ROOF WITH EXPANSION BOLTS (CONCRETE ROOF) OR RUST RESISTANT BOLTS (METAL DECK AND RA8, JOIST RATING: 32' O.C.

## EQUIPMENT SUPPORT (SPRING) ROOF CURB

NOTES:  
1 MOTOR SHALL BE PREMIUM EFFICIENCY TYPE, AND SHALL INCLUDE SHAFT GROUNDING RING - REFER TO 23 05 12.  
2 PUMP MANUFACTURER'S RECOMMENDED MINIMUM FLOW SHALL BE LESS THAN OR EQUAL TO APPROVED CHILLER MANUFACTURER'S RECOMMENDED MINIMUM FLOW

INTERLOCK NEW VARIABLE PRIMARY CHILLED WATER PUMP 1-P1 WITH NEW PACKAGED AIR COOLED WATER CHILLER UNIT 1-CQU1 TO START CHILLER AUTOMATICALLY WITH MANUFACTURER'S RECOMMENDED TIME DELAY AFTER CHILLED WATER PUMP IS STARTED.

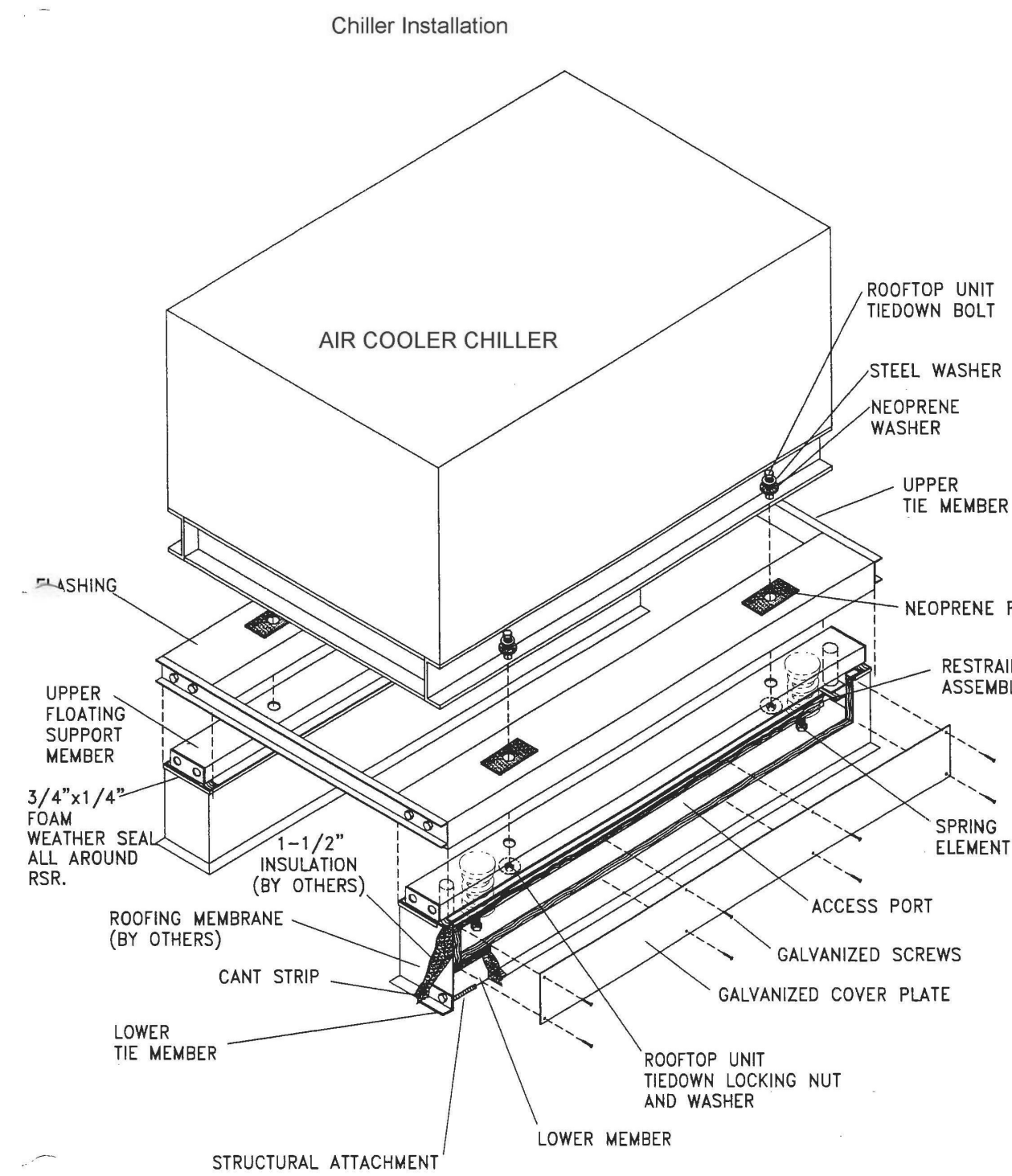
MANUFACTURER SHALL PROVIDE ALL AVAILABLE ACOUSTIC OPTIONS, INCLUDING COMPRESSOR BLANKETS, LOW NOISE CONDENSER FANS, ETC.

