NTUA Headquarters Complex Office Building

Fort Defiance, Arizona
Dyron Murphy Architects Project No. 2015.05

ADDENDUM No. 3

November 11, 2016

This addendum forms part of the Contract Documents and modifies the Bid Documents dated, October 6, 2016, as noted below. All Bidders must acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.

BIDDER QUESTIONS:

1. Regarding Glass Railing Assembly at Stair S1. Elevations A3, A5, A6/A304 show lay-outs and materials for this. The hand rail is called out as 05 5000.G1, "Aluminum, Brushed Anodized" Spec Section 05-7300 Glass Railing Assemblies call for 304 Stainless Steel at

1) Top Guard Rails
2) Handrails
3) End Post/Balustrade Post
4) Exposed Bottom Rails: Extruded aluminum structural member, brushed finish to match top rail…Which material are they to be, Brushed Aluminum or Brushed Stainless Steel?

At interior stairs, S1, hand rail system to be per specification section 05 7300 Glass Railing Assemblies.

2. The specs call for the Top Rail to be 1 ½" dia. Round w/ a channel for glass. Detail A6/A311 shows a Square Top Rail at the Glass Railing. Which is correct?
Provide 1-1/2 inch diameter round top rail as noted in specifications.

3. In Addendum #2 it was stated that the IT Server room was to receive a Dry System. Just want to confirm you did not mean a Pre-Action Fire Sprinkler System complete with Detection, as this is the typical preference for Server Rooms. Please confirm?
Provide system as noted on Addendum No. 2.

4. There are three major steel curtain wall manufacturers in the US. They each make very different shapes and sizes. Was a particular manufacturer required?
A particular manufacturer is not required. Design as shown on drawings is based on TGP (Technical Glass Products) as basis of design. Bidder is responsible to submit design to meet the design intent and requirements.

5. Exterior frame type K at office 1432 (A101c) is not present in elevation K (C6/A605). Should this be frame type U?
Window type at Office 1432, south wall, and as shown on elevation E5/A203 to be Window Type 'U'. However, window type to be 9'-0" height at this location only.

6. There is a window type at exterior wall of Offices 1428 thru 1431 which has no tag (lower right of elevation E5/A203)?
Window type is missing from Window Types. Refer to attached sketch with required dimensions and information.

7. Cannot find aluminum frame type T?
Window type 'T' is not used.

8. There is an aluminum-framed sliding pocket door (type N) but no spec for this door type?
The requirements of the wood sliding door system are to be per the drawings and specification section 08 1416 Flush Wood Doors. The track requirements and other components are noted in the Door Hardware Schedule and specification section 08 7100.

9. Fire-rated doors #1311, 1411, 1529, 1810a, 2211, 2318, 2423A2423B, C01b, S2B, and V02a are scheduled as aluminum frames (doors also at some of them). Is this correct? Fire-rated aluminum costs about $300/sq.ft. and $12,000 per door leaf.
Doors at locations noted are wood doors per the Door Schedule. Provide as indicated on drawings.

10. There is a spec section for aluminum sun shades (10 7113), but none appear on the plan elevations or wall sections. Where are these located?
The aluminum sun shades, 10 7113, are clearly shown on the various building elevations, building sections, wall sections and details.

11. Frame types XX are listed as "Clerestory Windows at Lobby". There isn't a clear view anywhere which shows how many of each window type is required?
The location and quantities of window types 'XX' are clearly shown on sheet A102c and E5/A405.

12. Cannot find frame type Y.
Window type 'Y' is not used.

13. The other question has to do with the 'k' class extinguisher. The spec 10 4400, 2.02, C7 says there are (3) required. I only saw one in the kitchen (G101). Could you provide the page(s) that show the other locations? There are two (2) locations shown on G101c in the Ktichen/Serving area. The third location will be determined at a later date.

14. Sheet A101A note indicates to "provide 3"-4" size smooth black river rock below all of stair S1, 3" deep. Coordinate with landscaping where black river rock extends to exterior. I do not see where the landscape plans address this item. Please provide sketch to define area of black river rock.
Refer to attached sketch for extent of river rock on the exterior.

15. Sheet A101B Meeting Room A 1814: Note indicates there is a motorized projector lift, but does not note a projector. Are we to provide a projector at every projector lift location? Please confirm and provide spec. for projector.
Projectors will be provided by Owner.

16. Is there going to be a VoiP Telephone system to be installed and if so, what is the manufacturer?
The VoiP telephone system will be provided by Owner.

17. Is there a wage determination rate through Navajo Nation for the low voltage portion to bid?
All wages are per wage rate included in the bid documents.

18. On page 10 of the Instructions to Bidders, section 8.1 Submission Materials, I cannot find a Certification Form in the bid documents. Please advise.
The letter of certification is to be provided by the bidder/contractor on their company letterheard indicating compliance with the requirements noted in the section.

19. Will the state/county tax be required on top of the Navajo Nation Tax, or will only the Navajo 5% Tax be required?
The Navajo Nation 5% service tax is what is required with the project located on Navajo. The companies are responsible for the cost of other taxes associated with it business transactions, ie state or county. Those taxes may be more associated with the material cost, which are not purchased on the Navajo Nation.

20. Will there be Federal Funds involved in the project that will require Davis Bacon Wages Rates, or should the Wage Rates listed be used?
With RUS loans the Davis Bacon Wage Rates are not required—the Wage Rate listed should be used.

21. Is the gas line going to the Hogan listed in the Allowance #2 included in the Base Bid or is it accounted for in the Allowance.
The extension of the gas line to the Hogan is part of the allowance and should be accounted for in that cost. Refer to sheet C201 for point of termination and extension.

22. Is there a specification for the Wood Stair Treads and landing that can be provided.
The requirements for the wood treads are included in the specification section 05 5100 Metal Stairs.

23. Please clarify what the edge conditions are to be for the gravel mulch ground cover that is shown on the Landscaping plans sheet L200-L202. There is currently no callout as to if we are to provide metal or concrete edger at the edge of the edge of the landscape rock mulch or between the two different types of rock mulch.
There are no edge conditions between the various gravel materials.

24. On L201, there appears to be no rock mulch at the plantings along the north edge of the parking lot along the fence as well as around the fleet vehicle parking lot, please confirm that there is not rock mulch at these locations.
Provide 1" Sierra Rose gravel mulch (as indicated on Material Schedule on L202) at the north edge of the parking lot between the curb and fence.
Rock mulch is not required around the fleet vehicle parking.

25. Please clarify if detail B5/S301 applies to the foundation required for the mechanical equipment enclosure, as the schedule provided on S701 only provides foundation sheets for walls that extend up to 10' above grade only. The Mechanical Equipment Enclosure is called out to be 16' tall walls. Please clarify.
Refer to revised sheet S601 provided as part of Addendum No. 1 for revised information regarding the mechanical enclosure. In addition, refer to Addendum No. 1 for correct wall height (18'-0").

26. A4/A404, there is a callout for SS-1 pointing to the wall as if there is to be a solid surface backsplash between the countertop and wall cabinet, however, there cut section that are provided do not show a detail for this condition. Please provide a detail with the solid surface backsplash if that is the intent.
Provide solid surface backsplash at locations noted on the drawings and schedules. Attachment to wall to be per manufacturer recommendations.

27. On the above mentioned hardware spec, there is no hardware sets for Doors C09 and C10. Also, Doors G01a, G01b, and 1810e are not on the door schedule. Please advise.
Doors C09 and C10 are to be deleted.
Doors G01 and G01b are hardware set 4 as noted on the hardware schedule (specification section 08 7100). These are exterior doors to the mechanical enclosure and service yard enclosure.
Door 1810e is hardware set 36 as noted on the hardware schedule (specification section 08 7100). Door is located in Kitchen (Alternate 01).

DRAWING + SPECIFICATION CLARIFICATIONS:

CIVIL:
1. Refer to civil addendum included herein.
- Bidder questions clarifications.
- Revised specification section 21 4123B

MECHANICAL:
1. Refer to mechanical and plumbing addendum included herein.
- Revised sheets: M003, M101a, M101b, M101c, M102a, M102b, M102c, M104, M501, M502, P002, P101a, P101b, P101c, P102a, P102b, P102c, P111c, P112c, P304, P401.

ELECTRICAL:

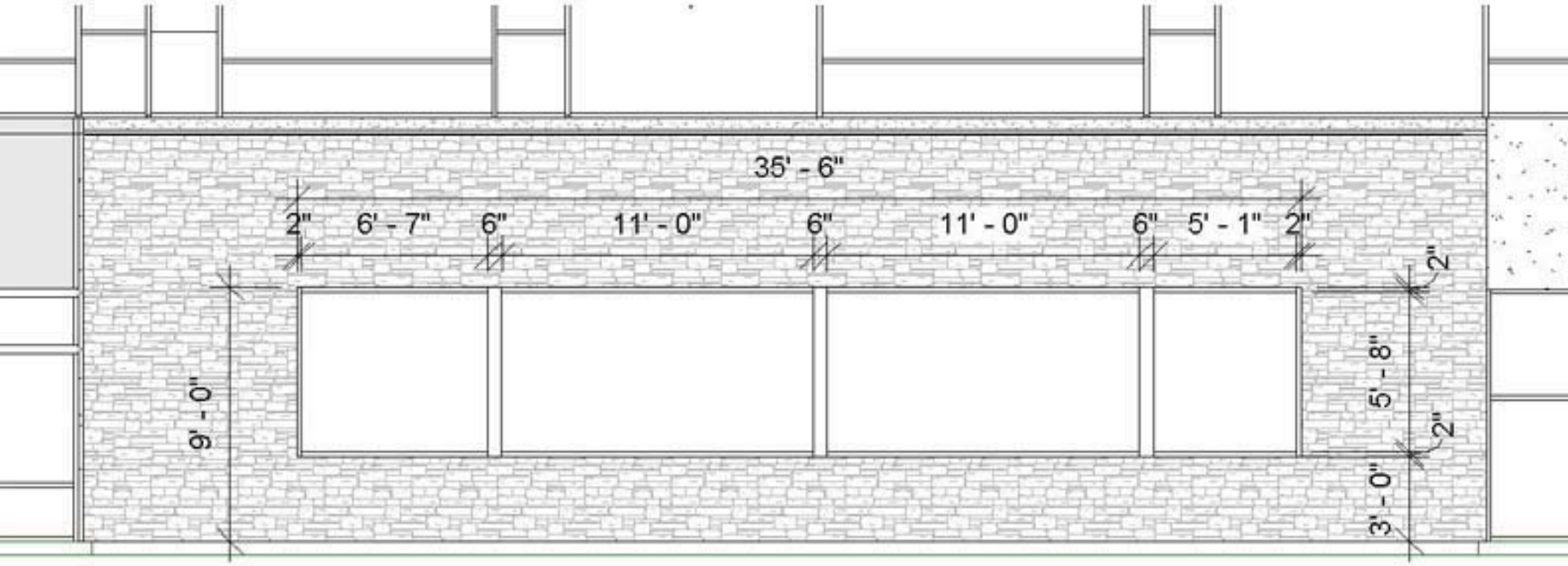
1. Refer to electrical addendum included herein.
    - Bidder questions clarifications.

END OF ADDENDUM NO.3

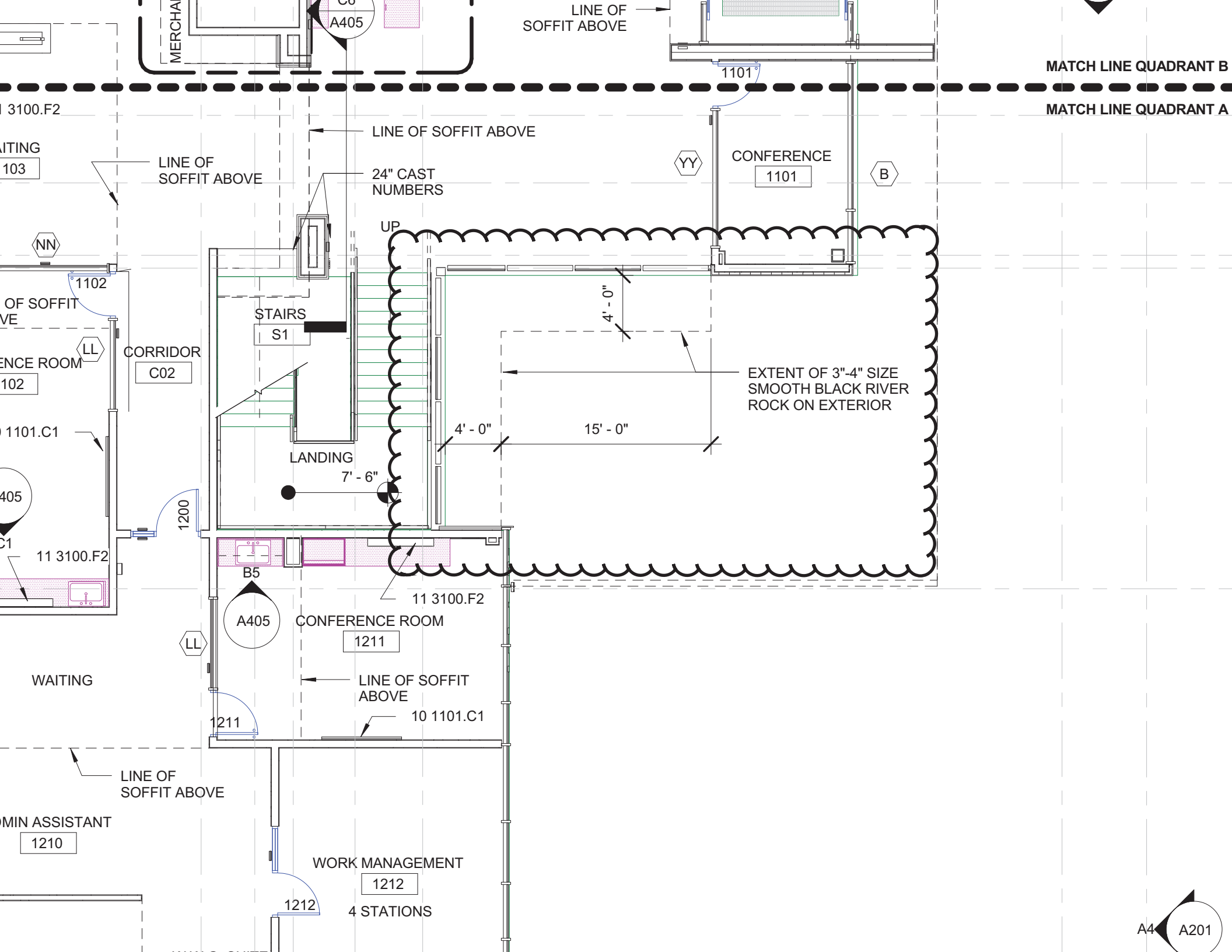
Oscar Tovar, Project Manager
Dyron Murphy Architects, P.C

Attachments:

1. Architectural sketches.
2. Civil addendum.
3. Mechanical addendum.
4. Electrical addendum



ALUMINUM STOREFRONT SYSTEM
GLAZING: IG-1
ELEVATION E5/A203 (OFFICES 1428-1431)
ADDENDUM NO. 3


MERCHA
C6
A405
LINE OF
SOFFIT ABOVE
1101
MATCH LINE QUADRANT B
MATCH LINE QUADRANT A
3100.F2
ITING
103
LINE OF SOFFIT ABOVE
LINE OF
SOFFIT ABOVE
24" CAST
NUMBERS
YY
CONFERENCE
1101
B
UP
NN
1102
OF SOFFIT
VE
STAIRS
S1
LL
CORRIDOR
C02
ENCE ROOM
102
1101.C1
4' - 0"
EXTENT OF 3"-4" SIZE
SMOOTH BLACK RIVER
ROCK ON EXTERIOR
4' - 0"
15' - 0"
LANDING
7' - 6"
405
1200
C1
11 3100.F2
B5
A405
11 3100.F2
CONFERENCE ROOM
1211
LL
WAITING
LINE OF SOFFIT
ABOVE
1211
10 1101.C1
LINE OF
SOFFIT ABOVE
OMIN ASSISTANT
1210
WORK MANAGEMENT
1212
1212
4 STATIONS
A4
A201

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November 9, 2016

Oscar Tovar
Sr. Project Manager
Dyron Murphy Architects, P.C.
4505 Montbel Place NE
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Re: NTUA HQ – Addendum 02
REVISED Responses to Comments

SPECIFICATIONS

Questions from Engineering America

The following comments are:

1. 1.03 Qualifications item D. and E. to be removed and replaced with: The tank manufacturer shall submit with bid that it is compliant with EPA AIS; steel sheets made from American steel.

   Response: Modify Specification 1.03.D to the following:

   "D. Certification from the tank manufacturer that all steel and aluminum used for the tank shall be smelted and produced in the U.S.A., or is otherwise compliant with American Iron and Steel Guidelines, as defined by the US EPA for Clean Water State Revolving Fund projects. Contractor shall provide all documentation for this certification or compliance.

   1. Only bids from manufactured tank suppliers who comply with this subsection and have successfully pre-qualified will be considered."

3. 1.07 Coatings item 4.a. and 5.a.b. remove and replace CST Storage with: Tank Manufacture.

   Response: Modify 5a and 5b to the following (4a was previously modified):

   '5. Measurement of Color

   a. The exterior color of the sheets shall be measured using a colorimeter approved by Manufacturer. The colorimeter shall have a valid calibration record.

   b. The color must fall within the tolerance specified by Manufacturer; else the panel shall be rejected."

SECTION 21 41 23 B
BOLTED STEEL TANK

PART 1 GENERAL

1.01 SCOPE

Furnish and erect a glass-fused-to-steel bolted water storage tank, including foundation, tank structure and tank appurtenances as shown on the Drawings and described herein.

A. All required labor, materials and equipment shall be included.

B. All materials furnished by the tank manufacturer, which are in contact with the stored water shall be certified and listed by the National Sanitation Foundation (NSF) to meet ANSI/NSF Additives Standard No. 61. Certification of a coating type alone will not be sufficient to meet this requirement.

1.02 REFERENCES

A. SSPC SP-10 - Surface Preparation Standard – Near-White Metal Blast Cleaning

B. ASTM C633-79 - Standard Test Method for Adhesion or Cohesive Strength of Flame-Sprayed Coatings

C. ISO 28706-1:2008 – Vitreous and Porcelain Enamels – Determination of Resistance to Chemical Corrosion

D. ISO 2859 – Sampling Procedures for Inspection by Attributes

E. EN 14430:2004 – Vitreous and Porcelain Enamels – High Voltage Test

F. ISO 6370-2 – Vitreous and Porcelain Enamels – Determination of Resistance to Abrasion

1.03 QUALIFICATIONS OF TANK SUPPLIER

A. The Engineer's selection of factory applied glass-fused-to-steel bolted tank construction for this facility has been predicated upon specific criteria, construction methods, and an optimum coating for resistance to internal and external tank corrosion. Deviations from the specified design, construction or coating details, will not be permitted.

B. The tank manufacturer shall submit with its proposal a drawing showing major dimensions and plate thickness upon which the bid is based and a site specific foundation design based on the soils report showing preliminary dimensions and approximate quantities of concrete and reinforcing steel. The tank and foundation drawings shall be signed and sealed by a Professional Engineer licensed in the state of Arizona.

C. Strict adherence to the standards of design, fabrication, erection, product quality, and long term performance established in this Specification will be required by the Owner and Engineer.

D. Certification from the tank manufacturer that all steel and aluminum used for the tank shall be smelted and produced in the U.S.A., or is otherwise compliant with American Iron and Steel Guidelines, as defined by the US EPA for Clean Water State Revolving Fund projects. Contractor shall provide all documentation for this certification or compliance.

1. Only bids from manufactured tank suppliers who comply with this subsection and have successfully pre-qualified will be considered.

E. The Engineer reserves the right to evaluate all bids based on long term, 50-year minimum operation, coatings and maintenance costs. Values to be used in this evaluation will be at the discretion of the Engineer, as detailed in this specification and bid tabulation form. The Engineer will add such costs, dependent upon the type of tank offered, to the bidder's price to determine the effective low bid for purposes of making the award.

1.04 RELATED WORK

A. Section 21 41 23 – Fire Protection Tank

1.05 DESIGN CODES AND GUIDES

A. The most recent editions of the publications listed in the following text form a part of the specification to the extent referenced. The publications are referred to by the following abbreviation:

1. ANSI/AWWA D103 – Standard for Factory Coated Bolted Steel Tanks.
2. NFPA 22 – Water Tanks for Private Fire Protection.
3. 2009 NFPA 5000 - Building Construction and Safety Code
4. IBC 2006 - International Building Code
   a. ASCE 7-05 - Minimum Design Loads for Buildings and Other Structures
   b. ACI 318-05 - Building Code Requirements for Structural Concrete

B. Specific design criteria in addition to that specified on the contract drawings:

1. Occupancy and Use Category: IV – Fire Suppression Facility
2. Minimum frost depth: 30 inches
3. Minimum thickness: 20 inches
4. Allowable soil bearing pressure (on engineered fill): 2,500 psf
5. Foundation type: Reinforced Concrete Bottom with Embedded Steel Base Setting Ring per Paragraph 1.09.A of this Section.

1.06 SUBMITTALS

The following shall be submitted in accordance with Administrative Requirements of the project, Section 01 3000 of the Project Manual.

A. Shop Drawings:

1. Dimensioned tank fabrication drawings indicating all appurtenances with necessary plan and elevation views.
2. Engineering calculations for tank and foundation by registered professional engineer in the State of Arizona.
3. Tank foundation plan.
4. Tank foundation materials of construction.
5. Include the following tank finish data:
   a. Manufacturer's standard product data, performance characteristics and material safety data sheet.
   b. List of materials to be used under this section.
   c. Exception to or deviations from specified requirements, if any, and reasons for same.