CHILLER SHALL BE CAPABLE OF MINIMUM FLOW OF 147 GPM OR LESS. CHILLER SHALL BE PROVIDED WITH OPTIONS (ADDITIONAL TUBE PASSES, ETC.) AS REQUIRED TO MEET THIS MINIMUM FLOW REQUIREMENT.

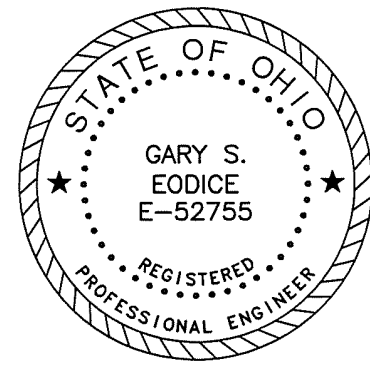
CHILLER MINIMUM FULL LOAD EER AT AHRI STANDARD RATING CONDITIONS SHALL BE 10.5.

NOTES:

1 COALESCING TYPE AIR AND DIRT SEPARATOR UNDER BASE BID (BID ITEM #1). UNDER DEDUCT ALTERNATE #3 (BID ITEM #4), PROVIDE TANGENTIAL TYPE AIR SEPARATOR INSTEAD, WITH 8" FLANGES AND NO STRAINER.

[illegible]

**Heapy Engineering**  
MEP Design Technology Planning Commissioning Energy  
**Nationally Recognized Leader in Sustainability**  
1400 W Dorothy Lane, Dayton, OH 45409-1310  
Ph 937-224-0861 Fax 937-224-5777 [www.heapy.com](http://www.heapy.com)  
Heapy Project No.: **2016-04003** Firm License No.: **01528**



**LEVIN PORTER  
ARCHITECTS**  
3011 NEWMARK DRIVE O: 937.224.1931  
MIAMISBURG, OHIO 45342 F: 937.224.3091  
[www.levin-porter.com](http://www.levin-porter.com)  
Levin Porter Associates Inc. dba Levin Porter Architects

Approved: Project Director

Date \_\_\_\_\_

Drawn

Drawn

1

# M601

Day. of

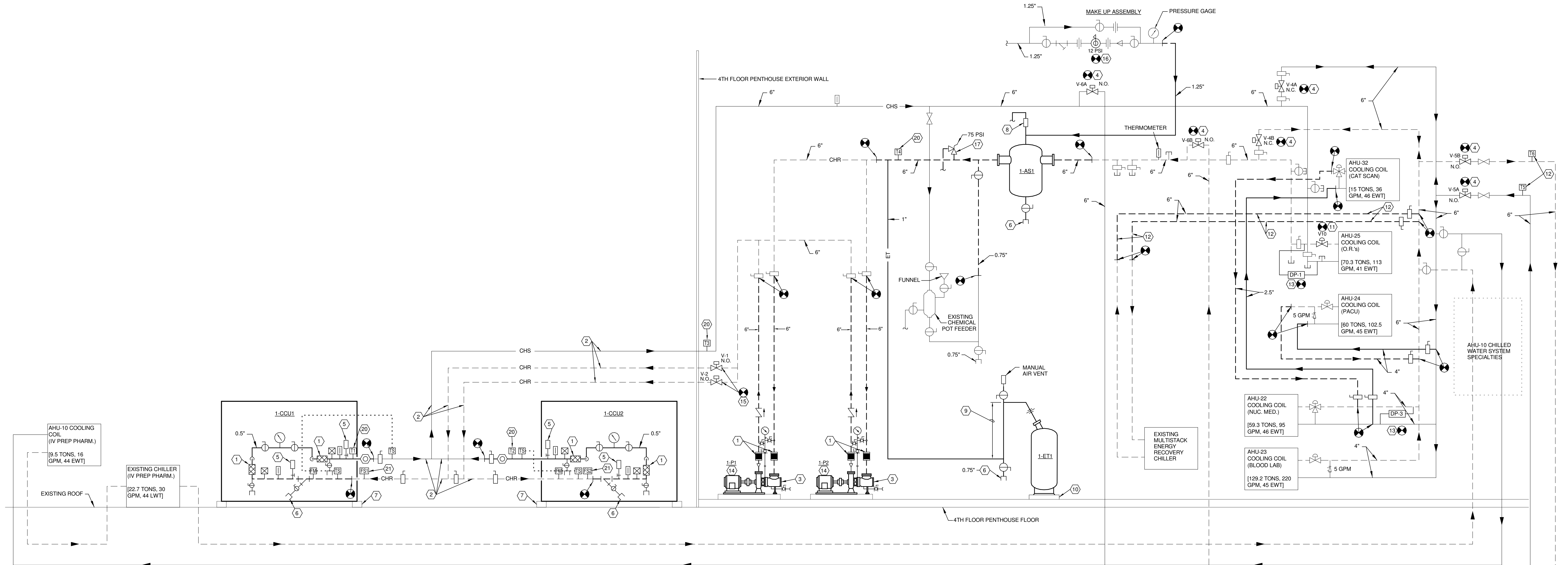
Office of  
Construction  
and Facilities  
Management