B. Tank inspection report including test results.

C. Tank manufacturer qualifications including listing of 3 similar installations within the last 5 years.

D. Operations and Maintenance manual.

E. Tank Warranty.

F. Certification from the tank manufacturer that the tank meets the requirements of the standards listed in Section 1.03.

1.07 COATING

A. GLASS COATING

The tank shall be provided with a glass fused-to-steel coating per AWWA D103.

B. FACTORY INSPECTION

1. The manufacturer's quality system shall be ISO 9001 certified and refer to ISO (International Organization for Standardization) for the following testing and procedures.
2. Chemical Resistance of Glass Coating
    a. Frits shall be individually tested in accordance with pertinent sections of ISO 28706-1:2008.
3. Factory Holiday Test
    a. A dry volt test using a minimum of 1100 volts is required.
    b. Frequency of the test shall be every sheet. Any sheet registering a discontinuity on the interior surface of floor shall be rejected.
4. Measurement of Glass Thickness
    a. Glass thickness shall be measured using an electronic dry film thickness gage (magnetic induction type) approved by Manufacturer. The thickness gage shall have a valid calibration record.
    b. The thickness of the glass shall be between 10.0 and 18.0 mils (0.010 and 0.018 inches).
5. Measurement of Color
    a. The exterior color of the sheets shall be measured using a colorimeter approved by Manufacturer. The colorimeter shall have a valid calibration record.
    b. The color must fall within the tolerance specified by Manufacturer; else the panel shall be rejected.
6. Impact Adherence Test
    a. The adherence of the glass coating to the steel shall be tested in accordance with ISO standards. Any sheet that has poor adherence shall be rejected.
7. Fishscale Test
    a. The glass coating shall be tested in-house for fishscale by placing the full size production sheets in an oven at 400º F for one hour. The sheets will then be examined for signs of fishscale. Any sheet exhibiting fishscale shall be rejected and all sheets from that gage lot will be similarly tested.

1.08 SHIPPING AND HANDLING

A. All sheets that pass Factory Inspection and Quality Control checks shall be protected from damage prior to packing for shipment.

B. Heavy paper or plastic foam sheets shall be placed between each panel to eliminate sheet-to-sheet abrasion during shipment.

C. Individual stacks of panels will be wrapped in heavy mil plastic and steel banded to special wood pallets built to maintain the roll-radius of the tank panels and minimize contact or movement of finished panels during shipment.

D. Shipment from the factory will be by truck, hauling the tank components exclusively.

1.09 ERECTION

A. FOUNDATION

1. The tank foundation shall be either:
    a. Type 1, Steel-bottom tanks supported on ringwalls per AWWA D103.

    Or

    b. Type 6, Concrete-bottom with embedded steel base setting ring per AWWA D103
2. The tank foundation is a part of this contract and shall be installed by the Authorized

Tank Dealer. A site specific foundation design signed and sealed by a Professional Engineer licensed in the state of Arizona, based on the soils report, shall be submitted for review and approval.

3. The tank foundation shall be designed by the manufacturer to safely sustain the structure and its live loads.

4. Tank footing design shall be based on the soil bearing capacity given in the geotechnical report. Copies of the soil report are to be provided to the bidder prior to bid date by the Owner or Engineer.

B. Sidewall Structure

1. Field erection of the glass-coated, bolted-steel tank shall be in strict accordance with the procedures outlined in the manufacturer's erection manual, and performed by an authorized dealer of the tank manufacturer, regularly engaged in erection of these tanks, using factory trained erectors.

2. Specialized erection jacks and building equipment developed and manufactured by the tank manufacturer shall be used to erect the tanks.

3. Particular care shall be taken in handling and bolting of the tank panels, structural members, and appurtenances to avoid abrasion of the coating system. Prior to a liquid test, all surface areas shall be visually inspected by the Engineer.

4. No backfill shall be placed against the tank sidewall without prior written approval of the tank manufacturer. Any backfill allowed shall be placed according to the strict instructions of the tank manufacturer.

C. Roof

1. The roof shall be a structurally supported dome roof per AWWA D103.

a. The dome shall be clear span and designed to be self-supporting from the periphery structure with primary horizontal thrust contained by an integral tension ring.

b. The dome and tank shall be designed to act as an integral unit. The tank shall be designed to support an aluminum dome roof including all specified live loads.

2. Roof Vent

a. A properly sized vent assembly in accordance with AWWA D103 shall be furnished and installed above the maximum water level of sufficient capacity so that at maximum design rate of water fill or withdrawal, the resulting interior pressure or vacuum will not exceed ½ inch water column.

b. The overflow pipe shall not be considered to be a tank vent.

c. The vent shall be constructed of aluminum such that the hood can be unbolted and used as a secondary roof access.

d. The vent shall be so designed in construction as to prevent the entrance of birds and/or animals by including an expanded aluminum screen (½ inch) opening. An insect screen of 23 to 25 mesh polyester monofilament shall be provided and designed to open should the screen become plugged by ice formation.

D. APPURTENANCES

1. Pipe Connections

a. Where pipe connections are shown to pass through tank panels, they shall be field located, saw cut, (acetylene torch cutting or welding is not permitted), and utilize an interior and exterior flange assembly. Tank shell reinforcing shall comply with AWWA D103 latest edition. A single component urethane sealer shall be applied on any cut panel edges or bolt connections.

b. Overflow piping shall be sized as shown on the Drawings and shall be seamless aluminum tubing.

2. Outside Tank Ladder

a. An outside tank ladder shall be furnished and installed as shown on the submittal drawings.

b. Ladders shall be fabricated of aluminum and utilize grooved, skid-resistant rungs.

c. Safety cage and step-off platforms shall be fabricated of galvanized steel. Ladders shall be equipped with a hinged lockable entry device.

3. Shell Manways

a. One bottom access door shall be provided as shown on the submittal drawings in accordance with AWWA D103.

b. The manhole opening shall be a minimum of 30 inches in diameter. The access door (shell manhole) and the tank shell reinforcing shall comply with AWWA D103 latest edition, Sec. 5.1.

4. Cathodic Protection

a. A passive cathodic protection system shall be designed and supplied by the tank manufacturer based upon information supplied by the Engineer or Owner.

E. HYDROSTATIC FIELD TESTING

1. Following completion of erection and cleaning of the tank, the structure shall be tested for liquid tightness by filling tank to its overflow elevation.

2. Any leaks disclosed by this test shall be corrected by the authorized dealer in accordance with the manufacturer's recommendations.

3. Water required for testing shall be furnished by the Owner at the time of tank erection completion, and at no charge to the tank erector. Disposal of test water shall be the responsibility of the Owner.

4. Labor and equipment necessary for hydrostatic tank testing is to be included in the price of the tank.

F. TANK MANUFACTURER’S WARRANTY

The tank manufacturer shall include a warranty for the tank materials and coating. As a minimum, this warranty shall provide assurance against defects in workmanship and materials, under normal and proper use, maintenance and operation, during the period expiring on the earlier of (i) one year after liquid is first introduced into the tank or (ii) 14 months after shipment from the factory.

The manufacturer shall further warrant that the glass coated product zone surfaces (that portion of the tank interior below the normal high elevation of the contained liquid) will not corrode, under normal and proper use, maintenance and operation, during the period expiring on the earlier of (i) 12 months after liquids is first introduced into the tank or (ii) 14 months after shipment from the factory.

ArSed Engineering Group, LLC.

Date: November 10, 2016

Project: NTUA-HQ COMPLEX OFFICE BUILDING
Fort Defiance, Arizona

AEG Project #: 15037

From: Brian Arnold, P.E.

Re: ADDENDA #03
- Mechanical & Plumbing Revisions to ISSUE FOR CONSTRUCTION Documents

This Addendum revises the documents for the Issue For Construction (IFC) documentation, issued October 06, 2016. This Addendum modifies portions of the original IFC documents as noted below, and forms a part of the IFC documents. All other items included in the original IFC documents remain in effect for this Project.

DOCUMENT:	DESCRIPTION:
Drawing M003 MECHANICAL EQUIPMENT SCHEDULES	- ADDS: At WSHP Schedule: SMOKE DETECTORS AT ALL UNITS DUCTED FILTER RACK SECTION – FACTORY PROVIDED
Drawings M101a M101b M101c M102a M102b M102c MECHANICAL HVAC PLANS	- ADDS: RETURN AIR OPENINGS THRU WALLS, ABOVE CEILINGS.
Drawing M104 MECHANICAL HVAC PLAN ADDITIVE ALT #02	- ADDS: MECHANCIAL HEAT PUMP WATER PIPING
Drawing M501 MECHANICAL BUILDING AUTOMATION SYSTEM	- ADDS: Detail M1 / M501: Electrical Power Monitor – NORMAL / EMERGENCY Detail M4 / M501: Outdoor Air Temperature (dry-bulb and wet-bulb)
Drawing M502	- REVISES: Detail M2 / M502 – revises ERV Points List Schedule

MECHANICAL BUILDING AUTOMATION SYSTEM	- ADDS: Detail M3 / M502: AC-101 & AC-102 HVAC at IT Server Room [1113] Detail M4 / M502: AC-103 at Call Center Room [1700] Detail M5 / M502: AC-105 at Electrical Room [ELEC1] Detail M6 / M502: AC-104 at UOC [1610] and Programmer [1611] Detail M7 / M502: Split-System Cooling Units at IT Closet [1114]; ELEV EQUIP [1107]; IT Closet [2116]; IT Closet [2410] -
Drawing P002 PLUMBING SCHEDULES	- RE-ISSUE THE ENTIRE DRAWING FOR CLARIFICATION
Drawings P101a P101b P101c P102a P102b P102c WASTE PIPING PLANS – Levels 1 & 2	- ADDS: Condensate piping for Water Source Heat Pump Units
Drawing P111c PLUMBING WATER & GAS PLAN – Level 1	- ADDS: Water piping (CW & HW) up to sinks on 2nd floor above.
Drawing P112c PLUMBING WATER & GAS PLAN – Level 1	- ADDS: - Sink Designations - Water piping (CW & HW) up to sinks on 2nd floor above
Drawing P304 PLUMBING FITNESS CENTER ADDITIVE ALT #02	- ADDS: Condensate piping for Water Source Heat Pump Units
Drawing P401 PLUMBING DETAILS	- ADDS: Condensate drain at trap for Lav detail - REVISES: Water Heater Flue Vent Detail

If there are any questions or comments related to this information, do not hesitate to contact our office.

END OF MECHANICAL ADDENDA #03 ITEMS

WATER SOURCE HEAT PUMP SCHEDULE

Trane (mfgr) Model Number	Nominal capacity	Design airflow	External static press	Total static press	WATER: Fluid flow rate	WATER: Fluid PD	COOLING CAPACITY: Net total cooling cpcty	Net sens cooling cpcty	Clg EAT		Clg LAT		Clg EWT	Clg LWT	HEATING CAPACITY: Net htg cpcty	Heat of rjctn	Heat of absrpn	Htg EAT	Htg LAT	Htg EWT	Htg LWT	EFFICIENECY: EER @ AHRI	COP @ AHRI	ELECTRICAL: Clg power	Htg power	Blower power	Compressor power	Unit voltage	Min circuit ampacity	Total FLA	Max overload protection	GENERAL: Refrig charge (HFC-410A) - ckt 1	ASHRAE 90.1
		cfm	in h2o	in h2o	gpm	ft h2o	mbh	mbh	db °F	wb °F	db °F	wb °F	°F	°F	mbh	mbh	mbh	°F	°F	°F	°F	EER	COP	kW	kW	kW	kW		A	A	A	lb	
EXHF0067	1/2 ton	235	0.35	0.4	1.5	2.9	7.0	6.3	80.0	62.0	49.5	49.4	84.0	96.1	48.50	9.05	6.26	68.0	108.5	55.0	46.70	15.0	4.9	0.58	0.62	0.05	0.63	265/60/1	3.5	2.9	15	1.6	Yes
EXHF0097	3/4 ton	315	0.4	0.47	1.8	2.8	8.3	7.6	80.0	62.0	52.3	51.8	84.0	95.9	9.65	10.68	7.30	68.0	103.3	55.0	46.89	14.9	5.4	0.68	0.69	0.08	0.75	265/60/1	4.1	3.4	15	1.6	Yes
EXHF0127	1 ton	415	0.4	0.5	2.4	2.9	10.8	9.9	80.0	62.0	52.9	52.0	84.0	95.5	12.64	13.81	9.45	68.0	102.8	55.0	47.13	15.5	5.2	0.86	0.94	0.1	0.93	265/60/1	7.0	5.7	15	1.8	Yes
EXHF0157	1 1/4 ton	525	0.4	0.53	3.0	4.2	13.3	12.0	80.0	62.0	53.6	52.3	84.0	95.4	15.99	17.04	11.84	68.0	103.2	55.0	47.11	15.3	4.8	1.08	1.22	0.13	1.18	265/60/1	8.9	7.3	15	1.8	Yes
EXHF0187	1 1/2 ton	625	0.4	0.5	3.6	3.2	17.1	15.5	80.0	62.0	51.6	51.4	84.0	95.9	20.27	21.40	15.32	68.0	105.2	55.0	46.49	16.7	5.1	1.23	1.45	0.15	1.35	265/60/1	10.9	9.0	15	2.8	Yes
EXHF0247	2 ton	835	0.4	0.54	4.8	4.7	21.2	18.9	80.0	62.0	54.0	52.3	84.0	95.2	25.28	26.94	18.91	68.0	102.8	55.0	47.12	16.0	4.8	1.64	1.88	0.28	1.87	265/60/1	12.4	10.1	20	3.2	Yes
EXHF0307	2 1/2 ton	1,045	0.4	0.57	6.0	7.0	27.6	25.1	80.0	62.0	52.4	51.8	84.0	95.4	31.52	34.29	24.18	68.0	102.7	55.0	46.94	16.8	5.4	1.94	2.16	0.36	2.21	265/60/1	16.4	13.7	25	3.3	Yes
EXHF0364	3 ton	1,250	0.5	0.71	7.2	4.2	31.6	28.5	80.0	62.0	53.9	52.3	84.0	95.0	39.33	39.70	29.85	68.0	104.0	55.0	46.71	17.0	5.4	2.34	2.79	0.51	2.72	460/60/3	10.5	9.1	15	4.4	Yes
EXHF0424	3 1/2 ton	1,460	0.5	0.68	8.4	6.0	37.4	33.7	80.0	62.0	53.5	52.2	84.0	95.2	46.53	47.18	35.61	68.0	104.6	55.0	46.52	16.8	5.3	2.84	3.2	0.58	3.28	460/60/3	11.3	9.8	15	5.1	Yes
EXHF0484	4 ton	1,650	0.5	0.72	9.6	6.3	42.5	38.3	80.0	62.0	53.7	52.3	84.0	95.3	52.12	54.02	39.70	68.0	103.8	55.0	46.73	16.1	5.3	3.33	3.65	0.71	3.8	460/60/3	12.0	10.5	15	5.2	Yes
EXHF0604	5 ton	1,870	0.5	0.75	12.0	5.5	52.0	45.6	80.0	62.0	52.0	51.2	84.0	95.1	68.40	66.86	50.35	68.0	110.0	55.0	46.61	15.0	4.9	4.29	5.33	0.99	5.1	460/60/3	16.7	14.7	20	7.1	Yes
EXHF0704	6 ton	2,300	0.5	0.79	14.1	5.6	62.5	56.4	80.0	62.0	51.8	51.5	84.0	94.5	71.08	75.63	55.19	68.0	103.5	55.0	47.33	15.5	4.5	3.82	4.67	0.21	4.79	460/60/3	18.1	15.7	25	7.6	Yes

AREA "A" WSHP's

Level 1

Equip Tag	Trane (mfgr) Model Number	Nominal capacity	Design airflow (cfm)
hpA101	EXHF0187	1 1/2 ton	625
hpA102	EXHF0604	5 ton	1,870
hpA103	EXHF0187	1 1/2 ton	625
hpA104	EXHF0424	3 1/2 ton	1,460
hpA105	EXHF0157	1 1/4 ton	525
hpA106	EXHF0247	2 ton	835
hpA107	EXHF0604	5 ton	1,870
hpA108	EXHF0247	2 ton	835
hpA109	EXHF0127	1 ton	415
hpA110	EXHF0307	2 1/2 ton	1,045
hpA111	EXHF0247	2 ton	835
hpA112	EXHF0364	3 ton	1,250
hpA113	EXHF0247	2 ton	835
hpA114	EXHF0704	6 ton	2,300
hpA115	EXHF0067	1/2 ton	235
hpA116	EXHF0187	1 1/2 ton	625
hpA117	EXHF0364	3 ton	1,250
hpA118	EXHF0247	2 ton	835
hpA119	EXHF0247	2 ton	835
hpA120	EXHF0364	3 ton	1,250
hpA121	EXHF0157	1 1/4 ton	525
hpA122	EXHF0187	1 1/2 ton	625
hpA123	EXHF0127	1 ton	415
hpA124	EXHF0307	2 1/2 ton	1,045
hpA125	EXHF0247	2 ton	835

Level 2

Equip Tag	Trane (mfgr) Model Number	Nominal capacity	Design airflow (cfm)
hpA201	EXHF0704	6 ton	2,300
hpA202	EXHF0157	1 1/4 ton	525
hpA203	EXHF0307	2 1/2 ton	1,045
hpA204	EXHF0187	1 1/2 ton	625
hpA205	EXHF0127	1 ton	415
hpA206	EXHF0187	1 1/2 ton	625
hpA207	EXHF0424	3 1/2 ton	1,460
hpA208	EXHF0247	2 ton	835
hpA209	EXHF0247	2 ton	835
hpA210	EXHF0187	1 1/2 ton	625
hpA211	EXHF0364	3 ton	1,250
hpA212	EXHF0307	2 1/2 ton	1,045
hpA213	EXHF0247	2 ton	835
hpA214	EXHF0247	2 ton	835
hpA215	EXHF0484	4 ton	1,650
hpA216	EXHF0307	2 1/2 ton	1,045
hpA217	EXHF0307	2 1/2 ton	1,045
hpA218	EXHF0307	2 1/2 ton	1,045

ADD ALT 02: (Level 2)

hpA219	EXHF0247	2 ton	835
hpA220	EXHF0604	5 ton	1,870
hpA221	EXHF0424	3 1/2 ton	1,460
hpA222	EXHF0307	2 1/2 ton	1,045

AREA "B" WSHP's

Level 1

Equip Tag	Trane (mfgr) Model Number	Nominal capacity	Design airflow (cfm)
hpB101	EXHF0307	2 1/2 ton	1,045
hpB102	EXHF0704	6 ton	2,300
hpB103	EXHF0604	5 ton	1,870

ADD ALT 01: (Level 1)

hpB104	EXHF0364	3 ton	1,250
hpB105	EXHF0364	3 ton	1,250
hpB106	EXHF0364	3 ton	1,250

Level 2

Equip Tag	Trane (mfgr) Model Number	Nominal capacity	Design airflow (cfm)
hpB201	EXHF0364	3 ton	1,250
hpB202	EXHF0364	3 ton	1,250
hpB203	EXHF0127	1 ton	415
hpB204	EXHF0187	1 1/2 ton	625

AREA "C" WSHP's

Level 1

Equip Tag	Trane (mfgr) Model Number	Nominal capacity	Design airflow (cfm)
hpC101	EXHF0097	3/4 ton	315
hpC102	EXHF0157	1 1/4 ton	525
hpC103	EXHF0247	2 ton	835
hpC104	EXHF0704	6 ton	2,300
hpC105	EXHF0307	2 1/2 ton	1,045
hpC106	EXHF0157	1 1/4 ton	525
hpC107	EXHF0127	1 ton	415
hpC108	EXHF0157	1 1/4 ton	525
hpC109	EXHF0127	1 ton	415
hpC110	EXHF0247	2 ton	835
hpC111	EXHF0484	4 ton	1,650
hpC112	EXHF0127	1 ton	415
hpC113	EXHF0424	3 1/2 ton	1,460
hpC114	EXHF0127	1 ton	415
hpC115	EXHF0127	1 ton	415
hpC116	EXHF0364	3 ton	1,250
hpC117	EXHF0187	1 1/2 ton	625
hpC118	EXHF0127	1 ton	415
hpC119	EXHF0364	3 ton	1,250
hpc120	EXHF0127	1 ton	415
hpC121	EXHF0067	1/2 ton	235
hpC122	EXHF0307	2 1/2 ton	1,045
hpC123	EXHF0307	2 1/2 ton	1,045

Level 2

Equip Tag	Trane (mfgr) Model Number	Nominal capacity	Design airflow (cfm)
hpC201	EXHF0127	1 ton	415
hpC202	EXHF0247	2 ton	835
hpC203	EXHF0484	4 ton	1,650
hpC204	EXHF0127	1 ton	415
hpC205	EXHF0247	2 ton	835
hpC206	EXHF0247	2 ton	835
hpC207	EXHF0247	2 ton	835
hpC208	EXHF0307	2 1/2 ton	1,045
hpC209	EXHF0187	1 1/2 ton	625
hpC210	EXHF0704	6 ton	2,300
hpC211	EXHF0247	2 ton	835
hpC212	EXHF0307	2 1/2 ton	1,045
hpC213	EXHF0157	1 1/4 ton	525
hpC214	EXHF0247	2 ton	835
hpC215	EXHF0424	3 1/2 ton	1,460
hpC216	EXHF0187	1 1/2 ton	625
hpC217	EXHF0187	1 1/2 ton	625
hpC218	EXHF0484	4 ton	1,650
hpC219	EXHF0097	3/4 ton	315

MISCELLANEOUS ITEMS TO BE FURNISHED BY MECHANICAL CONTRACTOR :

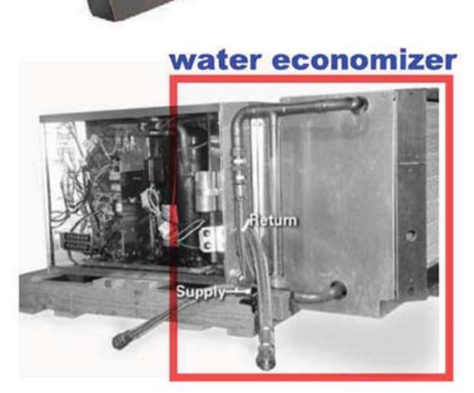
- ☒ HIGH EFFICIENCY HORIZONTAL
- ☒ COPPER HEAT EXCHANGER
- ☒ SEE PLANS FOR AIR DISCHARGE CONFIGURATION
- ☒ EXTENDED TEMPERATURE RANGE PACKAGE
- ☒ 24V CONTROLS
- ☒ REFRIGERANT: R-410A
- ☒ 2" FILTERS MERV 8
- ☒ SMOKE DETECTOR (3)
- ☒ ENHANCED SOUND ATTENUATION PACKAGE
- ☐ STANDARD PIPING CONFIGURATION
- ☐ DIGITAL MANUAL & AUTO CHANGEOVER 7 DAY PROGRAMMABLE; 3-HEAT/2-COOL, DDC THERMOSTAT
- ☒ CONDENSATE PUMP PROVIDED WITH EACH UNIT
- ☒ ECM SUPPLY FAN MOTOR
- ☒ INTERFACE WITH BUILDING AUTOMATION SYSTEM: BACnet PROTOCOL
- ☒ DUCTED FILTER RACK SECTION - FURNISHED WITH EACH HEAT PUMP UNIT. (3)
- ☒ PROVIDE AND INSTALL PRE-MANUFACTURED HOSE PIPING KITS AS MANUFACTURED BY HAYS FLUID CONTROLS, "3-SERIES". HOSE KITS TO INCLUDE:
  - ISOLATION VALVE(S): BALL VALVE, BOTH SUPPLY AND RETURN.
  - STRAINER.
  - AUTOMATIC FLOW CONTROL VALVE, ("MESURFLO"), ON RETURN LINE.
  - SOLENOID VALVE: 24V, ATC VALVE ON RETURN LINE.

  LINE SIZE PER THE FOLLOWING SCHEDULE:

FLOW:	LINE SIZE:
UP TO 7.5GPM:	3/4"
7.6 GPM TO 12.0GPM:	1.0"
12.1 GPM TO 20.0GPM:	1-1/4"

NOTE: FOR ALL 2ton, 2.5ton, 3ton, 3.5ton, 4ton, 5ton, 6ton WSHP's SPECIFIED:

1. PROVIDE AND INSTALL A WATER-SIDE ECONOMIZER.
   a. WATERSIDE ECONOMIZER HAS THE ABILITY TO TAKE ADVANTAGE OF ANY LOOP CONDITION THAT RESULTS IN COOL WATER TEMPERATURES. A PRIME EXAMPLE WOULD BE DURING FALL, WINTER AND SPRING WHEN COOLING TOWERS HAVE MORE CAPACITY THAN REQUIRED AND CAN BE CONTROLLED TO LOWER TEMPERATURES FOR ECONOMIZER SUPPORT.
   b. IN THIS SYSTEM, THE PERIMETER UNITS EXTRACT HEAT FROM THE BUILDING LOOP WHILE IN THE HEATING MODE, FORCING THE BUILDING LOOP TEMPERATURE TO DECREASE.
2. THE WATERSIDE ECONOMIZING PACKAGE SHALL BE AN EXTERNAL UNIT ACCESSORY, PRE-PIPED AND PRE-WIRED READY FOR TURN-KEY INSTALLATION TO THE UNIT.
   a. THE WATER-SIDE ECONOMIZER WILL BE FIELD INSTALLED ON THE RETURN AIR INLET SIDE OF THE WSHP UNIT.
3. THE ECONOMIZING COIL SHALL BE DESIGNED TO PERFORM WITH THE WSHP AT UNIT MEASURED FLOW RATE OF 80.6°F DB/66.2°F WB WITH 45°F EWT.
4. ALL HYDRONIC COILS SHALL BE OF 5/8" COPPER AND ALUMINUM PLATE FIN COMBINATION. ALL COILS SHALL BE PROOF AND LEAK TESTED FROM THE MANUFACTURER.THE PROOF TEST SHALL BE PERFORMED AT 1.5 TIMES THE MAXIMUM OPERATING PRESSURE AND THE LEAK TEST AT THE MAXIMUM OPERATING PRESSURE.
5. A DUAL SLOPED NON CORROSIVE DRAIN PAN SHALL BE EASILY ACCESSIBLE AND CLEANABLE FOR THE HYDRONIC ECONOMIZING COIL.
6. AN ELECTRONIC TWO-POSITION, 3-WAY VALVE SHALL METER WATER FLOW TO THE ECONOMIZING COIL DURING THE ECONOMIZING MODE. IT SHALL BE FACTORY SET TO ENERGIZE THE ECONOMIZING MODE AT 55°F, WHILE SIMULTANEOUSLY HALTING MECHANICAL OPERATION OF THE COMPRESSOR.
7. HANGING BRACKETS WITH RUBBER ISOLATION SHALL BE PROVIDED FOR THE HORIZONTAL VERSION OF THE ECONOMIZING COIL OPTION.THE BRACKET DESIGN SHALL BE THE SAME THROUGHOUT THE EQUIPMENT.



(1)

NOTE:
UNITS SELECTED AT 6,500 FT. ELEVATION

NOTE: DISCONNECTS BY ELECTRICAL CONTRACTOR.

PLATE AND FRAME HEAT EXCHANGER SCHEDULE:

SYM	TACO (mfgr) MODEL NO:	TYPE	SVC	TOTAL HEAT EXCH (mbh)	HEAT TRNSFR AREA (ft2)	LMTD (°F)	HOT SIDE: EWT (°F)	LWT (°F)	FLOW RATE (gpm)	PRESS. DROP (psi)	COLD SIDE: EWT (°F)	LWT (°F)	FLOW RATE (gpm)	PRESS. DROP (psi)
HX-01	PF82-129-4	PLATE & FRAME	COND. WATER	3,155	1,108	1.37	95.0	85.0	550	8.5	83.0	93.0	680	15.2

HEAT PUMP WATER CIRCULATING PUMP SCHEDULE

SYMBOL	MANUFACTURER	MODEL	TYPE	SYSTEM	GPM	HEAD FT.	IMPELLER DIA.	SUCTION x DISCHARGE	EFF.	RPM	HP	ELECTRICAL V/PH/HZ
HPWP-01	TACO	CI4009	CLOSE COUPLED BASE MOUNTED	HEAT PUMP CIRCULATING WATER	550	75	9.25	5.0"x4.0"	79.0%	1750	15.0	460/3/60
HPWP-02	TACO	CI4009	CLOSE COUPLED BASE MOUNTED	HEAT PUMP CIRCULATING WATER	550	75	9.25	5.0"x4.0"	79.0%	1750	15.0	460/3/60

MISCELLANEOUS ITEMS TO BE FURNISHED BY MECHANICAL CONTRACTOR:

- ☒ CLOSE COUPLED
- ☐ COUPLING GUARD
- ☐ NON OVER LOADING SELECTION
- ☒ ODP PREMIUM EFFICIENCY MOTOR
- ☒ BASE MOUNTED
- ☒ BRONZE FITTED
- ☒ INTERNAL SELF FLUSHING MECHANICAL SEAL
- ☐ SPLIT CASE
- ☒ 175 PSI WORKING PRESSURE
- ☐ REPLACEABLE GREASEABLE BALL BEARINGS

COOLING TOWER CIRCULATING PUMP SCHEDULE

SYMBOL	MANUFACTURER	MODEL	TYPE	SYSTEM	GPM	HEAD FT.	IMPELLER DIA.	SUCTION x DISCHARGE	EFF.	RPM	HP	ELECTRICAL V/PH/HZ
CTP-01	TACO	CI4011	CLOSE COUPLED BASE MOUNTED	COOLING TOWER CIRCULATING WATER	680	95	11.0"	5.0"x4.0"	81.0%	1750	25.0	460/3/60
CTP-02	TACO	CI4011	CLOSE COUPLED BASE MOUNTED	COOLING TOWER CIRCULATING WATER	680	95	11.0"	5.0"x4.0"	81.0%	1750	25.0	460/3/60

MISCELLANEOUS ITEMS TO BE FURNISHED BY MECHANICAL CONTRACTOR:

- ☒ CLOSE COUPLED
- ☐ COUPLING GUARD
- ☐ NON OVER LOADING SELECTION
- ☒ ODP PREMIUM EFFICIENCY MOTOR
- ☒ BASE MOUNTED
- ☒ BRONZE FITTED
- ☒ INTERNAL SELF FLUSHING MECHANICAL SEAL
- ☐ SPLIT CASE
- ☒ 175 PSI WORKING PRESSURE
- ☐ REPLACEABLE GREASEABLE BALL BEARINGS

TRIPLE DUTY VALVE SCHEDULE

SYMBOL	MANUFACTURER (OR APPROVED EQUAL)	MODEL	SIZE	FLOW GPM	SYSTEM	COMMENTS
TDV-01	TACO	MPV030-5	5.0"	550	HEAT PUMP CIRCULATING WATER	2.37 PSI PRESSURE DROP MISCELLANEOUS: Flanged connections.
TDV-02	TACO	MPV030-5	5.0"	550	HEAT PUMP CIRCULATING WATER	
TDV-03	TACO	MPV030-5	5.0"	680	COOLING TOWER CIRCULATING WATER	
TDV-04	TACO	MPV030-5	5.0"	680	COOLING TOWER CIRCULATING WATER	

SUCTION DIFFUSER SCHEDULE

SYMBOL	MANUFACTURER (OR APPROVED EQUAL)	MODEL	SIZE	FLOW GPM	SYSTEM	COMMENTS
SD-01	TACO	SD060040-6	6.0"x5.0"	550	HEAT PUMP CIRCULATING WATER	1.62 PSI PRESSURE DROP MISCELLANEOUS: Flanged connections Furnish with start-up screen.
SD-02	TACO	SD060040-6	6.0"x5.0"	550	HEAT PUMP CIRCULATING WATER	
SD-03	TACO	SD060040-6	6.0"x5.0"	680	COOLING TOWER CIRCULATING WATER	
SD-04	TACO	SD060040-6	6.0"x5.0"	680	COOLING TOWER CIRCULATING WATER	

AIR SEPARATOR SCHEDULE

SYMBOL	MANUFACTURER (OR APPROVED EQUAL)	MODEL	SERVICE	FLOW GPM	PIPE CONN.	PROVIDE WITH:
AS-01	TACO	4906A	HEAT PUMP CIRCULATING WATER	550	6 in	STRAINER, ASME, BRACKET SUPPORTS METRAFLEX MODEL MV15A 3/4" AUTO AIR VENT
AS-02	TACO	4906A	COOLING TOWER CIRCULATING WATER	680	6 in	

EXPANSION TANK SCHEDULE

SYMBOL	MANUFACTURER (OR APPROVED EQUAL)	MODEL	SERVICE	DIMENSIONS (IN) DIA.	HEIGHT	VOLUME (GAL) TANK	ACCEPT. (GAL) TANK	MOUNTING	TYPE
EXT-01	TACO	CBX254-125	HEAT PUMP CIRCULATING WATER	24"	40"	68	34	VERTICAL	DIAPHRAGM
EXT-02	TACO	CBX254-125	COOLING TOWER CIRCULATING WATER	24"	40"	68	34	VERTICAL	DIAPHRAGM

REMARKS:
CONSTRUCTED PER ASME SECTION VII, DIV.1; MAX OPERATING TEMPERATURE: 240°F; MIN. OPERATING TEMP: 40°F

VARIABLE FREQUENCY DRIVE SCHEDULE

SYMBOL	SERVICE	MFG'R	MODEL	HP	VOLTAGE	PROVIDE WITH:
VFD-01	HEAT PUMP CIRCULATING WATER	TACO/SCHNEIDER ELECTRIC SQUARE D	DSJ4YOBD	15.0	460/3/60	NEMA 1 VFD with 3 contactor bypass, LCD text keypad, Reduced harmonic technology (line reactor), overcurrent circuit breaker, 0-20mA speed reference.
VFD-02	HEAT PUMP CIRCULATING WATER	TACO/SCHNEIDER ELECTRIC SQUARE D	DSJ4YOBD	15.0	460/3/60	
VFD-03	COOLING TOWER CIRCULATING WATER	TACO/SCHNEIDER ELECTRIC SQUARE D	DSJ4YOBD	25.0	460/3/60	
VFD-04	COOLING TOWER CIRCULATING WATER	TACO/SCHNEIDER ELECTRIC SQUARE D	DSJ4YOBD	25.0	460/3/60	

MISCELLANEOUS ITEMS TO BE FURNISHED BY MECHANICAL CONTRACTOR:

- ☒ NEMA 1 ENCLOSURE
- ☒
- ☒ COMMUNICATION CARD WITH BAS: COMPATIBLE WITH BACNET BAS PROTOCOL
- ☒ 4-20mA INPUT SIGNAL
- ☒ MAIN AND DRIVE FUSES
- ☒ VERTICAL ENCLOSURE
- ☒ LINE REACTOR

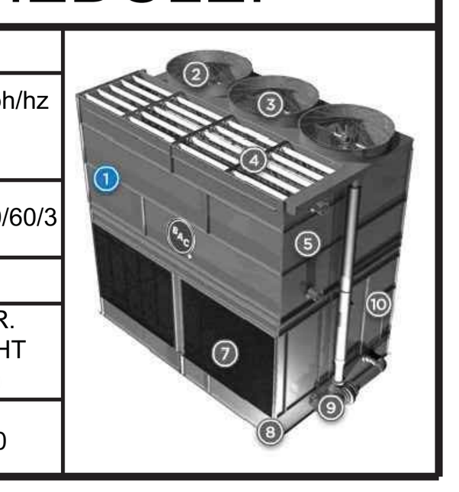
COOLING TOWER (FLUID COOLER) SCHEDULE:

SYM	BALTIMORE AIR COIL (mfgr) MODEL NO:	AMBIENT (wb °F)	HEAT REJECTION (mbh)	WATER: FLUID FLOW (gpm)	EWT (°F)	LWT (°F)	PRESS DROP (psi)	SPRAY FLOW (gpm)	ELECTRICAL: FAN MTR (hp)	PUMP MTR (hp)	BASIN HEATER (kW)	v/ph/hz
CT-01	FXV-1212C-16D-K	68	3,150	680	93	83	13.8	859	10	7.5	12	460/60/3

PROVIDE COOLING TOWER WITH:

- CORROSION RESISTANT CONSTRUCTION
- PAN BASIN HEATER
- CLEANABLE COIL
- LOW SOUND FAN
- STAINLESS STEEL PAN BASIN
- VFD ON ONE (1) DISCHARGE FAN MOTOR
- DISCHARGE AIR DAMPERS - BOTH DISCHARGE FANS (2)

PHYSICAL: DIMENSIONS L x W x H (ft)	OPER. WEIGHT (lbs)
12'x12'x16'-6"	23,840



HEATING HOT WATER BOILER SCHEDULE:

1. BOILER PRODUCT
   a. Raypak XTherm™ condensing water-tube hydronic boiler(s)
   b. The boiler(s) shall be fired with gas at a rated input of BTU/hr.
   c. The boiler(s) shall be CSA tested and certified with a minimum thermal efficiency of 96 percent at full fire (99% at part load).
   d. The boiler(s) shall be ASME inspected and stamped and National Board registered for 160 PSIG maximum allowable working pressure and 250ºF maximum allowable temperature, complete with a Manufacturer's Data Report.
   e. The boiler(s) shall have a floor loading of 131 lbs. /square foot or less.
2. QUALITY ASSURANCE
   a. Regulatory Requirements
      - ANSI Z21.13/CSA 4.9
      - Local and national air quality regulations for low NOx (0-20 PPM NOx emissions) boilers
   b. Certifications
      - CSA
      - ASME H Stamp and National Board Listed - Primary Heat Exchanger
      - ASME U Stamp and National Board Listed - Secondary Heat Exchanger
      - ISO 9001
3. HEAT EXCHANGER WARRANTY
   a. Limited five-year warranty (copper) from date of installation
   b. Limited twenty-five-year thermal shock warranty
   c. Limited ten-year closed-system heat exchanger warranty
   d. Limited ten-year secondary heat exchanger warranty
4. PRIMARY HEAT EXCHANGER
   a. The primary heat exchanger shall be of a single-bank, vertical multi-pass design and shall completely enclose the combustion chamber for maximum efficiency. The tubes shall be set vertically and shall be rolled into a powder-coated, ASME boiler quality, carbon steel tube sheet.
   b. The primary heat exchanger shall be sealed to 160 PSIG rated cast iron headers with silicone "O" rings, having a temperature rating over 500°F (bronze headers optional).
   c. The low water volume primary heat exchanger shall be explosion-proof on the water side and shall carry a twenty-five-year warranty against thermal shock.
   d. The headers shall be secured to the tube sheet by stud bolts with flange nuts to permit inspection and maintenance without removal of external piping connections. A heavy gauge stainless steel slotted wrap shall ensure proper combustion gas flow across the copper-finned tubes.
   e. The flue connection, combustion air opening, gas connection, water connections, electrical
   f. connections and condensate drain shall be located on the rear.
   g. The primary heat exchanger shall have accessible boiler drain valves with hose bibs to drain the water section of the primary heat exchanger.
5. SECONDARY HEAT EXCHANGER
   a. The secondary heat exchanger shall be a single-bank, multi-pass design constructed of stainless steel and bears the ASME U stamp.
   b. The boiler(s) shall be capable of operating at inlet water temperatures as low as 50°F.
6. CONDENSATE DRAIN
   a. The boiler(s) will feature a condensate drain switch which will shut down the boiler(s) if the condensate drain is blocked.
7. BURNERS
   a. The combustion chamber shall be of the sealed combustion type employing the Raypak high temperature FeCrAloy woven mesh burner, mounted in a vertical orientation.
   b. The burner must be capable of firing at both a complete blue flame with maximum gas and air input as well as firing infrared when gas and air are reduced. The burner must be capable of firing at 100% of rated input when supplied with 4.0" WC of inlet gas pressure, so as to maintain service under heavy demand conditions; no exceptions.
   c. The burner shall use a combustion air blower to precisely control the fuel/air mixture for maximum efficiency throughout the entire range of modulation. The combustion air blower shall operate for a pre-purge period before burner ignition and a post-purge period after burner operation to clear the combustion chamber.
   d. The blower shall infinitely vary its output in response to a 4-20 mA signal supplied directly from the PID modulating temperature controller, thereby electronically and precisely adjusting the volume of air and gas supplied for combustion. Minimum fire shall be 25 percent of rated input.
8. PILOT CONTROL SYSTEM
   a. The boiler(s) shall be equipped with a 100 percent safety shutdown.
   b. The ignition shall be Hot Surface Ignition type with full flame rectification by remote sensing separate from the ignition source, with a three-try-for-ignition sequence, to ensure consistent operation.
   c. The igniter will be located to the side of the heat exchanger to protect the device from condensation during start-up.
   d. The ignition control module shall include an LED that indicates six (6) individual diagnostic flash codes.
   e. An external viewing port shall be provided, permitting visual observation of burner operation.
9. GAS TRAIN
   a. The boiler(s) shall have a firing/leak test valve and pressure test valve as required by CSD-1.
   b. The boiler(s) shall have dual-seated main gas valve.
   c. Gas control trains shall have a redundant safety shut-off feature, main gas regulation, shut-off cock and plugged pressure tapping to meet the requirements of ANSI Z21.13/CSA 4.9.
10. BOILER CONTROL
    a. The following safety controls shall be provided:
       - High limit control with manual reset
       - Flow switch, mounted and wired
       - PSIG ASME pressure relief valve, piped by the installer to an approved drain
       - Temperature and pressure gauge (shipped loose)
       - The boiler(s) shall be equipped with a PID modulating temperature controller with LCD display that incorporates an adjustable energy-saving pump control relay and freeze protection and is factory mounted and wired to improve system efficiency; three water sensors included.
       - Firing Mode: Provide electronic modulating control of the gas input to the boiler.
11. BOILER DIAGNOSTICS
    a. Provide external LED panel displaying the following boiler status/faults:
       - Power on - Green
       - Call for heat - Amber
       - Burner firing - Blue
       - Service - Red
    b. Provide internal circuit board indicating the following safety faults by a 2 line, 20 character, LCD display:
       - System status
       - Condensate blockage
       - Manual reset high limit
       - Auto reset high limit
       - Low water cut-off
       - Blocked vent
       - Low gas pressure switch
       - High gas pressure switch
       - Controller alarm
       - Flow switch
       - Air pressure
       - Factory option
       - External interlock
       - Cold Water Start/Cold Water Run
       - Ignition lock-out
12. COMBUSTION CHAMBER:
    a. The combustion chamber wrapper shall be insulated to reduce standby radiation losses, reducing jacket losses and increasing unit efficiency.
13. CABINET
    a. The corrosion-resistant galvanized-steel jackets shall be finished with a baked-on epoxy powder coat, which is suitable for outdoor installation, applied prior to assembly for complete coverage, and shall incorporate louvers in the outer panels to divert air past heated surfaces.
    b. The boiler(s), if located on a combustible floor, shall not require a separate combustible floor base.
    c. The boiler(s) shall connect both the combustion air and flue products through the back of the unit.
    d. The boiler shall have as standard an internal, combustion air filter rated to MERV 8 (>95% arrestance).
14. BOILER PUMP
    a. The boiler(s) shall be equipped with a factory-packaged pump system.
    b. Cold Water Protection System
       - The boiler(s) shall be configured with a cold water protection automatic proportional bypass system that ensures the boiler will experience inlet temperatures in excess of 120ºF in less than 7 minutes to avoid damaging condensation.
       - The cold water protection system shall be configured with two variable-speed pumps that are controlled by a system-matched PID control that injects the correct amount of cold water directly into the boiler loop to maintain the required minimum inlet temperature. The PID controller temperature sensor shall be located in the inlet header of the boiler.
15. BOILER OPERATING CONTROLS
    a. The boiler(s) shall feature a modulating digital controller with selectable outdoor reset mode option, mounted and wired.
    b. System sensor and optional air temperature sensor shall be shipped loose for field installation by installing contractor. Inlet/Outlet sensors are factory-installed.
16. DIRECT VENT
    a. The boiler(s) shall meet safety standards for direct vent equipment as noted by the 2006 Uniform Mechanical Code, section 1107.6, and ASHRAE 15-1994, section 8.13.6.
17. SOURCE QUALITY CONTROL
    a. The boiler(s) shall be completely assembled, wired, and fire-tested prior to shipment from the factory.
    b. The boiler(s) shall be furnished with the sales order, ASME Manufacturer's Data Report(s), inspection sheet, wiring diagram, rating plate and Installation and Operating Manual.