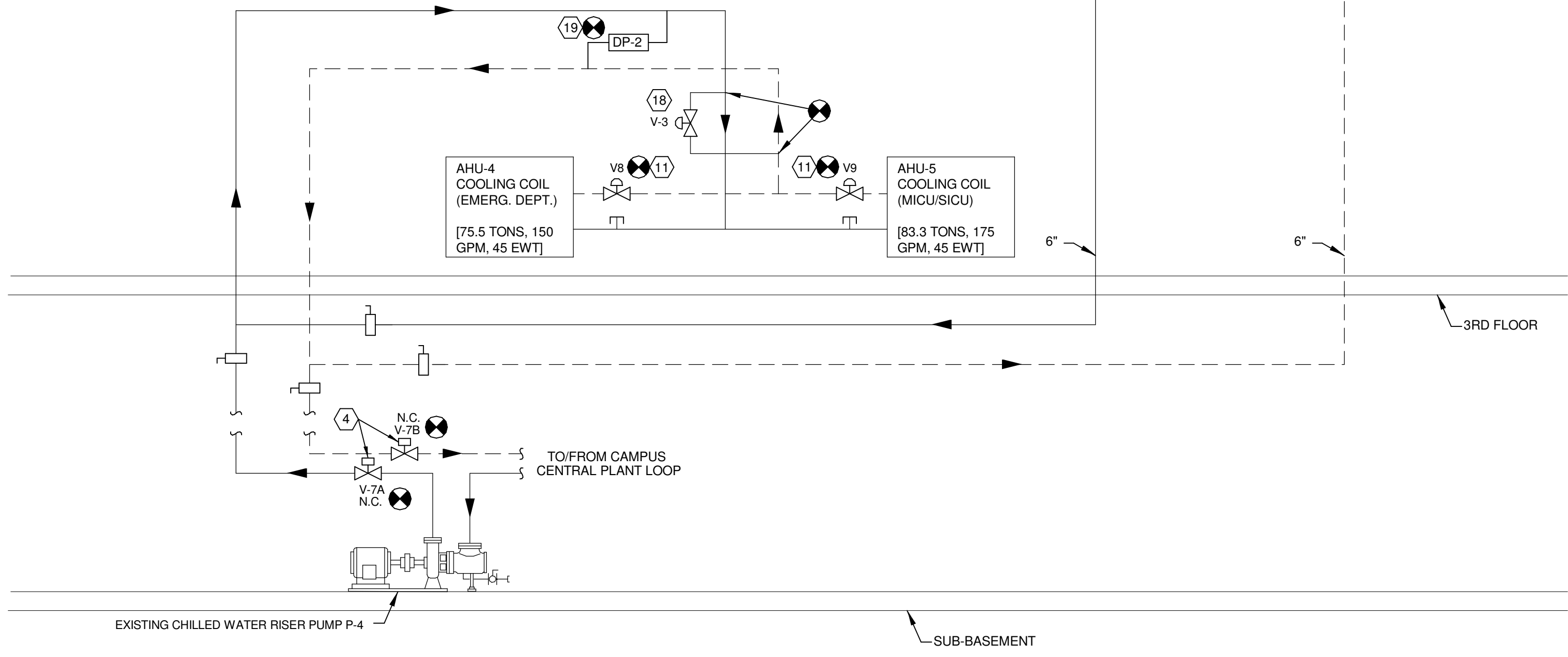
three inches = one foot  
one and one-half inches = one foot  
one inch = one foot  
three-quarters inch = one foot  
one-half inch = one foot  
three-eighths inch = one foot  
one-quarter inch = one foot  
one-eighth inch = one foot



# GENERAL NOTES

- A REFER TO SHEET ME001 FOR LEGEND ABBREVIATIONS, AND ADDITIONAL GENERAL NOTES.
- B IN GENERAL, LIGHT LINEWEIGHTS ON THIS SHEET INDICATE EXISTING WORK TO REMAIN, AND HEAVIER LINEWEIGHTS INDICATE NEW WORK.
- NOTES
- 1 FLEXIBLE PIPE CONNECTION.
- 2 PROVIDE ALUMINUM JACKET AND HEAT TRACE ON ALL EXTERIOR PIPING. REFER TO SPECIFICATIONS.
- 3 SUCTION DIFFUSER WITH BUILT IN STRAINER.
- 4 UNDER DEDUCT ALTERNATE #2 (BID ITEM #3), DELETE THIS CONTROL VALVE FROM THE SCOPE OF THE PROJECT.
- 5 MANUAL AIR VENT WITH SHUT-OFF VALVE.
- 6 PROVIDE HOSE CONNECTION AND SCREW-ON CAP.
- 7 SPRING ISOLATION RAIL - REFER TO DETAIL ON SHEET M601.
- 8 HIGH CAPACITY AUTO. AIR VENT. EXTEND DISCHARGE TO FLOOR DRAIN.
- 9 PROVIDE 12" MINIMUM DROP ANTI-THERMOSYPHON LOOP TO PREVENT GRAVITY HEATING OF TANK.
- 10 PROVIDE 4" HIGH CONCRETE HOUSEKEEPING PAD.
- 11 UNDER DEDUCT ALTERNATE #3 (BID ITEM #4), DELETE REPLACEMENT OF THIS CONTROL VALVE FROM THE SCOPE OF THE PROJECT.
- 12 UNDER DEDUCT ALTERNATE #1 (BID ITEM #2), DELETE THIS PIPING FROM THE SCOPE OF THE PROJECT.
- 13 PROVIDE DIFFERENTIAL PRESSURE SENSOR. REFER TO FLOOR PLAN ON SHEET ME104 FOR LOCATION AND CONTROL SEQUENCES ON SHEET M601.

- 14 INSTALL PUMP ON EXISTING CONCRETE INERTIA BASE.
- 15 PROVIDE TWO-POSITION CHILLER ISOLATION CONTROL VALVE. REFER TO FLOOR PLAN ON SHEET ME104 AND CONTROL SEQUENCES ON SHEET M601.
- 16 PROVIDE NEW MAKE-UP WATER PRESSURE REDUCING VALVE.
- 17 PROVIDE NEW SAFETY RELIEF VALVE.
- 18 PROVIDE 2-WAY MODULATING DDC CONTROL VALVE TO MAINTAIN MINIMUM FLOW OF AIR COOLED CHILLERS AND ASSOCIATED PUMPS. REFER TO FLOOR PLAN ON SHEET M100 AND CONTROL SEQUENCE ON SHEET M601.
- 19 PROVIDE DIFFERENTIAL PRESSURE SENSOR. REFER TO FLOOR PLAN ON SHEET M100 AND CONTROL SEQUENCE ON SHEET M601.
- 20 DDC TEMPERATURE SENSOR. REFER TO CONTROL SEQUENCE ON SHEET M601.
- 21 FLOW SWITCH. REFER TO CONTROL SEQUENCE ON SHEET M601.