SYMBOL	LOCATION	MFGR	MODEL	MBH INPUT @ S.L.	MBH OUTPUT @ ALT.	WATER: EWT °F	LWT °F	FLUE	INTAKE	ELECTRICAL: V/PH/HZ	BLOWER & CONTROLS	BOILER PUMP HP	
B-01	MECH ROOM [1064]	RAYPAK: XTHERM	H7-2005	1,999	1,650	140	170	8"Ø	8"Ø	120/1/60	18 AMPS	1.0	17 AMPS

MISCELLANEOUS ITEMS TO BE FURNISHED WITH EQUIPMENT BY MECHANICAL CONTRACTOR:

NOTE: SEPARATE POWER SUPPLY FOR BOILER AND PUMP REQUIRED

- ☒ AGA LISTED
- ☒ PACKAGED, FACTORY CONTROLS
- ☒ MODULATING GAS VALVE
- ☒ 96% EFFICIENCY
- ☒ CONDENSING TYPE BOILER
- ☒ CAT IV VENTING: VERTICAL VENT AND INTAKE KIT:
  - AL29-4C VENT MATERIAL
  - GALVANIZED STEEL INTAKE
- ☒ TEN YEAR WARRANTY
- ☒ FLAME SAFEGUARD
- ☒ ASME RELIEF VALVE
- ☒ HI LIMIT CONTROL
- ☒ LOW AIR PRESSURE SWITCH
- ☒ WATER FLOW SWITCH
- ☒ TEMP & PRESSURE GAUGES
- ☒ TEMPERATURE CONTROL
- ☒ 2-ACID NEUTRALIZATION KITS: 1-FOR BOILER; 1-FOR FLUE VENT
- ☒ STANDARD GAS TRAIN
- ☒ ADJUSTABLE INLET AIR SHUTTER
- ☒ DIAGNOSTIC ANNUCIATOR
- ☒ HOT SURFACE IGNITION/5:1 TURNDOWN
- ☒ COPPER FIN-TUBE HEAT EXCHANGER
- ☒ PUMP RELAY CONTACTS
- ☒ INTERFACE WITH DDC CONTROLS
- ☒ BRONZE FITTED CIRCULATING PUMP: FACTORY MOUNTED AND WIRED

ENERGY RECOVERY VENTILATOR SCHEDULE
ROOFTOP MOUNTED, VERTICAL SUPPLY AND RETURN

SYMBOL	GREENHECK mfgr (O.A.E): MODEL #:	OUTDOOR AIR SIDE (OUTSIDE AIR INTO BUILDING): AIR FLOW (cfm)	EXT. PRESS. (in w.c.)	INDOOR AIR SIDE (EXHAUST AIR FROM BUILDING): AIR FLOW (cfm)	EXT. PRESS. (in w.c.)	PERFORMANCE EFFECTIVENESS (%): SUMMER (TOTAL)	WINTER (TOTAL)	ELECTRICAL: BLOWER MOTOR (hp) SPLY	EXH	DRIVE	V/PH/HZ	MCA (A)	MOCP (A)	PHYSICAL: LxWxH (in)	WGHT (lbs)
ERV-A101	PVe-35-SC	2,760	0.75	2,485	0.60	55	65	5.0	3.0	BELT	460/3/60	10.7	15.0	98x104x56	1,800
ERV-A201	PVe-35-SC	2,160	0.75	1,950	0.60	55	65	3.0	3.0	BELT	460/3/60	10.7	15.0	98x80x56	1,800
ERV-B101	PVe-45-SC	1,920	0.75	1,730	0.60	55	65	3.0	1.5	BELT	460/3/60	10.7	15.0	98x104x56	2,000
ERV-B201	ECV-10-VG	720	0.75	650	0.60	55	65	1.0	0.5	BELT	460/3/60	16.9	20.0	98x30x56	650
ERV-C101	PVe-35-SC	2,200	0.75	1,980	0.60	55	65	3.0	3.0	BELT	460/3/60	10.7	15.0	98x80x56	2,000
ERV-C201	PVe-35-SC	2,225	0.75	1,980	0.60	55	65	3.0	3.0	BELT	460/3/60	16.9	20.0	98x80x56	2,000

MISCELLANEOUS ITEMS TO BE FURNISHED BY MECHANICAL CONTRACTOR :

- ☒ FUSED DISCONNECT SWITCH
- ☒ UL LISTED
- ☒ TWO (2) BELT-DRIVE BLOWERS W/ ADJ SHEAVES
- ☒ PREMIUM EFFICIENCY MOTORS
- ☐ FACTORY SUPPLIED & MOUNTED VFD'S - OA & EA AIRSTREAMS
- ☒ MOTOR STARTERS
- ☐ TIMED EXHAUST FROST PROTECTION
- ☒ SMOKE DETECTORS
- ☒ OUTSIDE AIR AND EXHAUST AIR DAMPERS-MOTORIZED
- ☒ REQUIRED RELAYS AND SWITCHES
- ☒ FILTER MAINTENANCE INDICATOR SWITCH
- ☒ 2" PLEATED FILTERS: MERV 8
- ☒ FLEXIBLE DUCT CONNECTIONS
- ☒ SINGLE-POINT POWER CONNECTION AND A SINGLE-POINT 24 VAC CONTACTOR CONTROL CONNECTION
- ☒ FACTORY CONTROLS
- ☒ INTERFACE w/ BACnet DDC CONTROLS

NOTE:
ERV'S SELECTED AT 6,500 FT. ELEVATION

ELECTRIC UNIT HEATER SCHEDULE

TAG	SERVICE	MFG'R	MODEL	HEATING CAPACITY	WATTS	FAN WATTS	VOLTAGE
EUH-101	MECH ROOM [MECH1]	QMARK	MW UH7504	25,600	7,500	6	240V/1PH/60HZ

- ☒ LOW VOLT. TRANSFORMER
- ☒ LOW VOLT. HEATING THERMOSTAT
- ☒ WALL BRACKET

UL APPROVED UNIT HEATER WITH GALVANIZED STEEL CABINET AND EPOXY PAINT FINISH, TUBULAR HEATING ELEMENTS AND ADJUSTABLE AIRFLOW LOUVERS. THE BALL BEARING MOTOR SHALL BE TOTALLY ENCLOSED, WITH INTERNAL THERMAL PROTECTION. PROPELLER SHALL BE OF STEEL, DIRECT DRIVE, AND STATICALLY BALANCED. UNITS SHALL HAVE CONTACTORS, TRANSFORMERS, WALL MOUNTED THERMOSTAT, WALL BRACKET, ETC. FOR A COMPLETE SINGLE POINT CONNECTION.

NOTE: ALL LINE VOLTAGE WIRING BY ELECTRICAL CONTRACTOR

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FT. DEFIANCE, ARIZONA

100% CONSTRUCTION DOCUMENTS

OCTOBER 6, 2016

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BRIAN ARNOLD NEW MEXICO 14466 REGISTERED PROFESSIONAL ENGINEER
10/06/16
ENGINEER

Revision Schedule		
Revision Number	Revision Date	Revision Description
1	10/27/16	ADD.01
2	11/3/16	ADD.02
3	11/10/16	ADD.03

PROJECT NUMBER	DRAWN BY	PROJ MGR
2015.05	WOOD	BA

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Sheet Title
MECHANICAL: EQUIPMENT SCHEDULES

Sheet Number
M003

Sequence of

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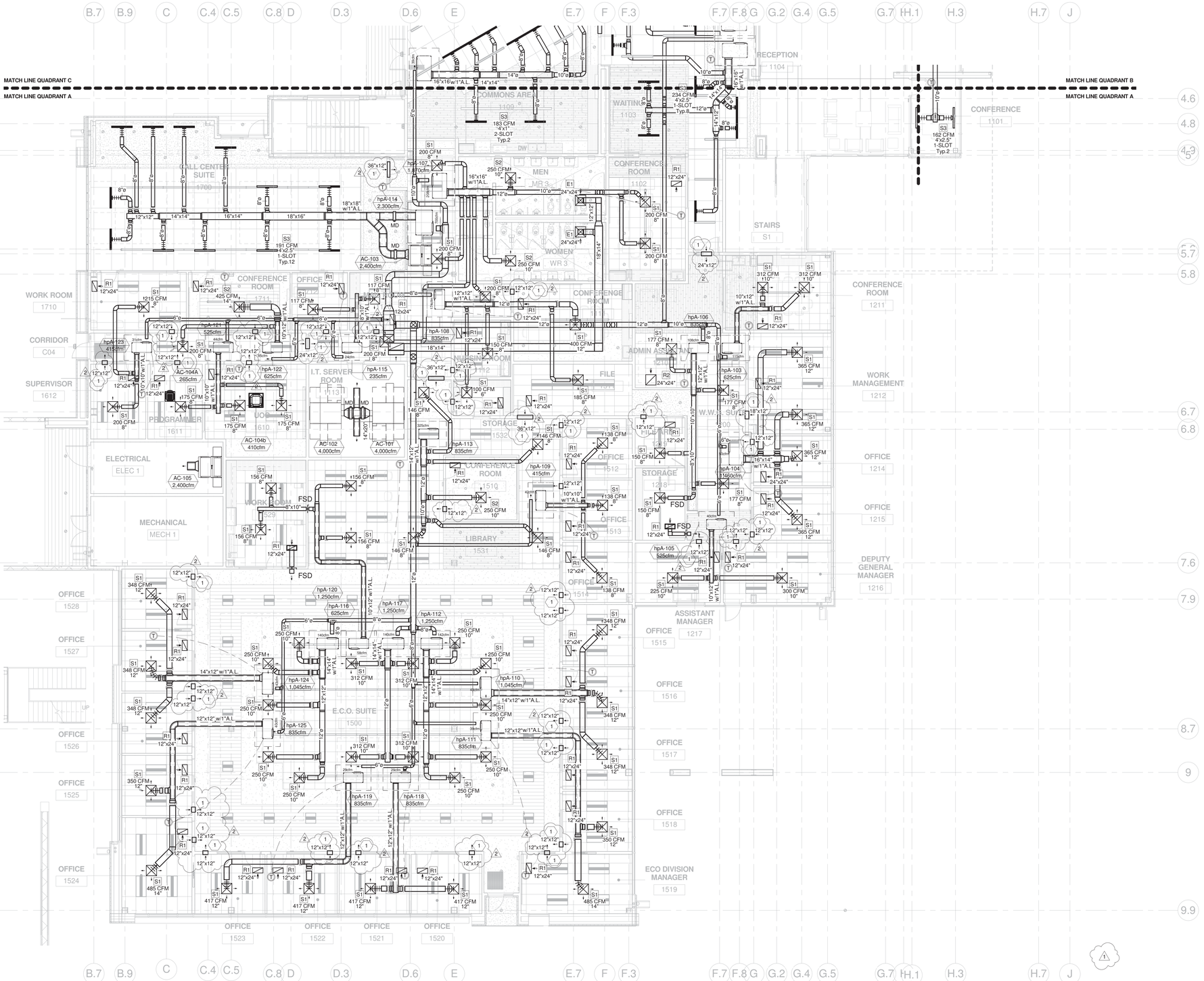

A5 **MECHANICAL 1st FLOOR HVAC PLAN - QUADRANT A**
1/8" = 1'-0"

NTUA HQ COMPLEX OFFICE BUILDING

FT. DEFIANCE, ARIZONA

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OCTOBER 6, 2016

KEYED NOTES

1. LOCATION OF RETURN AIR WALL OPENING IN WALL ABOVE CEILING.

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Revision Schedule		
Revision Number	Revision Date	Revision Description
1	10/27/16	ADD. 01
2	11/10/16	ADD.03

PROJECT NUMBER	DRAWN BY	PROJ MGR
2015.05	DMT	BA

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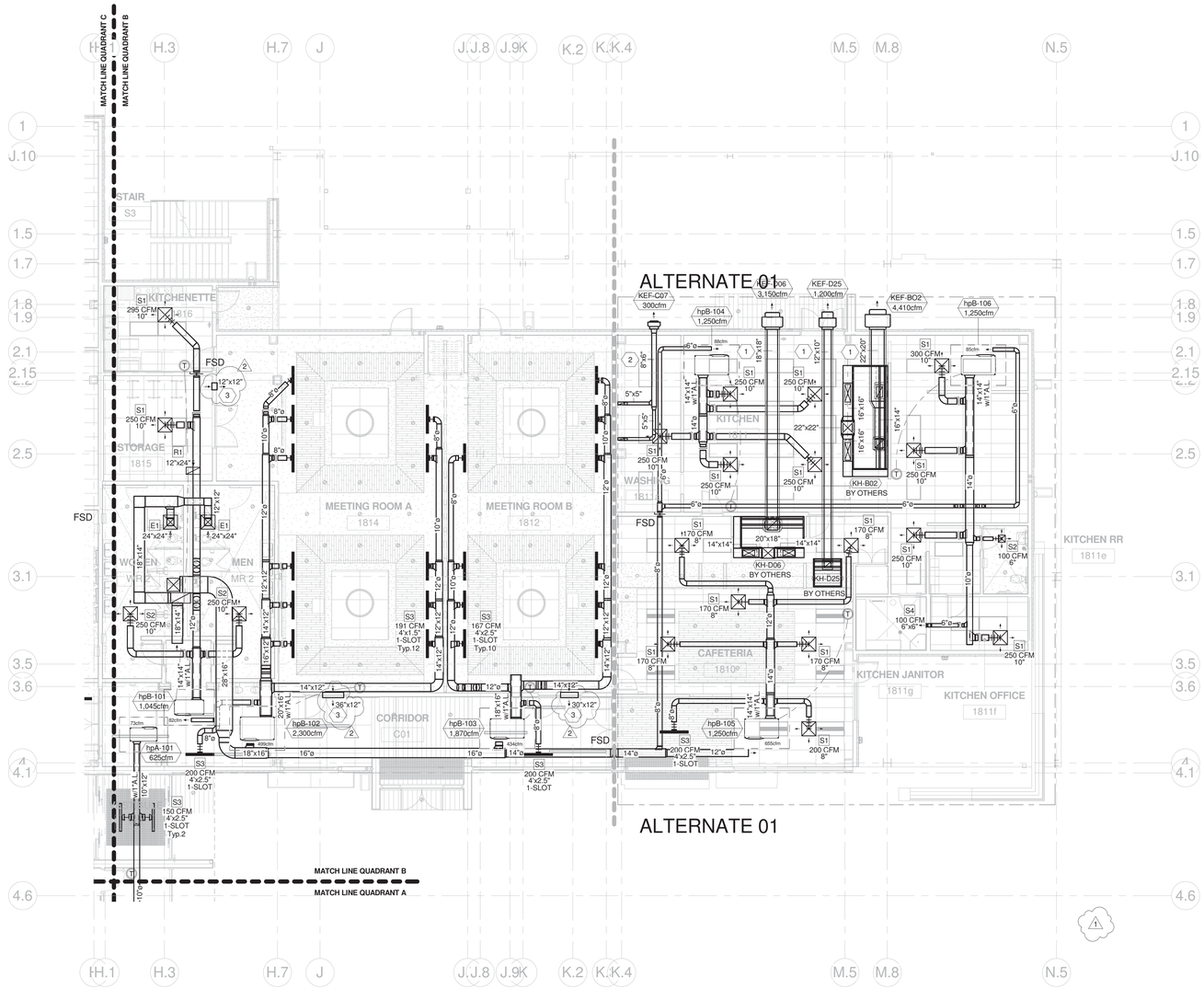
Sheet Title
MECHANICAL 1st FLOOR HVAC PLAN - QUADRANT A

Sheet Number
M101a
Sequence of



A4 **MECHANICAL 1st FLOOR HVAC PLAN - QUADRANT B**
1/8" = 1'-0"

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FT. DEFIANCE, ARIZONA

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OCTOBER 6, 2016

KEYED NOTES:

1. GREASE EXHAUST DUCT: INSTALL BETWEEN GREASE HOOD (KEH-xxx) AND KITCHEN EXHAUST FAN (KEF-xxx).
   a. DUCTWORK IS 16GA, ALL WELDED CONSTRUCTION, SLOPE AT 1/4"-PER-FOOT TOWARDS HOOD EXHAUST OPENING.
   b. INSTALL DUCT CLEANING ACCESS DOORS AT 5'-0" O.C. IN HORIZONTAL SECTIONS OF GREASE DUCTWORK.
   c. GREASE DUCT ASSEMBLY WILL BE WRAPPED WITH TWO (2) LAYERS OF 1-1/2" THICK FIRETEMP DUCTWRAP. FOLLOW ALL MANUFACTURERS INSTALLATION INSTRUCTIONS TO MAINTAIN U.L. LISTING.
2. DISHWASHER EXHAUST DUCT: INSTALL BETWEEN DISHWASHER AND EXHAUST FAN (KEF-C07).
   a. DUCTWORK IS 16GA, ALL WELDED CONSTRUCTION, SLOPE AT 1/4"-PER-FOOT TOWARDS HOOD EXHAUST OPENING.
3. LOCATION OF RETURN AIR OPENING IN WALL ABOVE CEILING.