## CHILLED WATER SYSTEM SCHEMATIC - NEW WORK

SCALE: NONE

|          |      |              |   |  |                      |  |  |  |   |   |
|----------|------|--------------|---|--|----------------------|--|--|--|---|---|
| Revision | Date | CONSULTANTS: | <b>Heapy Engineering</b><br>MEP Design Technology Planning Commissioning Energy<br><i>Nationally Recognized Leader in Sustainability</i><br>1400 W Dorothy Lane, Dayton, OH 45409-1310<br>Ph 937-224-0861 Fax 937-224-5777 www.heapy.com<br>Heapy Project No.: 2016-04003 Firm License No.: 01528 |  | ARCHITECT/ENGINEERS: | <b>LEVIN PORTER ARCHITECTS</b><br>3011 NEWMARK DRIVE MIAMISBURG, OHIO 45342<br>P: 937.224.1931 F: 937.224.3091<br>www.levin-porter.com<br>Levin Porter Associates Inc. dba Levin Porter Architects | Drawing Title<br><b>CHILLED WATER PIPING AND CONTROLS SCHEMATIC - NEW WORK</b><br>Approved: Project Director | Project Title<br><b>Replace Operating Room Chillers</b><br>Location<br><b>Cincinnati, Ohio</b><br>Date<br>5/1/2017<br>Checked<br><b>BGA</b><br>Drawn<br><b>JAC</b> | Project No.<br>VA Project No. 539-18-203<br>LPA Project No. 62131.00<br>Building Number<br><b>1</b><br>Drawing Number<br><b>M603</b><br>Dwg. of | <b>Office of Construction and Facilities Management</b><br> |
|----------|------|--------------|---|--|----------------------|--|--|--|---|---|





(3)



4



1. REPLACE 300A/3P BREAKER WITH A 600A/3P BREAKER.
2. CHILLER PUMP STARTERS. REMOVE AND REPLACE WITH NEW VFD'S.
3. (4) ANTI-BIRD SOUND DEVICES. REMOVE AND SAVE FOR REPLACEMENT ON NEW CHILLERS.
4. REPLACE VFD FOR PUMP "CWP-4". 15 HP 480V, 3P.



- a. DEDUCT #1 (BID ITEM #2): "PROVIDE ALL ITEMS UNDER BID ITEM #1 - EXCEPT DELETE ALL LABOR AND MATERIALS ASSOCIATED WITH REPLACEMENT OF VFD AND ASSOCIATED DDC CONTROL WORK FOR EXISTING SUB-BASEMENT CHILLED WATER RISER PUMP P-4, SERVING AHU-4 & 5, AND DELETE ALL LABOR AND MATERIALS ASSOCIATED WITH PIPING REVISIONS TO EXISTING MULTISTACK SIDESTREAM HEAT RECOVERY CHILLER PIPING IN 4TH FLOOR PENTHOUSE."