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10/06/16
ENGINEER

Revision Schedule		
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1	10/27/16	ADD. 01
2	11/10/16	ADD.03

PROJECT NUMBER	DRAWN BY	PROJ MGR
2015.05	DMT	BA

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Sheet Title
MECHANICAL 1st FLOOR HVAC PLAN - QUADRANT B

Sheet Number
M101b
Sequence of

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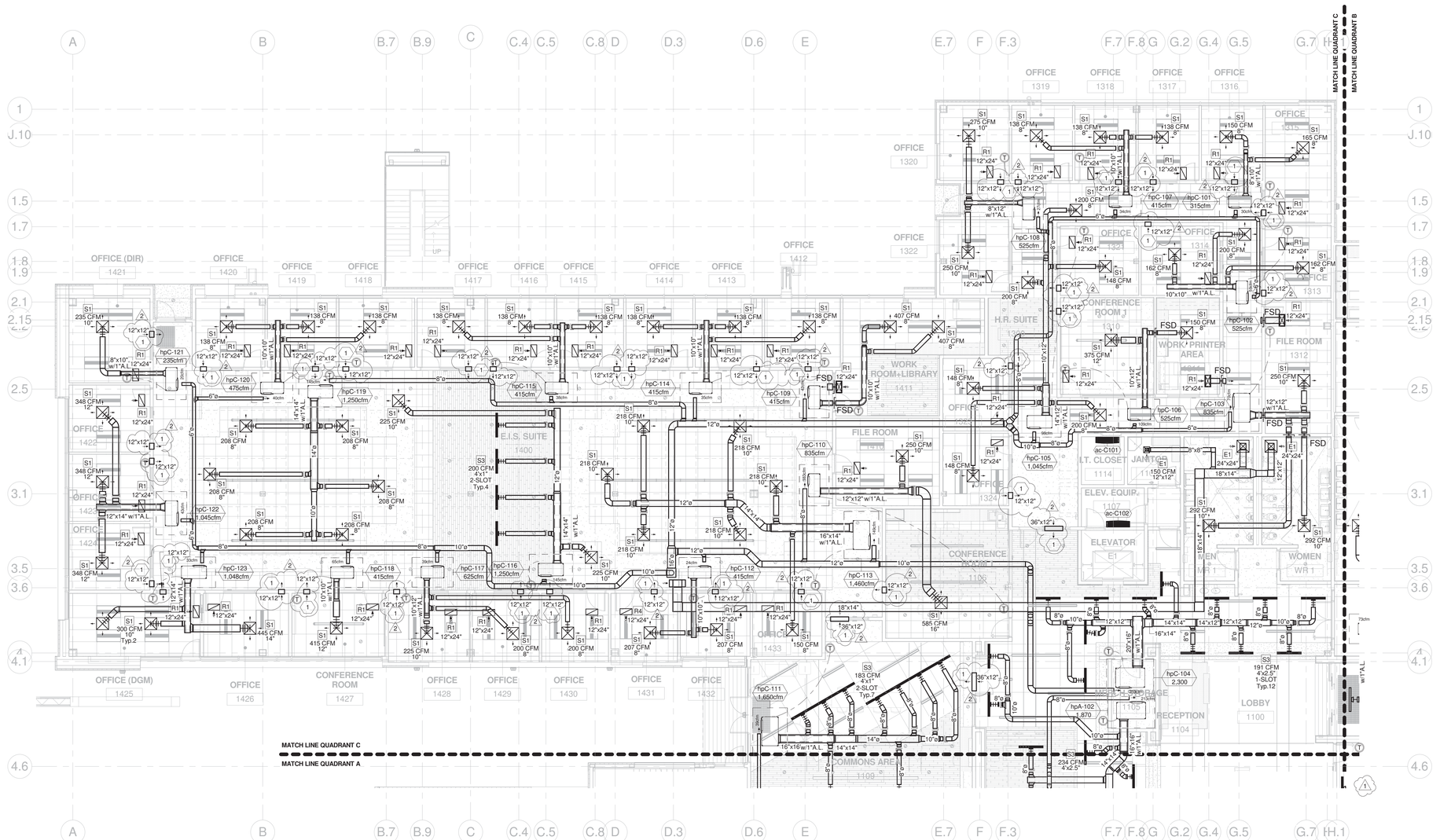
OCTOBER 6, 2016

2 KEYED NOTES

1. LOCATION OF RETURN AIR WALL OPENING IN WALL ABOVE CEILING.



A5 **MECHANICAL 1st FLOOR HVAC PLAN - QUADRANT C**

1/8" = 1'-0"

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Revision Schedule		
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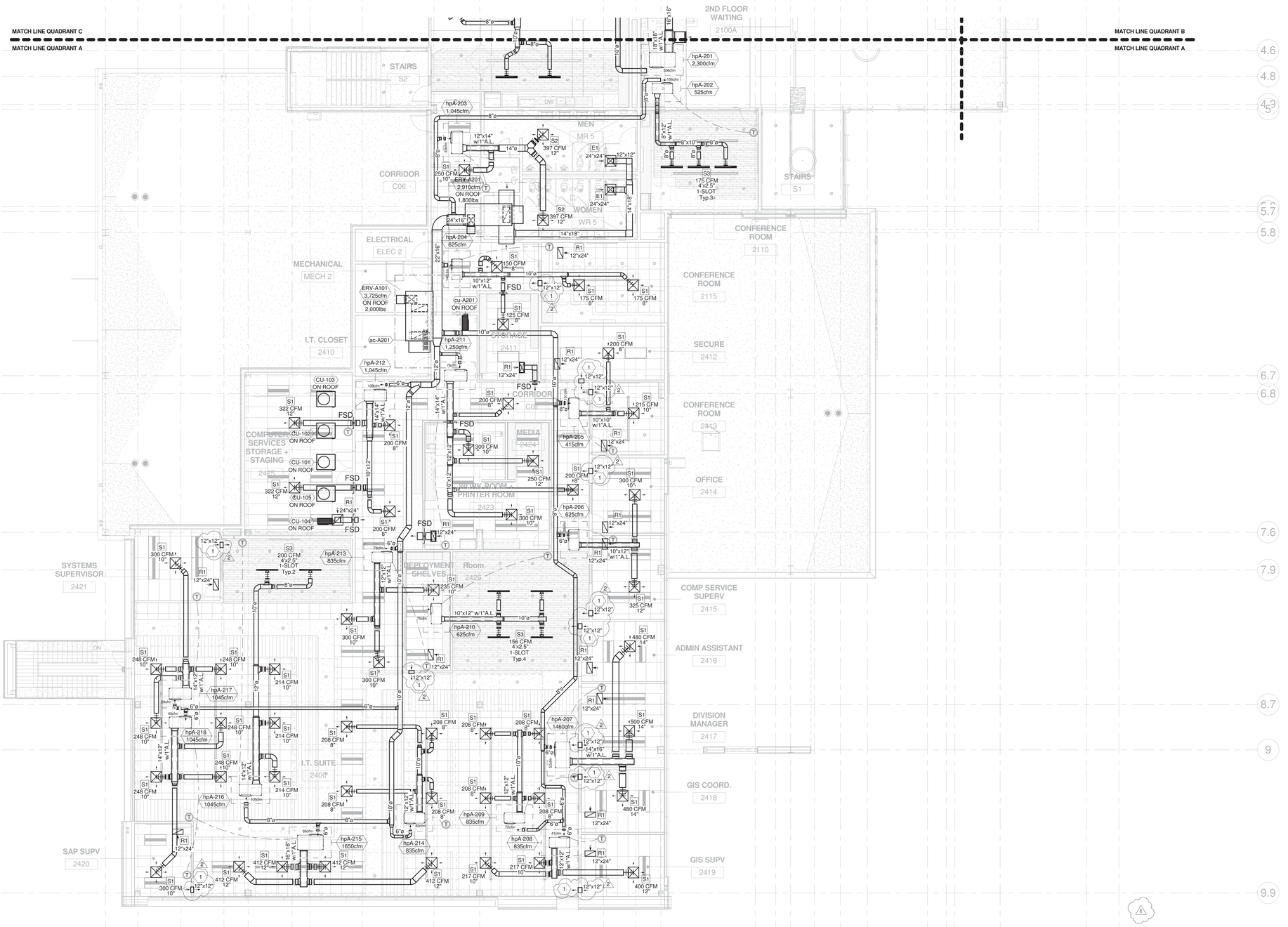
Sheet Title
MECHANICAL 1st FLOOR HVAC PLAN - QUADRANT C

Sheet Number

M101c

Sequence of



A5 **MECHANICAL 2nd FLOOR HVAC PLAN - QUADRANT A**
1/8" = 1'-0"

NTUA HQ COMPLEX OFFICE BUILDING

FT. DEFIANCE, ARIZONA

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KEYED NOTES

1. LOCATION OF RETURN AIR WALL OPENING IN WALL ABOVE CEILING.

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10/06/16
ENGINEER

Revision Schedule		
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2015.05	DMT	BA

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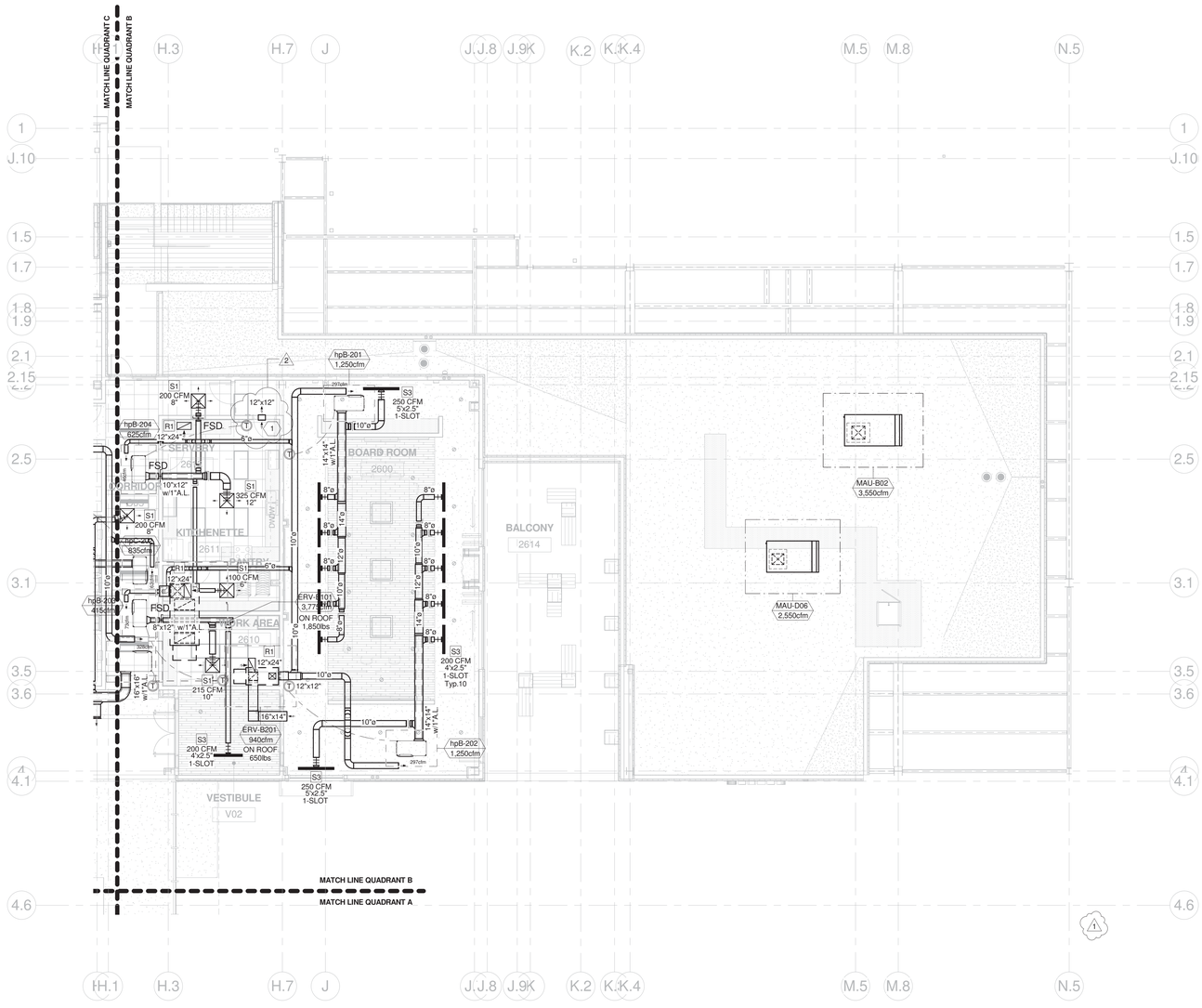
Sheet Title
MECHANICAL 2nd FLOOR HVAC PLAN - QUADRANT A

Sheet Number
M102a
Sequence of



2 MECHANICAL 2nd FLOOR HVAC PLAN - QUADRANT B

1/8" = 1'-0"

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OCTOBER 6, 2016

2 KEYED NOTES

1. LOCATION OF RETURN AIR WALL OPENING IN WALL ABOVE CEILING.

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10/06/16

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Revision Schedule		
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2015.05	DMT	BA

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Sheet Title
MECHANICAL 2nd FLOOR HVAC PLAN - QUADRANT B

Sheet Number

M102b

Sequence of

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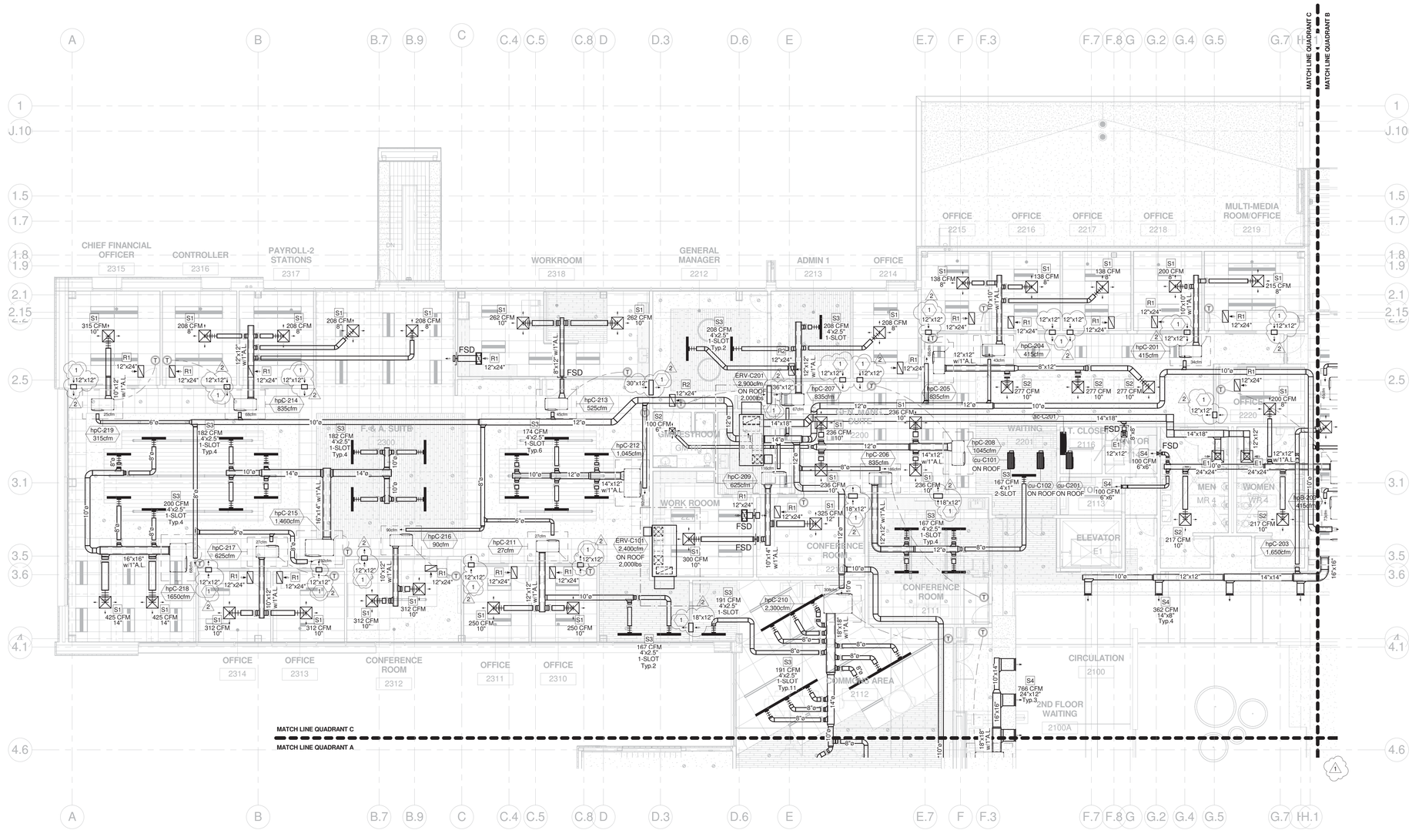
100% CONSTRUCTION DOCUMENTS

OCTOBER 6, 2016

2 KEYED NOTES

1. LOCATION OF RETURN AIR WALL OPENING IN WALL ABOVE CEILING.



A5 **MECHANICAL 2nd FLOOR HVAC PLAN - QUADRANT C**

1/8" = 1'-0"

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Revision Schedule		
Revision Number	Revision Date	Revision Description
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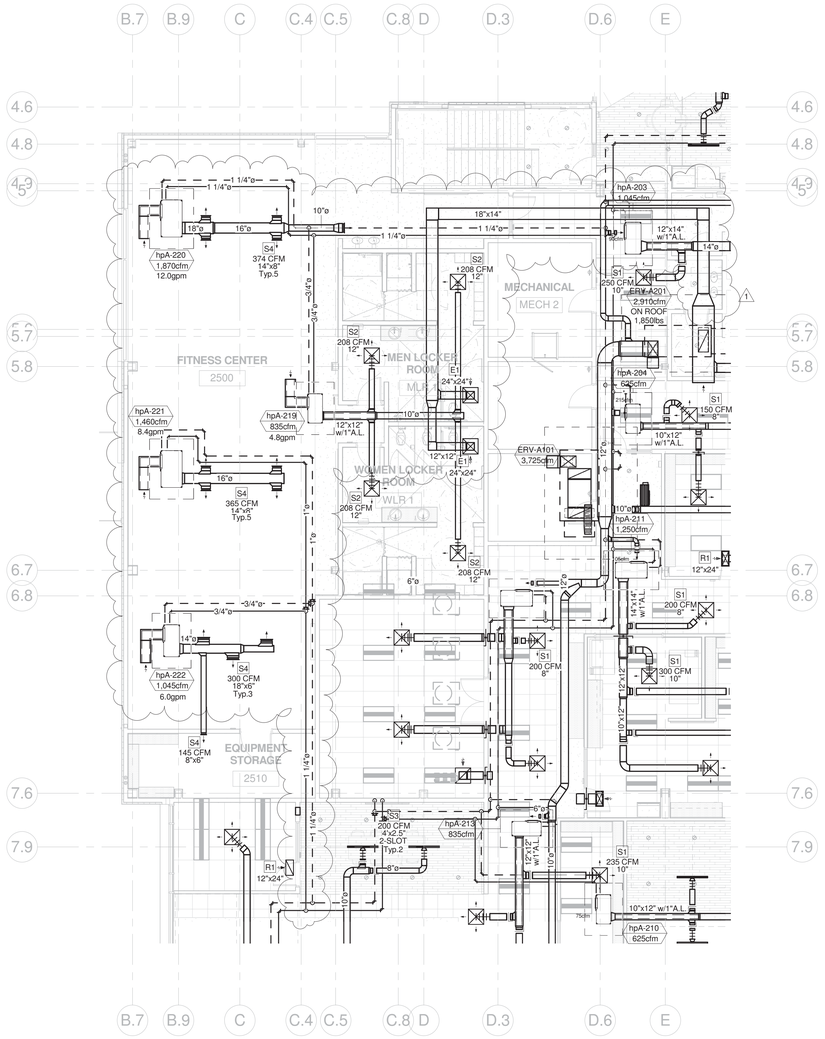
Sheet Title: **MECHANICAL 2nd FLOOR HVAC PLAN - QUADRANT C**

Sheet Number

M102c

Sequence of



A4 **MECHANICAL 2nd FLOOR HVAC PLAN - FITNESS - Alt 2**
1/8" = 1'-0"

NTUA HQ COMPLEX OFFICE BUILDING

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OCTOBER 6, 2016

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Revision Schedule		
Revision Number	Revision Date	Revision Description
1	11/10/16	ADD.03

PROJECT NUMBER	DRAWN BY	PROJ MGR
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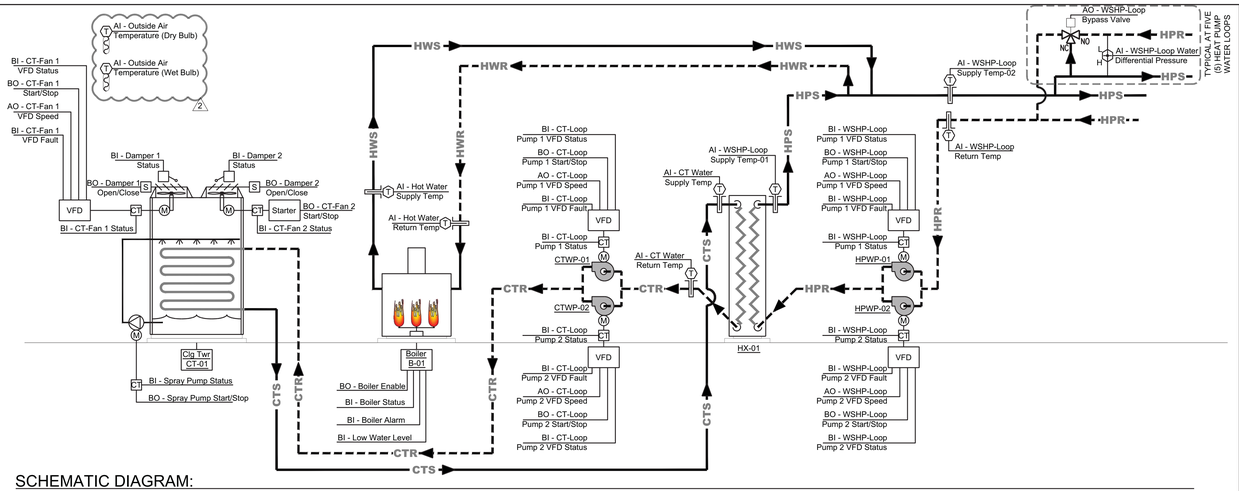
Sheet Title
MECHANICAL 2nd FLOOR HVAC PLAN - ALTERNATE #2

Sheet Number
M104

Sequence of



SCHEMATIC DIAGRAM:

SEQUENCE OF OPERATIONS:

WATER LOOP PIPING SYSTEMS - CONFIGURATION:

A. TWO (2) CLOSED-LOOP WATER SYSTEMS SERVE THE FACILITY:
1. WATER SOURCE HEAT PUMP WATER-LOOP SYSTEM, (WSHP-LOOP):
   a. PROVIDES COOLING OR HEATING ENERGY TO THE WSHP UNITS IN THE INTERIOR OF BUILDING.
   b. HEATING ENERGY IS ADDED TO THE WSHP-LOOP USING A HIGH-EFFICIENCY, CONDENSING, HEATING WATER BOILER (B-01).
   c. TWO (2) HEAT PUMP WATER PUMPS: HPWP-01 AND HPWP-02.
   d. THE WSHP-LOOP IS ENTIRELY INSIDE THE BUILDING.
   e. THERE ARE FIVE (5) WSHP-LOOPS INSTALLED IN THE BUILDING:
      - LEVEL 1, QUADRANT A AND C.
      - LEVEL 2, QUADRANT A AND C.
      - LEVEL 1 AND 2, QUADRANT B.
   f. A DIFFERENTIAL PRESSURE SENSOR (DP) IS INSTALLED IN EACH OF THE FIVE (5) WSHP-LOOP SYSTEMS. (DIFFERENTIAL PRESSURE IS THE WATER PRESSURE DIFFERENCE BETWEEN WSHP-LOOP SUPPLY AND RETURN PIPING).
      - WHEN EACH WSHP UNIT COMPRESSOR IS ON, THE WATER VALVE AT WSHP UNIT IS OPEN, (WSHP-LOOP WATER FLOWS THRU WSHP UNIT).
      - WHEN EACH WSHP UNIT COMPRESSOR IS OFF, THE WATER VALVE AT WSHP UNIT IS CLOSED, (WSHP-LOOP WATER DOES NOT FLOWS THRU WSHP UNIT).
      - IN EACH INDIVIDUAL WSHP-LOOP: WHEN ALL OF THE WSHP UNIT COMPRESSORS ARE ON, THE DP SENSOR WILL BE AT LOWEST PRESSURE DIFFERENTIAL, (DP SETTING IS DETERMINED DURING TEST & BALANCE OF WATER SYSTEM).
      - AS THE INDIVIDUAL WSHP UNITS COMPRESSORS' TURN OFF, THE WSHP WATER VALVES WILL CLOSE, AND DP WILL INCREASE.
      - AS THE INDIVIDUAL WSHP UNITS COMPRESSORS' TURN ON, THE WSHP WATER VALVES WILL OPEN, AND DP WILL DECREASE.
   g. A BY-PASS VALVE IS INSTALLED IN EACH OF THE FIVE (5) WSHP-LOOP SYSTEMS.
      - THE BY-PASS VALVE IS INSTALLED ADJACENT TO THE DP SENSOR.
      - THE BY-PASS VALVE IS A MODULATING, 3-WAY VALVE.
      - THE BY-PASS VALVE WILL OPEN / CLOSE POSITION, IN RESPONSE TO DP SENSOR READING.
2. COOLING TOWER WATER-LOOP SYSTEM, (CT-LOOP):
   a. PROVIDES COOLING ENERGY TO THE WSHP-LOOP SYSTEM.
   b. COOLING ENERGY IS ADDED TO THE CT-LOOP USING A CLOSED-CIRCUIT COOLING TOWER (CT-01).
   c. TWO (2) COOLING TOWER WATER PUMPS: CTP-01 AND CTP-02.
   d. THE MAJORITY OF THE CT-LOOP IS OUTSIDE THE BUILDING - THE ONLY PORTION OF CT-LOOP INSIDE THE BUILDING IS IN THE MAIN MECHANICAL ROOM.

B. THE TWO (2) CLOSED-LOOP WATER SYSTEMS ARE SEPARATED USING A PLATE-AND-FRAME HEAT EXCHANGER (HX-01):
1. THE CT-LOOP SIDE OF THE HEAT EXCHANGER HAS A 40% PROPYLENE GLYCOL SOLUTION TO MINIMIZE POTENTIAL FOR FREEZING THE CT-LOOP WATER -
   a. PROVIDES FREEZE PROTECTION DOWN TO -5°F.
2. THE WSHP-LOOP SIDE OF THE HEAT EXCHANGER HAS 0% PROPYLENE GLYCOL (NO GLYCOL INSIDE OF BUILDING).

WATER SOURCE HEAT PUMP WATER LOOP SYSTEM (WSHP-LOOP): RUN CONDITIONS - SCHEDULED:

A. THE WATER SOURCE HEAT PUMP WATER SYSTEM (WSHP-LOOP) SHALL BE ENABLED TO RUN WHENEVER:
1. THE WSHP UNITS ARE IN THE OCCUPIED NODE, OR,
2. A DEFINABLE NUMBER OF WSHP UNITS ARE IN THE OCCUPANT-OVERRIDE MODE.

B. THE WSHP-LOOP SHALL RUN IN ONE OF THREE OPERATING MODES:
1. HEATING-DOMINANT MODE
2. COOLING-DOMINANT MODE
3. COOLING-ECONOMIZER MODE

C. THE BAS CONTROLLER SHALL MONITOR ALL OF THE WSHP UNITS, AND DETERMINE IF EACH INDIVIDUAL WSHP UNIT IS IN COOLING OR HEATING MODE.
1. IF 50%, OR MORE, (USER ADJ.) OF THE WSHP UNITS IS IN HEATING MODE, THE WSHP-LOOP WILL BE IN HEATING-DOMINANT MODE.
2. IF 50%, OR MORE, (USER ADJ.) OF THE WSHP UNITS IS IN COOLING MODE, THE WSHP-LOOP WILL BE IN COOLING-DOMINANT MODE.
3. IF THE WSHP-LOOP IS IN COOLING-DOMINANT MODE, AND THE OUTSIDE AMBIENT AIR CONDITIONS ARE SUCH THAT ECONOMIZER OPERATION IS AVAILABLE, THE WSHP-LOOP WILL BE IN THE COOLING-ECONOMIZER MODE.

D. WHEN THE BAS CONTROLLER COMMANDS THE WSHP-LOOP TO BE ON:
1. THE HPWR-xx PUMPS WILL BE ENABLED ON.
   a. THE TWO (2) HPWP-xxx 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 WSHP-LOOP WATER DIFFERENTIAL PRESSURE, THE LAG PUMP SHALL STAGE ON AND RUN IN UNISON WITH THE LEAD PUMP TO MAINTAIN WSHP-LOOP WATER DIFFERENTIAL PRESSURE SETPOINT.
   b. 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
      - DAILY
      - WEEKLY
      - MONTHLY
   c. ALARMS SHALL BE PROVIDED AS FOLLOWS:
      - HPWP-xx WATER PUMPS
        - 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.

WSHP-LOOP DIFFERENTIAL PRESSURE CONTROL:

A. THE BAS CONTROLLER SHALL MEASURE WSHP-LOOP WATER DIFFERENTIAL PRESSURE AND MODULATE THE WSHP-LOOP WATER PUMP VFDS IN SEQUENCE TO MAINTAIN THE DIFFERENTIAL PRESSURE SETPOINT.
1. THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES. ALL SETPOINTS SHALL BE FIELD ADJUSTED DURING THE COMMISSIONING PERIOD TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS.

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

C. ON DROPPING HOT WATER DIFFERENTIAL PRESSURE, THE VFDS SHALL STAGE ON AND RUN TO MAINTAIN SETPOINT AS FOLLOWS:
1. THE CONTROLLER SHALL MODULATE THE LEAD VFD TO MAINTAIN SETPOINT.
2. IF THE LEAD VFD SPEED IS GREATER THAN A SETPOINT OF 90% (ADJ.), THE LAG VFD SHALL STAGE ON.
3. THE LAG VFD SHALL RAMP UP TO MATCH THE LEAD VFD SPEED AND THEN RUN IN UNISON WITH THE LEAD VFD TO MAINTAIN SETPOINT.

D. ON RISING WSHP-LOOP DIFFERENTIAL PRESSURE, THE VFDS SHALL STAGE OFF AS FOLLOWS:
1. IF THE VFDS SPEEDS DROPS BACK TO 60% (ADJ.) BELOW SETPOINT, THE LAG VFD SHALL STAGE OFF.
2. THE LEAD VFD SHALL CONTINUE TO RUN TO MAINTAIN SETPOINT.

E. ALARMS SHALL BE PROVIDED AS FOLLOWS:
1. HIGH WSHP-LOOP DIFFERENTIAL PRESSURE: IF 25% (ADJ.) GREATER THAN SETPOINT.
2. LOW WSHP-LOOP DIFFERENTIAL PRESSURE: IF 25% (ADJ.) LESS THAN SETPOINT.

BYPASS VALVE:

A. THE BYPASS VALVE SHALL NORMALLY BE CLOSED.

B. THE BYPASS VALVE SHALL BE ENABLED WHENEVER THE WSHP-LOOP SYSTEM IS CALLED TO RUN.
1. THE CONTROLLER SHALL MEASURE THE OUTSIDE AIR TEMPERATURE.
   a. IF THE OUTSIDE AIR TEMPERATURE IS 37°F OR BELOW, (ADJ), AND ALL OF THE HEAT PUMPS ARE NOT OPERATING, THE BYPASS VALVE WILL OPEN TO THE 100% OPEN POSITION, AND ONE OF THE VFD'S WILL RAMP DOWN TO THE 20% SPEED POSITION.
   b. IF EITHER VFD-1 AND/OR VFD-2 IS SENSED TO BE IN THE 'HAND' POSTION AND HIGH WSHP-LOOP DIFFERENTIAL PRESSURE HAS REACHED, (OR EXCEEDS), SETPOINT, THE BYPASS VALVE WILL MODULATE OPEN TO MAINTAIN DIFFERENTIAL SETPOINT.

CLOSED CIRCUIT COOLING TOWER WATER LOOP: RUN CONDITIONS - COMMANDED

A. THE CLOSED CIRCUIT COOLING TOWER WATER LOOP SYSTEM (CT-LOOP) SHALL BE ENABLED TO RUN WHENEVER:
1. THE WSHP-LOOP IS IN THE COOLING-DOMINANT MODE OR THE COOLING-ECONOMIZER MODE, AND -
2. OUTSIDE AIR TEMPERATURE IS GREATER THAN 40°F (USER ADJ.).

B. THE BAS CONTROLLER SHALL MEASURE THE CT-LOOP WATER SUPPLY TEMPERATURE AND STAGE THE CT-xx WATER PUMPS, COOLING TOWER DAMPER, SPRAY PUMP AND FANS ON IN SEQUENCE TO MAINTAIN SETPOINTS.
1. WHEN THE BAS CONTROLLER COMMANDS THE CT-LOOP TO BE ON:
   a. THE CT-xx PUMPS WILL BE ENABLED ON:
      - THE TWO (2) CT-xxx 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 CT-LOOP WATER TEMPERATURE, THE LAG PUMP SHALL STAGE ON AND RUN IN UNISON WITH THE LEAD PUMP TO MAINTAIN CT-LOOP WATER TEMPERATURE.
   b. 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
      - DAILY
      - WEEKLY
      - MONTHLY
   c. ALARMS SHALL BE PROVIDED AS FOLLOWS:
      - CT-xx WATER PUMPS
        - 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.
2. THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES.
3. ALL SETPOINTS SHALL BE FIELD ADJUSTED DURING THE COMMISSIONING PERIOD TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS.
4. ON RISING CT-LOOP WATER SUPPLY TEMPERATURE, THE DAMPER, SPRAY PUMP AND FAN SHALL STAGE ON AT THE SETPOINTS GIVEN BELOW.
5. WHEN THE CT-LOOP WATER SUPPLY TEMPERATURE DROPS BACK BELOW THE SETPOINTS BY THE DIFFERENTIALS LISTED, THE FAN, PUMP AND DAMPER SHALL STAGE OFF.
6. TO PREVENT SHORT CYCLING AND BACK-EMF IN THE FAN MOTORS, THERE SHALL BE A MINIMUM DELAY (ADJ.) BETWEEN EACH STAGE.
7. WHEN OUTSIDE AIR TEMPERATURE IS BELOW 40°F (ADJ.), SPRAY PUMPS AND FANS SHALL BE DISABLED.

STAGE ON	TOWER DAMPER	SPRAY PUMP	FAN
IF CT-LOOP TEMP RISES ABOVE SETPOINT OF:	80°F	83°F	88°F
STAGE OFF			
IF CT-LOOP TEMP DROPS BELOW SETPOINT BY:	4°F	5°F	5°F

C. ALARMS SHALL BE PROVIDED AS FOLLOWS:
1. DAMPER
   - FAILURE: COMMANDED OPEN, BUT THE STATUS INDICATES CLOSED.
   - OPEN IN HAND: COMMANDED CLOSED, BUT THE STATUS INDICATES OPEN.
   - RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.
2. SPRAY PUMP
   - 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.
3. FAN
   - FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
   - IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
   - RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.
4. HIGH CONDENSER WATER SUPPLY TEMP: IF THE CONDENSER WATER SUPPLY TEMPERATURE IS GREATER THAN 90°F (ADJ.).

BOILER SYSTEM: RUN CONDITIONS - COMMANDED

A. THE BOILER SYSTEM SHALL BE ENABLED TO RUN WHENEVER:
1. THE WSHP-LOOP IS IN THE HEATING-DOMINANT MODE, AND -
2. OUTSIDE AIR TEMPERATURE IS LESS THAN 60°F (USER ADJ.).

B. TO PREVENT SHORT CYCLING, THE BOILER SYSTEM SHALL RUN FOR, AND BE OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER DEFINABLE), UNLESS SHUTDOWN ON SAFETIES OR OUTSIDE AIR CONDITIONS.

C. BOILER ENABLE:
1. THE BAS CONTROLLER SHALL MONITOR THE WSHP-LOOP TEMPERATURE.
   a. BOILER SHALL BE COMMANDED ON WHEN THE WSHP-LOOP SYSTEM REQUIRES HEATING TO BE ADDED.
   a. THE BOILER SYSTEM SHALL ALSO BE AVAILABLE TO RUN FOR FREEZE PROTECTION WHENEVER OUTSIDE AIR TEMPERATURE IS LESS THAN 38°F (ADJ.).
2. THE BOILER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.

D. BOILER SAFETIES:
1. THE FOLLOWING SAFETIES SHALL BE MONITORED:
   b. BOILER ALARM
   c. LOW WATER LEVEL.

E. ALARMS SHALL BE PROVIDED AS FOLLOWS:
1. BOILER ALARM.
2. LOW WATER LEVEL ALARM.
3. BOILER FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
4. BOILER RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
5. BOILER RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.

EQUIPMENT CONTROL POINTS SCHEDULE

WSHP-LOOP

Point Name	Hardware Points AI	AO	BI	BO	Software Points AV	BV	Sched	Trend	Alarm	Show On Graphic
WSHP-Loop Water Supply Temp-01	X							X		X
WSHP-Loop Water Supply Temp-02	X							X		X
WSHP-Loop Water Return Temp	X							X		X
WSHP-Loop Water DP - Area A, Level 1	X							X		X
WSHP-Loop Water DP - Area C, Level 1	X							X		X
WSHP-Loop Water DP - Area A, Level 2	X							X		X
WSHP-Loop Water DP - Area C, Level 2	X							X		X
WSHP-Loop By-Pass Valve - Area A, Level 1	X							X		X
WSHP-Loop By-Pass Valve - Area C, Level 1	X							X		X
WSHP-Loop By-Pass Valve - Area A, Level 2	X							X		X
WSHP-Loop By-Pass Valve - Area C, Level 2	X							X		X
WSHP-Loop By-Pass Valve - Area B	X							X		X
WSHP-Loop HPWP-01 VFD Speed		X						X		X
WSHP-Loop HPWP-02 VFD Speed		X						X		X
WSHP-Loop HPWP-01 Pump Status			X					X		X
WSHP-Loop HPWP-02 Pump Status			X					X		X
WSHP-Loop HPWP-01 VFD Status			X					X		X
WSHP-Loop HPWP-02 VFD Status			X					X		X
WSHP-Loop HPWP-01 ON / OFF				X				X		X
WSHP-Loop HPWP-02 ON / OFF				X				X		X
Outside Air Temp (Dry Bulb)					X					X
Outside Air Temp (Wet Bulb)					X					X
WSHP-Loop Differential Pressure Setpoint					X					X
WSHP-Loop Water Supply Temp Setpoint					X			X		X
WSHP-Loop High Water Temperature									X	
WSHP-Loop Low Water Temperature									X	
WSHP-Loop High Water DP									X	
WSHP-Loop Low Water DP									X	
WSHP-Loop HPWP-01 Failure									X	
WSHP-Loop HPWP-01 Running in Hand									X	
WSHP-Loop HPWP-01 Runtime Exceeded									X	
WSHP-Loop HPWP-02 Failure									X	
WSHP-Loop HPWP-02 Running in Hand									X	
WSHP-Loop HPWP-02 Runtime Exceeded									X	

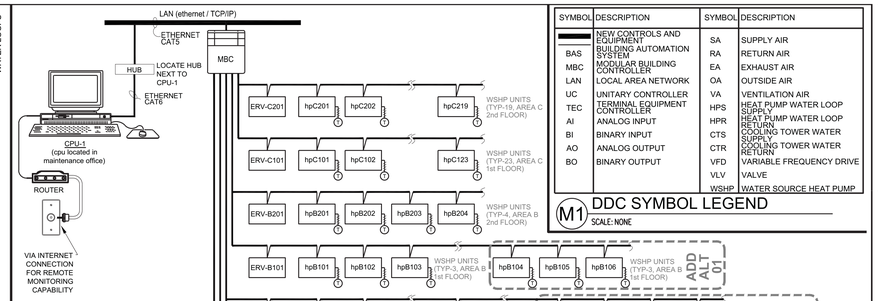
COOLING TOWER AND CT-LOOP

Point Name	Hardware Points AI	AO	BI	BO	Software Points AV	BV	Sched	Trend	Alarm	Show On Graphic
CT-Loop Water Supply Temp	X							X		X
CT-Loop Water Return Temp	X							X		X
CT-Loop CTP-01 VFD Speed		X						X		X
CT-Loop CTP-02 VFD Speed		X						X		X
CT-Fan-01 VFD Speed		X						X		X
CT-Loop CTP-01 Pump Status			X					X		X
CT-Loop CTP-02 Pump Status			X					X		X
CT-Loop CTP-01 VFD Status			X					X		X
CT-Loop CTP-02 VFD Status			X					X		X
CT-Fan-01 Status			X					X		X
CT-Fan-02 Status			X					X		X
CT-Damper-01 Status			X					X		X
CT-Damper-02 Status			X					X		X
CT-Fan-01 VFD Status			X					X		X
CT-Fan-01 VFD Fault			X					X		X
CT-Spray Pump Status			X					X		X
CT-Loop CTP-01 ON / OFF				X				X		X
CT-Loop CTP-02 ON / OFF				X				X		X
CT-Loop CTP-01 Pump ON / OFF				X				X		X
CT-Loop CTP-02 Pump ON / OFF				X				X		X
CT-Fan-01 ON / OFF				X				X		X
CT-Fan-02 ON / OFF				X				X		X
CT-Damper-01 OPEN / CLOSE				X				X		X
CT-Damper-02 OPEN / CLOSE				X				X		X
CT-Spray Pump START / STOP				X				X		X
CT-Loop High Water Temperature									X	
CT-Loop Low Water Temperature									X	
CT-Loop CTP-01 Failure									X	
CT-Loop CTP-01 Running in Hand									X	
CT-Loop CTP-01 Runtime Exceeded									X	
CT-Loop CTP-02 Failure									X	
CT-Loop CTP-02 Running in Hand									X	
CT-Loop CTP-02 Runtime Exceeded									X	
CT-Damper Failure									X	
CT-Damper Open in Hand									X	
CT-Spray Pump Failure									X	
CT-Spray Pump Running in Hand									X	
CT-Spray Pump Runtime Exceeded									X	

BOILER

Point Name	Hardware Points AI	AO	BI	BO	Software Points AV	BV	Sched	Trend	Alarm	Show On Graphic
Hot Water Supply Temp	X							X		X
Hot Water Return Temp	X							X		X
Boiler Alarm Status			X					X	X	X
Low Water Level			X					X	X	X
Boiler Status			X					X		X
Boiler Enable				X						X
Outside Air Temp					X					X
Hot Water Supply Temp Setpoint					X			X		X
Boiler Failure									X	
Boiler Running in Hand									X	
Boiler Runtime Exceeded									X	
High Hot Water Supply Temp									X	
Low Hot Water Supply Temp									X	

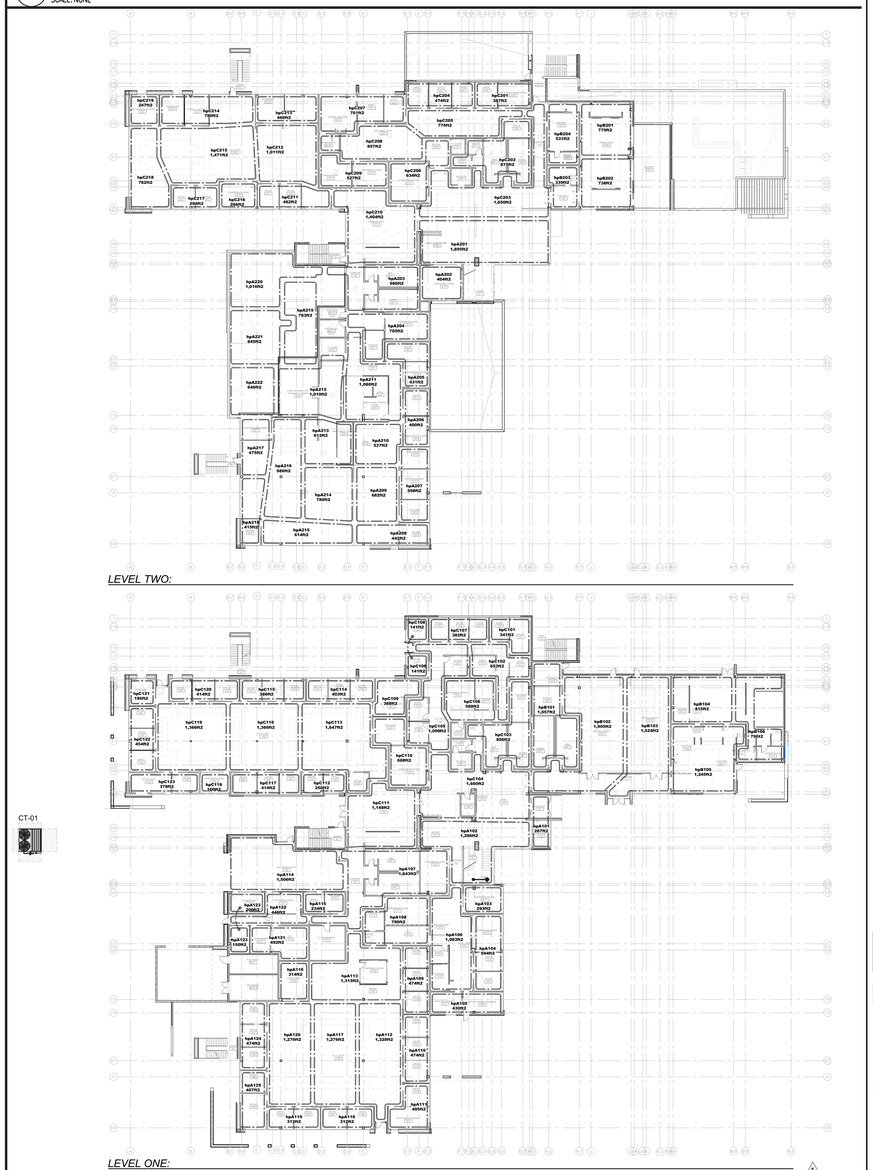
M4 WATER LOOP PIPING SYSTEMS: COOLING AND HEATING CONTROLS
SCALE: NONE



SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	NEW CONTROLS AND EQUIPMENT	SA	SUPPLY AIR
BAS	BUILDING AUTOMATION SYSTEM	RA	RETURN AIR
MBC	MODULAR BUILDING CONTROLLER	EA	EXHAUST AIR
LAN	LOCAL AREA NETWORK	OA	OUTSIDE AIR
UC	UNITARY CONTROLLER	VA	VENTILATION AIR
TEC	TERMINAL EQUIPMENT CONTROLLER	HPS	HEAT PUMP WATER LOOP SUPPLY
AI	ANALOG INPUT	HPR	HEAT PUMP WATER LOOP RETURN
BI	BINARY INPUT	CTS	COOLING TOWER WATER SUPPLY
AO	ANALOG OUTPUT	CTR	COOLING TOWER WATER RETURN
BO	BINARY OUTPUT	VFD	VARIABLE FREQUENCY DRIVE
		VLV	VALVE
		WSHP	WATER SOURCE HEAT PUMP