①

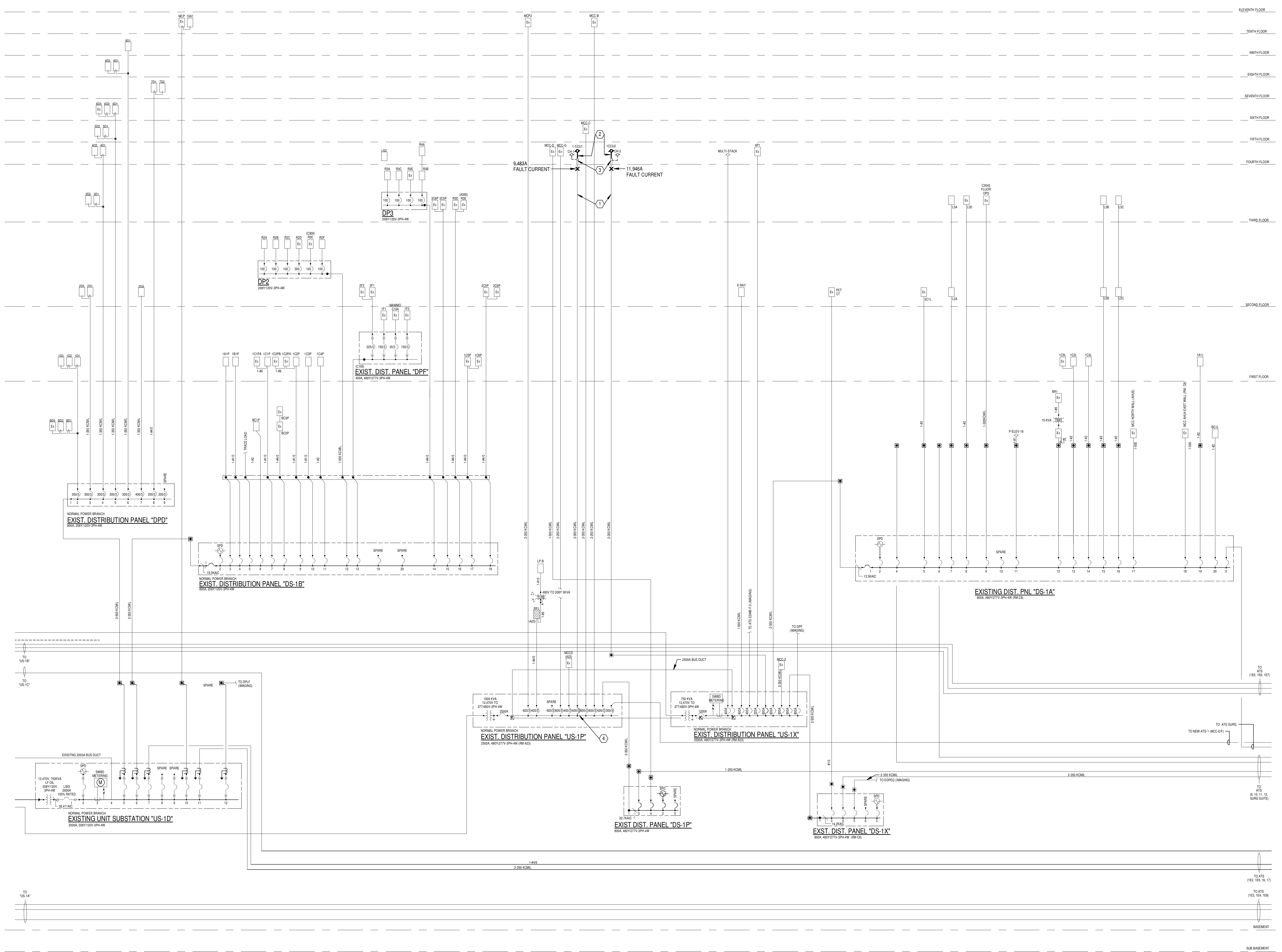


③

Revision



Scale bars and grid lines (A through L, 1 through 9) are provided for reference.



- ELECTRICAL NOTES**
- EXISTING CIRCUIT TO 600A DISCONNECT.
  - EXTEND CONDUIT AND WIRE TO NEW CHILLER. (2 SETS) 3#300 kcmil, #1 GRD., 2 1/2" C.
  - REPLACE FUSES WITH 600A LPS FUSE.
  - REPLACE 300A/3P BREAKER WITH A 600A/3P BREAKER. FIELD VERIFY BREAKER TYPE.

**1 SINGLE-LINE DIAGRAM**

|          |      |              |  |  |                      |   |                                |                  |                                 |                 |   |      |  |
|----------|------|--------------|--|--|----------------------|---|--------------------------------|------------------|---------------------------------|-----------------|---|------|--|
| Revision | Date | CONSULTANTS: | <b>Heapy Engineering</b><br>MEP Design Technology Planning Commissioning Energy<br>Nationally Recognized Leader in Sustainability<br>1400 W Dorothy Lane, Dayton, OH 45409-1310<br>Ph 937-224-0861 Fax 937-224-5777 www.heapy.com<br>Heapy Project No.: 2016-04003 Firm License No.: 01528 |  | ARCHITECT/ENGINEERS: | <b>LEVIN PORTER ARCHITECTS</b><br>3011 NEWMARK DRIVE<br>MIAMI, FL 33133<br>P: 305.224.1931<br>F: 305.224.3091<br>www.levin-porter.com<br>Levin Porter Associates Inc. dba Levin Porter Architects | Drawing Title                  |                  | Project Title                   |                 | Project No.   |      | Office of Construction and Facilities Management<br>Department of Veterans Affairs |
|          |      |              |  |  |                      |   | ELECTRICAL SINGLE-LINE DIAGRAM |                  | Replace Operating Room Chillers |                 | VA Project No. 538-18-203<br>LPA Project No. 62131.00 |      |  |
|          |      |              |  |  |                      | Location  |                                | Cincinnati, Ohio |                                 | Building Number |   | 1    |  |
|          |      |              |  |  |                      | Approved: Project Director  |                                | Date             |                                 | Checked         |   | MSG  |  |
|          |      |              |  |  |                      |   |                                | 5/1/2017         |                                 | Drawn           |   | JB   |  |
|          |      |              |  |  |                      |   |                                |                  |                                 | Drawing Number  |   | E601 |  |
|          |      |              |  |  |                      |   |                                |                  |                                 | Dwg. of         |   |      |  |