M1 DDC SYMBOL LEGEND
SCALE: NONE

M2 BAS / DDC CONTROL NETWORK SCHEMATIC
SCALE: NONE



M3 BUILDING THERMAL ZONE PLAN
SCALE: NONE

NTUA HQ COMPLEX OFFICE BUILDING

FT. DEFIANCE, ARIZONA

100% CONSTRUCTION DOCUMENTS

OCTOBER 6, 2016

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10/06/16
ENGINEER

Revision Schedule		
Revision Number	Revision Date	Revision Description
1	11/3/16	ADD.02
2	11/10/16	ADD.03

PROJECT NUMBER	DRAWN BY	PROJ MGR
2015.05	WOOD	BA

RVT FILE

Sheet Title: MECHANICAL: BUILDING AUTOMATION SYSTEM - DDC CONTROLS

Sheet Number: M501

Sequence of

SEQUENCE OF OPERATION:

CALL CENTER ROOM [1700] HVAC - CONFIGURATION:
A. REQUIRES 24-7 OPERATION, 365-DAYS-PER-YEAR.
B. REQUIRES 100% REDUNDANT / BACK-UP HVAC.
C. TWO (2) SOURCES OF HVAC SERVE CALL CENTER ROOM [1700]:
1. WSHP hpA114 - CONNECTED TO NORMAL ELECTRIC POWER
a. WSHP hpA114 WILL SERVE HVAC WHEN NORMAL ELECTRIC POWER IS AVAILABLE.
b. AC-103 WILL BE OFF.
2. AC-103 - CONNECTED TO EMERGENCY ELECTRIC POWER.
a. AC-103 WILL SERVE HVAC WHEN NORMAL ELECTRIC POWER IS NOT AVAILABLE.
• EMERGENCY POWER IS ENABLED ON WHEN NORMAL POWER IS NOT AVAILABLE.
D. THE BAS CONTROLLER SHALL MONITOR THE ELECTRICAL POWER SOURCE TO THE BUILDING:
1. NORMAL POWER, AND
2. EMERGENCY POWER
3. WHEN THE BAS CONTROLLER SENSES EMERGENCY ELECTRICAL POWER IS AVAILABLE, AC-103 SYSTEM WILL BE ENABLED ON.
E. CALL CENTER ROOM [1700] HVAC SYSTEM WILL OPERATE IN ONE-OF-TWO MODES:
1. NORMAL MODE OPERATION - (NORMAL ELECTRIC POWER MODE):
a. WSHP hpA114, WITH MOTORIZED DAMPER (DMPR-01), WILL BE ON.
b. DMPR-01 IS NORMALLY OPEN (NO).
c. WSHP hpA114 WILL RUN AND OPERATE AS DESCRIBED IN THE WSHP CONTROLS DETAIL (M1 / M502).
d. AC-103, WITH MOTORIZED DAMPER (DMPR-02), WILL BE OFF.
e. DMPR-02 WILL BE CLOSED, (NC).
2. EMERGENCY MODE OPERATION - (EMERGENCY ELECTRIC POWER MODE):
a. WSHP hpA114, WITH MOTORIZED DAMPER (DMPR-01), WILL BE OFF.
b. DMPR-01 WILL BE CLOSED.
c. AC-103, WITH MOTORIZED DAMPER (DMPR-02), WILL BE ON.
d. DMPR-02 WILL BE OPEN.
e. AC-103 WILL RUN AND OPERATE AS DESCRIBED IN THIS DETAIL..

AC-103 - CONFIGURATION:
A. SINGLE-ZONE, CONSTANT AIR VOLUME, SPLIT SYSTEM: DX COOLING, ELECTRIC HEATING.

RUN CONDITIONS - REQUESTED:
A. THE UNIT SHALL RUN CONTINUOUSLY AND SHALL MAINTAIN USER COOLING SETPOINT.
B. ALARMS SHALL BE PROVIDED AS FOLLOWS:
1. HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).

ZONE SETPOINT ADJUST:
A. THE OCCUPANT SHALL BE ABLE TO ADJUST THE ZONE TEMPERATURE COOLING AND HEATING SETPOINTS AT THE ZONE SENSOR.

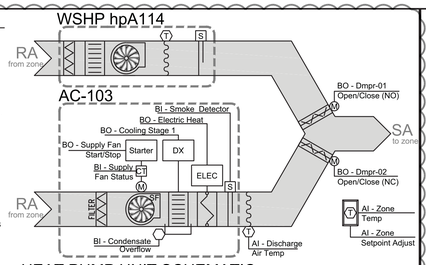
SUPPLY FAN:
A. THE SUPPLY FAN SHALL RUN ANYTIME THE UNIT COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES.
B. THE SUPPLY FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME TO PREVENT SHORT CYCLING.
C. ALARMS SHALL BE PROVIDED AS FOLLOWS:
1. SUPPLY FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
2. SUPPLY FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

COOLING:
A. THE COOLING SHALL BE ENABLED WHENEVER:
1. THE ZONE TEMPERATURE IS ABOVE COOLING SETPOINT
2. AND THE SUPPLY FAN STATUS IS ON.
3. ALARMS SHALL BE PROVIDED AS FOLLOWS:
a. HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS 5°F (ADJ.) GREATER THAN SETPOINT.

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

CONDENSATE OVERFLOW, (HIGH LIMIT):
A. IF THE FACTORY INSTALLED CONDENSATE OVERFLOW SWITCH IS ACTIVATED, THE SUPPLY FAN WILL BE ENABLED OFF, AND AN ALARM WILL BE GENERATED

WSHP hpA114



HEAT PUMP UNIT SCHEMATIC

AC-103 CONTROL POINTS SCHEDULE

Point Name	Hardware Points AI	AO	BI	BO	Software Points AV	BV	Sched	Trend	Alarm	Show On Graphic
Zone Temperature	X							X		X
Zone Setpoint Adjust	X									X
Discharge Air Temperature	X							X		X
Supply Fan Status			X					X	X	X
Smoke Detector - 01			X					X	X	X
Smoke Detector - 02			X					X	X	X
Condensate Overflow			X					X	X	X
Electric Heat ON / OFF				X				X		X
Supply Fan ON / OFF				X				X		X
Dmpr-01 OPEN / CLOSED				X				X		X
Dmpr-02 OPEN / CLOSED				X				X		X
Cooling Stage ON / OFF				X				X		X
Cooling Setpoint					X					
High Zone Temp									X	X
Low Zone Temp									X	X
Supply Fan Failure									X	X
Supply Fan Runtime Exceeded									X	X
Compressor Runtime Exceeded									X	

M4 HEAT PUMP UNIT w/ELEC HEAT CONTROL SYSTEM
SCALE: NONE
CALL CENTER ROOM [1700]

SEQUENCE OF OPERATION:

SINGLE-ZONE, CONSTANT AIR VOLUME, SPLIT SYSTEM: DX COOLING,
1. TYPICAL AT AC-105.

RUN CONDITIONS - REQUESTED:
1. THE UNIT SHALL RUN CONTINUOUSLY AND SHALL MAINTAIN USER COOLING SETPOINT.
2. ALARMS SHALL BE PROVIDED AS FOLLOWS:
A. HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).

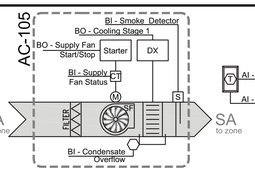
ZONE SETPOINT ADJUST:
1. THE OCCUPANT SHALL BE ABLE TO ADJUST THE ZONE TEMPERATURE COOLING SETPOINTS AT THE ZONE SENSOR.

SUPPLY FAN:
1. THE SUPPLY FAN SHALL RUN ANYTIME THE UNIT COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES.
2. THE SUPPLY FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME TO PREVENT SHORT CYCLING.
3. ALARMS SHALL BE PROVIDED AS FOLLOWS:
A. SUPPLY FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
B. SUPPLY FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

COOLING:
1. THE COOLING SHALL BE ENABLED WHENEVER:
A. THE ZONE TEMPERATURE IS ABOVE COOLING SETPOINT
B. AND THE SUPPLY FAN STATUS IS ON.
2. ALARMS SHALL BE PROVIDED AS FOLLOWS:
A. HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS 5°F (ADJ.) GREATER THAN SETPOINT.

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

CONDENSATE OVERFLOW, (HIGH LIMIT):
1. IF THE FACTORY INSTALLED CONDENSATE OVERFLOW SWITCH IS ACTIVATED, THE SUPPLY FAN WILL BE ENABLED OFF, AND AN ALARM WILL BE GENERATED



AIR CONDITIONING UNIT SCHEMATIC

AC-105 CONTROL POINTS SCHEDULE

Point Name	Hardware Points AI	AO	BI	BO	Software Points AV	BV	Sched	Trend	Alarm	Show On Graphic
Zone Temperature	X							X		X
Zone Setpoint Adjust	X									X
Supply Fan Status			X					X	X	X
Smoke Detector - 01			X					X	X	X
Condensate Overflow			X					X	X	X
Supply Fan ON / OFF				X				X		X
Cooling Stage ON / OFF				X				X		X
Cooling Setpoint					X					
High Zone Temp									X	X
Low Zone Temp									X	X
Supply Fan Failure									X	X
Supply Fan Runtime Exceeded									X	X
Compressor Runtime Exceeded									X	

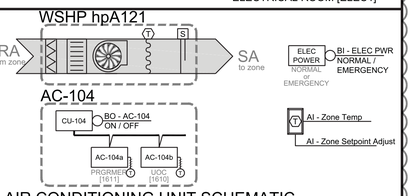
M5 AIR CONDITIONING UNIT SYSTEM CONTROL
SCALE: NONE
ELECTRICAL ROOM [ELEC1]

SEQUENCE OF OPERATION:

UOC [1610] AND PROGRAMMER [1611] HVAC - CONFIGURATION:
A. REQUIRES 24-7 OPERATION, 365-DAYS-PER-YEAR.
B. REQUIRES 100% REDUNDANT / BACK-UP HVAC.
C. TWO (2) SOURCES OF HVAC SERVE UOC [1610] AND PROGRAMMER [1611]:
1. WSHP hpA121 - CONNECTED TO NORMAL ELECTRIC POWER
a. WSHP hpA121 WILL SERVE HVAC WHEN NORMAL ELECTRIC POWER IS AVAILABLE.
b. AC-104 WILL BE OFF.
2. AC-104 - CONNECTED TO EMERGENCY ELECTRIC POWER.
a. AC-104 WILL SERVE HVAC WHEN NORMAL ELECTRIC POWER IS NOT AVAILABLE.
• EMERGENCY POWER IS ENABLED ON WHEN NORMAL POWER IS NOT AVAILABLE.
D. THE BAS CONTROLLER SHALL MONITOR THE ELECTRICAL POWER SOURCE TO THE BUILDING:
1. NORMAL POWER, AND
2. EMERGENCY POWER.
3. WHEN THE BAS CONTROLLER SENSES EMERGENCY ELECTRICAL POWER IS AVAILABLE, AC-104 SYSTEM WILL BE ENABLED ON.
E. UOC [1610] AND PROGRAMMER [1611] HVAC SYSTEM WILL OPERATE IN ONE-OF-TWO MODES:
1. NORMAL MODE OPERATION - (NORMAL ELECTRIC POWER MODE):
a. WSHP hpA121 WILL BE ON.
b. WSHP hpA1214 WILL RUN AND OPERATE AS DESCRIBED IN THE WSHP CONTROLS DETAIL (M1 / M502).
c. AC-104 WILL BE OFF.
2. EMERGENCY MODE OPERATION - (EMERGENCY ELECTRIC POWER MODE):
a. WSHP hpA121 WILL BE OFF.
b. AC-104 WILL BE ON.
c. AC-104 WILL RUN AND OPERATE ACCORDING TO IT'S OWN FACTORY PACKAGED CONTROL SYSTEM.

AC-104 - CONFIGURATION:
A. MULTIPLE-ZONE, CONSTANT AIR VOLUME, SPLIT SYSTEM: DX COOLING, ELECTRIC HEATING:

WSHP hpA121



AIR CONDITIONING UNIT SCHEMATIC

AC-104 CONTROL POINTS SCHEDULE

Point Name	Hardware Points AI	AO	BI	BO	Software Points AV	BV	Sched	Trend	Alarm	Show On Graphic
Zone Temperature	X							X		X
Zone Setpoint Adjust	X									X
Electric Power - NORMAL / EMERGENCY			X					X	X	X
AC-104 - ON / OFF				X				X		X
High Zone Temp									X	X
Low Zone Temp									X	X

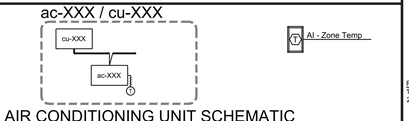
M6 SPLIT-SYSTEM (MULTI-ZONE) CONTROL
SCALE: NONE
UOC [1610] AND PROGRAMMER [1611]

SEQUENCE OF OPERATION:

ac-XXX / cu-XXX - CONFIGURATION:
A. SINGLE-ZONE, CONSTANT AIR VOLUME, SPLIT SYSTEM: DX COOLING

RUN CONDITIONS - REQUESTED:
A. ac-XXX / cu-XXX SYSTEM WILL RUN AND OPERATE ACCORDING TO IT'S OWN FACTORY PACKAGED CONTROL SYSTEM.
B. THE BAS CONTROLLER SHALL MONITOR THE ZONE SPACE TEMPERATURE.
C. ALARMS SHALL BE PROVIDED AS FOLLOWS:
1. HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN 85°F, (USER ADJ), AN ALARM SHALL BE GENERATED THRU THE BAS SYSTEM.

ac-XXX / cu-XXX



AIR CONDITIONING UNIT SCHEMATIC

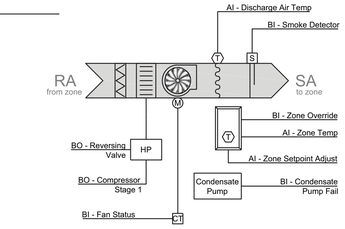
ac-XXX / cu-XXX CONTROL POINTS SCHEDULE

Point Name	Hardware Points AI	AO	BI	BO	Software Points AV	BV	Sched	Trend	Alarm	Show On Graphic
Zone Temperature	X							X		X
High Zone Temp									X	X

M7 SPLIT-SYSTEM (SINGLE-ZONE) CONTROL
SCALE: NONE
ac/cu-C101 - IT CLOSET [1114]
ac/cu-C102 ELEV EQUIP [1107]
ac/cu-C201 - IT CLOSET [2116]
ac/cu-A201 - IT CLOSET [2410]

SEQUENCE OF OPERATIONS

WATER SOURCE HEAT PUMP (TYPICAL OF 105 approx.)
RUN CONDITIONS - SCHEDULED:
THE UNIT SHALL RUN ACCORDING TO A USER DEFINABLE TIME SCHEDULE IN THE FOLLOWING MODES:
• OCCUPIED MODE: THE UNIT SHALL MAINTAIN
- 74°F (ADJ.) COOLING SETPOINT
- 70°F (ADJ.) HEATING SETPOINT
• UNOCCUPIED MODE (NIGHT SETBACK): THE UNIT SHALL MAINTAIN
- 85°F (ADJ.) COOLING SETPOINT.
- 55°F (ADJ.) HEATING SETPOINT.
ALARMS SHALL BE PROVIDED AS FOLLOWS:
• HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).
• LOW ZONE TEMP: IF THE ZONE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).
ZONE SETPOINT ADJUST:
• THE OCCUPANT SHALL BE ABLE TO ADJUST THE ZONE TEMPERATURE HEATING AND COOLING SETPOINTS AT THE ZONE SENSOR.
ZONE UNOCCUPIED OVERRIDE:
• A TIMED LOCAL OVERRIDE CONTROL SHALL ALLOW AN OCCUPANT TO OVERRIDE THE SCHEDULE AND PLACE THE UNIT INTO AN OCCUPIED MODE FOR AN ADJUSTABLE PERIOD OF TIME. AT THE EXPIRATION OF THIS TIME, CONTROL OF THE UNIT SHALL AUTOMATICALLY RETURN TO THE SCHEDULE.
SMOKE DETECTION:
• THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A SMOKE DETECTOR STATUS.
FAN:
• THE FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES.
HEATING AND COOLING - 1 COMPRESSOR STAGE:
• THE CONTROLLER SHALL RECEIVE A SIGNAL FROM THE LOOP WATER SOURCE MONITOR INDICATING THAT THERE IS WATER FLOW AND THAT THE WATER TEMPERATURE IS WITHIN ACCEPTABLE LIMITS.
• THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND CYCLE THE COMPRESSOR TO MAINTAIN ITS SETPOINT. TO PREVENT SHORT CYCLING, THE STAGE SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME. THE COMPRESSOR SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.
• THE HEATING SHALL BE ENABLED WHENEVER:
- OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).
- AND THE FAN IS ON.
- AND THE REVERSING VALVE IS IN HEAT MODE.
• THE COOLING SHALL BE ENABLED WHENEVER:
- OUTSIDE AIR TEMPERATURE IS GREATER THAN 60°F (ADJ.).
- AND THE FAN IS ON.
- AND THE REVERSING VALVE IS IN COOL MODE.
• ON MODE CHANGE, THE COMPRESSOR SHALL BE DISABLED AND REMAIN OFF UNTIL AFTER THE REVERSING VALVE HAS CHANGED POSITION.
ALARMS SHALL BE PROVIDED AS FOLLOWS:
• COMPRESSOR RUNTIME EXCEEDED: THE COMPRESSOR RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).
DISCHARGE AIR TEMPERATURE:
THE CONTROLLER SHALL MONITOR THE DISCHARGE AIR TEMPERATURE.
ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS GREATER THAN 120°F (ADJ.).
- LOW DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS LESS THAN 40°F (ADJ.).
FAN STATUS:
• THE CONTROLLER SHALL MONITOR THE FAN STATUS.
ALARMS SHALL BE PROVIDED AS FOLLOWS:
- FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- FAN RUNTIME EXCEEDED: FAN STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).



WSHP SCHEMATIC

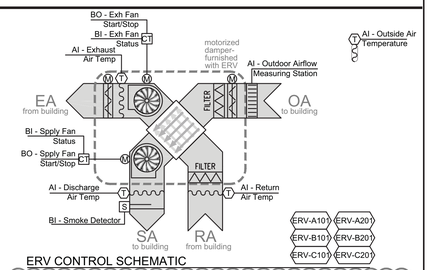
WSHP CONTROL POINTS SCHEDULE

Point Name	Hardware Points AI	AO	BI	BO	Software Points AV	BV	Sched	Trend	Alarm	Show On Graphic
Zone Temp	X							X		X
Zone Setpoint Adjust	X									X
Discharge Air Temp	X							X		X
Zone Override			X					X		X
Smoke Detector			X					X	X	X
Fan Status			X					X		X
Condensate Pump Fail			X						X	X
Fan Start/Stop				X				X		X
Compressor Start/Stop				X				X		X
Reversing Valve				X						X
Compressor Soft Shutdown						X				X
Schedule							X			
Heating Setpoint								X		X
Cooling Setpoint								X		X
High Zone Temp									X	
Low Zone Temp									X	
Compressor Runtime Exceeded									X	
High Discharge Air Temp									X	
Low Discharge Air Temp									X	
Fan Failure									X	
Fan in Hand									X	
Fan Runtime Exceeded									X	

M1 WATER SOURCE HEAT PUMP (WSHP) SYSTEM CONTROL
SCALE: NONE

SEQUENCE OF OPERATION:

A. OUTSIDE AIR (ENERGY RECOVERY VENTILATING) UNIT SYSTEM:
1. FACTORY ASSEMBLED UNIT - INCLUDES:
a. STATIC PLATE CORE HEAT EXCHANGER.
b. SINGLE-POINT POWER CONNECTION AND A SINGLE-POINT 24 VAC CONTACTOR CONTROL CONNECTION.
c. OA AND RA DAMPERS-MOTORIZED.
d. ELECTRIC DUCT HEATERS.
B. ERV-vee RUN CONDITIONS - SCHEDULED:
THE UNIT SHALL RUN ACCORDING TO A USER DEFINABLE TIME SCHEDULE IN THE FOLLOWING MODES:
1. OCCUPIED MODE:
a. OA AND RA DAMPERS WILL BE OPEN.
b. SUPPLY AIR FAN AND EXHAUST AIR FAN WILL BE ENABLED ON.
2. UNOCCUPIED MODE (NIGHT SETBACK):
a. OA AND RA DAMPERS WILL BE CLOSED.
b. SUPPLY AIR FAN AND EXHAUST AIR FAN WILL BE ENABLED OFF.
C. DISCHARGE AIR TEMPERATURE:
1. THE BAS CONTROLLER SHALL MONITOR:
a. THE OUTDOOR AMBIENT TEMPERATURE, AND,
b. THE SA DISCHARGE AIR TEMPERATURE.
2. ALARMS SHALL BE PROVIDED AS FOLLOWS:
a. HIGH DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS GREATER THAN 60°F (ADJ.).
b. LOW DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS LESS THAN 40°F (ADJ.).
D. OUTSIDE AIRFLOW MONITORING STATION:
1. OUTSIDE AIR MONITORING STATION SHALL CONTINUOUSLY MONITOR THE AMOUNT OF OUTSIDE AIR INTRODUCED INTO EACH ERV WITH AN ACCURACY EQUAL TO OR GREATER 15%.
2. IF OUTSIDE AIR QUANTITY DROPS BELOW SPECIFIED AIR FLOW, AN ALARM SHALL BE SENT TO THE BAS/DDC.
E. FILTER HOURS:
1. THE CONTROLLER SHALL MONITOR THE FAN(S) RUNTIME.
2. ALARMS SHALL BE PROVIDED AS FOLLOWS:
a. FILTER CHANGE REQUIRED: FILTER HAS BEEN IN USE FOR MORE THAN 2200HR (ADJ.).



ERV CONTROL SCHEMATIC

ERV CONTROL POINTS SCHEDULE

Point Name	Hardware Points AI	AO	BI	BO	Software Points AV	BV	Sched	Trend	Alarm	Show On Graphic
Outside Air Temp	X							X		X
Exhaust Air Temp	X									X
Return Air Temp	X							X		X
Outside Airflow Monitoring	X							X		X
High Static Shutdown			X					X	X	X
Supply Air Smoke Detector			X					X	X	X
Supply Fan Status			X					X		X
Exhaust Fan Status			X					X		X
Supply Fan Start/Stop				X				X		X
Exhaust Fan Start/Stop				X				X		X
Supply Fan Failure									X	
Supply Fan in Hand									X	
Supply Fan Runtime Exceeded									X	
Exhaust Fan Failure									X	
Exhaust Fan in Hand									X	
Exhaust Fan Runtime Exceeded									X	
Heat Wheel Rotation Failure									X	
High Supply Air Temp									X	
Low Supply Air Temp									X	
High Return Air Temp									X	
Low Return Air Temp									X	
High Supply Air Temp									X	
Low Supply Air Temp									X	

M2 OUTSIDE AIR (ENERGY RECOVERY VENTILATING) UNIT CONTROL
SCALE: NONE

SEQUENCE OF OPERATIONS

SINGLE-ZONE, CONSTANT AIR VOLUME, SPLIT SYSTEM: DX COOLING,
1. TYPICAL AT AC-101 AND AC-102.

AC-101/AC-102 LEAD/LAG OPERATION:
1. THE TWO AC UNITS SHALL OPERATE IN A LEAD/LAG FASHION.
A. THE LEAD AC UNIT SHALL RUN FIRST. ON FAILURE OF THE LEAD AC UNIT, THE LAG AC UNIT SHALL RUN AND THE LEAD AC UNIT SHALL TURN OFF.
a. WHEN AC-101 IS ON:
• AC-102 WILL BE OFF.
• M-DAMPR-01 WILL BE OPEN.
• M-DAMPR-02 WILL BE CLOSED.
b. WHEN AC-102 IS ON:
• AC-101 WILL BE OFF.
• M-DAMPR-01 WILL BE CL OSED.
• M-DAMPR-02 WILL BE OPEN.
B. WHEN THE LEAD AC UNIT IS ON, AND IF THE ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY 5°F, (OR A USER DEFINABLE AMOUNT), THE LAG AC UNIT WILL BE ENABLED ON.
C. THE DESIGNATED LEAD AC UNIT SHALL ROTATE WITH THE LAG AC UNIT ON A WEEKLY BASIS.

RUN CONDITIONS - REQUESTED:
1. THE UNIT SHALL RUN CONTINUOUSLY AND SHALL MAINTAIN USER COOLING SETPOINT.
2. ALARMS SHALL BE PROVIDED AS FOLLOWS:
A. HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).

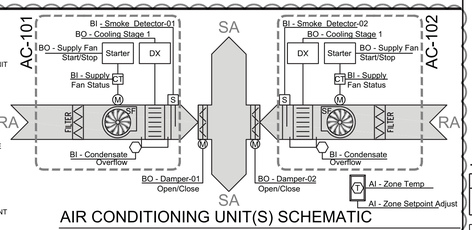
ZONE SETPOINT ADJUST:
1. THE OCCUPANT SHALL BE ABLE TO ADJUST THE ZONE TEMPERATURE COOLING SETPOINTS AT THE ZONE SENSOR.

SUPPLY FAN:
1. THE SUPPLY FAN SHALL RUN ANYTIME THE UNIT COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES.
2. THE SUPPLY FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME TO PREVENT SHORT CYCLING.
3. ALARMS SHALL BE PROVIDED AS FOLLOWS:
A. SUPPLY FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
B. SUPPLY FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

COOLING:
1. THE COOLING SHALL BE ENABLED WHENEVER:
A. THE ZONE TEMPERATURE IS ABOVE COOLING SETPOINT
B. AND THE SUPPLY FAN STATUS IS ON.
2. ALARMS SHALL BE PROVIDED AS FOLLOWS:
A. HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS 5°F (ADJ.) GREATER THAN SETPOINT.

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

CONDENSATE OVERFLOW, (HIGH LIMIT):
1. IF THE FACTORY INSTALLED CONDENSATE OVERFLOW SWITCH IS ACTIVATED, THE SUPPLY FAN WILL BE ENABLED OFF, AND AN ALARM WILL BE GENERATED



AIR CONDITIONING UNIT(S) SCHEMATIC

AC-101 / AC-102 CONTROL POINTS SCHEDULE

Point Name	Hardware Points AI	AO	BI	BO	Software Points AV	BV	Sched	Trend	Alarm	Show On Graphic
Zone Temperature	X							X		X
Zone Setpoint Adjust	X									X
Supply Fan Status			X					X		X
Smoke Detector - 01			X					X	X	X
Smoke Detector - 02			X					X	X	X
Condensate Overflow			X					X	X	X
Supply Fan ON / OFF				X				X		X
Motorized Damper-01 OPEN / CLOSED				X				X		X
Motorized Damper-02 OPEN / CLOSED				X				X		X
Cooling Stage ON / OFF				X				X		X
Cooling Setpoint					X					
High Zone Temp									X	X
Low Zone Temp									X	X
Supply Fan Failure									X	X
Supply Fan Runtime Exceeded									X	X
Compressor Runtime Exceeded									X	

M3 AIR CONDITIONING UNIT SYSTEM CONTROL
SCALE: NONE
IT SERVER ROOM [1113]

NTUA HQ COMPLEX OFFICE BUILDING

FT. DEFIANCE, ARIZONA
100% CONSTRUCTION DOCUMENTS
OCTOBER 6, 2016

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10/06/16
ENGINEER

Revision Schedule

Revision Number	Revision Date	Revision Description
1	11/3/16	ADD.02
2	11/10/16	ADD.03

PROJECT NUMBER	DRAWN BY	PROJ MGR
2015.05	WOOD	BA

RVT FILE

Sheet Title: MECHANICAL: BUILDING AUTOMATION SYSTEM - DDC CONTROLS

Sheet Number
M502
Sequence of

DOMESTIC WATER HEATER

SYMBOL	MANUFACTURER (OR EQUAL)	MODEL	TANK CAPACITY GALLONS	1ST HOUR DELIVERY	INPUT BTUH	CW INLET	HW OUTLET	FLUE/INTAKE DIAMETER	ELECTRICAL		GAS CONN	T&P RELIEF
									VOLTS	PHASE		
WH-1 WH-2	A.O. SMITH	BTH-100	75	166 GALLONS	100,000	1"	1"	4"/4"	120	1	3/4"	3/4"
WH-3	A.O. SMITH FOR BID ALTERNATE 1	BTH-150	100	297 GALLONS	150,000	1-1/2"	1-1/2"	4"/4"	120	1	1"	1"

COMMENTS

FURNISH COMPLETE PACKAGED WATER HEATER AND ASME STORAGE TANK WITH ALL CONTROLS, ASME RELIEF VALVE, HEAT EXCHANGER, TANK THERMOMETER, GLASS-LINED STEEL TANK CONSTRUCTION, INLET AND OUTLET THERMOMETERS, & PRE-PIPED WITH FITTINGS. COMPLETE ASSEMBLY SHALL FACTORY ASSEMBLED. HEATERS SHALL BE SET FOR OPERATION AT SITE ELEVATION, AGA RATED, LOW WATER CUTOFF, STANDARD EQUIPMENT, STANDARD CONTROLS-120V. 90% EFFICIENY RATING, 5 YEAR WARRANTY. BLOWER: 2.2 AMPS, IGNITER: 4.0 AMPS
CONTRACTOR TO PROVIDE HEAT TRAPS AND SEISMIC RESTRAINT STRAPS.

EXPANSION TANK SCHEDULE

SYMBOL	MANUFACTURER (OR EQUAL)	MODEL	DIMENSIONS (IN)		TANK VOLUME (GAL)	MOUNTING	TYPE	OPER. PRESS (PSIG)		OPER. TEMP. (°F)		COMMENTS
			DIA.	HEIGHT				MIN.	MAX.	MIN.	MAX.	
EXP-1	AMTROL	ST-20V-C	12"	19-1/2"	8.0	VERTICAL	BLADDER	-	125	-	180	CONSTRUCTED PER ASME SECTION VII, DIV.1
EXP-2	AMTROL FOR BID ALTERNATE 1	ST-12-C	12"	12-1/2"	4.0	IN-LINE	BLADDER	-	125	-	180	

HOT WATER CIRCULATION PUMP SCHEDULE

SYMBOL	MANUFACTURER (OR EQUAL)	MODEL	GPM	HEAD (FT.)	MOTOR				COMMENTS
					HP	VOLTS	PHASE	HZ	
HWCP-1	TACO	008	10	12	1/8	120	1	60	FLANGED CONNECTIONS, IN-LINE UNIT, ALL BRONZE CONSTRUCTION. PROVIDE 7-DAY TIME CLOCK AND AQUASTAT.

ELEVATOR DUPLEX SUMP PUMPS

SYMBOL	MANUFACTURER	MODEL	GPM	HEAD (FT.)	ELECTRICAL				SYSTEM	COMMENTS
					HP	VOLTS	PHASE	HZ		
SP-1 SP-1A	LIBERTY	ELV-280	50	10	1/2	115	1	60	ELEVATOR	UNITS INTERLOCKED TO OPERATE AS DUPLEX UNIT. FURNISH COMPLETE WITH 30" DIAx24" SUMP OR 30"x30"x24" CONCRETE FORMED SUMP, CSI DUPLEX CONTROL PANEL-SEE OIL DETECTION BELOW, NEC 1 ENCLOSURE, LOCKABLE LATCH, H-O-A SWITCHES, CIRCUIT BREAKER, STARTERS, OVERLOAD RELAYS, 20V FLOAT CIRCUIT, UL 508 RATED PANEL, AND PUMP RUN OPERATION INDICATION LIGHTS. PROVIDE WITH ALARM LIGHT AND HORN INDICATION, HIGH WATER ALARM ACTIVATION, TIMER METERS FOR PUMPS, AUX. ALARM CONTACT, AND FLOAT SWITHES/BRACKET. FURNISH WITH OIL DETECTION SYSTEM COMPLETE WITH CONTROL PANEL. REMOTE ALARM TO BE LOCATED AT ADMINISTRATION. MECHANICAL FLOAT TO SHUT-DOWN PUMPS AT DETECTION OF OIL.

KITCHEN EQUIPMENT PLUMBING SCHEDULE

SYMBOL	FIXTURE TYPE*	ROUGH-IN CONNECTIONS					COMMENTS
		CW	HW	WASTE	VENT	GAS	
A02.1, A03.1	WALK-IN EVAP. COIL	---	---	INDIRECT	---	---	HEAT TAPE, INSULATE, & JACKET FREEZER DRAIN, INSULATE & JACKET COOLER DRAIN ROUTED TO FLOOR SINK
B01, C02, D01, D39	HAND SINKS	1/2"	1/2"	2"	1-1/2"	---	---
B02.1, D06.1	FIRE SUPP. SYSTEM	1"	---	---	---	---	PROVIDE WATTS LF009 BFP, ALARM SWITCH TO HOOD SUPPRESSION SYSTEM
B03	COMBIN. OVEN/STEAMER	(4) 3/4"	---	INDIRECT	---	(2) 3/4"	(2) 190,000 BTUH EACH = 380,000 TOTAL GAS LOAD, INDIRECT DRAINS ROUTED TO FLOOR SINK
B04	30 GAL TILT SKILLET	1/2"	1/2"	---	---	1/2"	104,000 TOTAL GAS LOAD, DUMPS TO FLOOR TROUGH B05
B05	FLOOR TROUGH	---	---	3" MIN.	2"	---	FOR B04, GREASE WASTE REQUIRED
B06, D15	GRIDDLE RANGE	---	---	---	---	3/4"	72,000 TOTAL GAS LOAD EACH
B07	6 BURNER RANGE/OVEN	---	---	---	---	3/4"	210,000 BTUH TOTAL GAS LOAD
B13, B17, B24, D37	TABLE AND SINK	1/2"	1/2"	INDIRECT	---	---	INDIRECT DRAINS ROUTED TO FLOOR SINK(S)
B16, D24, D28	HOT FOOD WELLS	1/2"	---	INDIRECT	---	---	INDIRECT DRAINS FOUTED TO FLOOR SINK(S)
B34, B35, B35.1	ICE BIN, MAKER, FILTER	3/4"	---	INDIRECT	---	---	INDIRECT DRAINS TO FLOOR SINK
C03	SOILED DISH TABLE	---	---	INDIRECT	---	---	INDIRECT DRAIN TO FLOOR SINK
C05, C06	DISPOSER, PRE-WASH	(2) 1/2"	1/2"	2"	1-1/2"	---	COLD WATER TO DISPOSER AND COLD WATER TO PRE-WASH
C07	DISH MACHINE	---	1/2"	INDIRECT	---	---	110°F WATER MINIMUM, 140° F RECOMMENDED, BOOSTER HEATER, DRAIN WATER TEMPERING WITH UNIT
C13, C14	3-COMP. SINK, PRE-WASH	3/4"	3/4"	INDIRECT	---	---	INDIRECT DRAIN(S) TO FLOOR SINK (GREASE WASTE REQUIRED)
D05	SODA SYSTEM	1/2"	---	INDIRECT	---	---	INDIRECT DRAIN TO FLOOR SINK
D11	FRYER SYSTEM	---	---	---	---	3/4"	220,000 BTUH TOTAL GAS LOAD
D14	CHARBROILER RANGE	---	---	---	---	3/4"	80,000 TOTAL GAS LOAD
D42	SODA/ ICE DISPENSER	1/2"	---	INDIRECT	---	---	INDIRECT DRAIN TO FLOOR SINK
D43, D43.1	ICE MACHINE/FILTER	1/2"	---	INDIRECT	---	---	INDIRECT DRAIN TO FLOOR SINK
D45	ICED TEA BREWER	1/4"	---	---	---	---	BRANCH WATER FROM D47
D47	COFFEE BREWER	1/2"	---	---	---	---	BRANCH 1/4" WATER TO D45
MUA-B02	MAKE-UP AIR UNIT (B02)	---	---	---	---	3/4"	254,500 BTUH TOTAL GAS LOAD
MUA-D06	MAKE-UP AIR UNIT (D06)	---	---	---	---	3/4"	176,200 BTUH TOTAL GAS LOAD

*KITCHEN EQUIPMENT FURNISHED BY OTHERS, ROUGH-INS AND FINAL CONNECTIONS BY PLUMBING CONTRACTOR-COORDINATE WITH FOOD SERVICE DRAWINGS FOR SIZES & LOCATIONS

PLUMBING FIXTURE SCHEDULE

SYMBOL	FIXTURE TYPE	MANUF/MODEL (OR EQUAL)	FIXTURE MOUNTING HEIGHT	CONNECTIONS				COMMENTS
				CW	HW	WASTE	VENT	
P-1	WATER CLOSET	AMERICAN STANDARD NO. 3451.001 "MADERA"	15" TOP OF RIM	1"	---	4"	2" OR 4" SEE DWG.	VITREOUS CHINA, FLUSH VALVE, FLOOR MOUNTED, ELONGATED BOWL, SIPHON JET ACTION, WHITE FINISH. OLSONITE NO. 95 OPEN FRONT SEAT, SLOAN CROWN NO. 111-1.28, 1.28 GPF HIGH EFF. WATER SAVER FLUSH VALVE (PISTON ACTIVATED).
P-1A	WATER CLOSET (ADA)	AMERICAN STANDARD NO. 3461.001 "MADERA"	16-1/2" TOP OF RIM	1"	---	4"	2" OR 4" SEE DWG.	VITREOUS CHINA, FLUSH VALVE, FLOOR MOUNTED, ELONGATED BOWL, SIPHON JET ACTION, WHITE FINISH. OLSONITE NO. 95 OPEN FRONT SEAT, SLOAN CROWN NO. 111-1.28, 1.28 GPF HIGH EFF. WATER SAVER FLUSH VALVE (PISTON ACTIVATED).
P-2	URINAL	AMERICAN STANDARD NO. 6950.005 "WASHBROOK"	24" TOP OF RIM	3/4"	---	2"	1-1/2"	VITREOUS CHINA, FLUSH VALVE, WALL HUNG, TOP SPUD, WASHOUT FLUSH ACTION, WHITE FINISH. SLOAN CROWN NO. 186-0.125, 0.125 GPF HIGH EFF. WATER SAVER FLUSH VALVE (PISTON ACTIVATED). ZURN OR SMITH URINAL CARRIER SYSTEM.
P-3	LAVATORY (ADA)	AMERICAN STANDARD NO. 0614.003 "STUDIO"	UNDERCOUNTER SEE ARCH. FOR COUNTER HEIGHT	1/2"	1/2"	2"	1-1/2"	VITREOUS CHINA, 21.25"x15.25"x6.75", SELF-RIMMING, WHITE FINISH. ZURN Z-86500-XL-25M METERING FAUCET WITH ADA PUSH-BUTTON HANDLES AND 0.35 GPM VP AERATOR. PROVIDE WITH LOOSE KEY STOPS AND SUPPLIES, 1-1/4" P-TRAP, GRID STRAINER, TRUEBRO #102 LAV-GUARD KIT, & WATTS MMV THERMOSTATIC MIXING VALVE SET AT 105°F PER ASSE 1070.
P-4	LAVATORY (ADA)	AMERICAN STANDARD NO. 0321.075 "DECYLN"	WALL MOUNTED 34" TO RIM	1/2"	1/2"	2"	1-1/2"	VITREOUS CHINA, 20"x18", CONCEALED ARM, WHITE FINISH. ZURN Z-86500-XL-25M METERING FAUCET WITH ADA PUSH-BUTTON HANDLES AND 0.35 GPM VP AERATOR. PROVIDE WITH LOOSE KEY STOPS AND SUPPLIES, 1-1/4" P-TRAP, GRID STRAINER, TRUEBRO #102 LAV-GUARD KIT, & WATTS MMV THERMOSTATIC MIXING VALVE SET AT 105°F PER ASSE 1070.
P-5	LAVATORY (ADA)	AMERICAN STANDARD NO. 0491.019 "RONDALYN"	COUNTERTOP SEE ARCH. FOR COUNTER HEIGHT	1/2"	1/2"	2"	1-1/2"	VITREOUS CHINA, 20"x17" OVAL, SELF-RIMMING, WHITE FINISH. ZURN Z-86500-XL-25M METERING FAUCET WITH ADA PUSH-BUTTON HANDLES AND 0.35 GPM VP AERATOR. PROVIDE WITH LOOSE KEY STOPS AND SUPPLIES, 1-1/4" P-TRAP, GRID STRAINER, TRUEBRO #102 LAV-GUARD KIT, & WATTS MMV THERMOSTATIC MIXING VALVE SET AT 105°F PER ASSE 1070.
P-6	DRINKING FOUNTAIN (ADA)	HAWS MODEL NO. 1001MS	WALL MOUNTED SEE ARCH. FOR MOUNTING HEIGHTS	1/2"	---	2"	1-1/2"	WALL MOUNTED BARRIER-FREE, 18 GAUGE TYPE 304 SATIN STAINLESS STEEL FINISH WITH BUBBLER HEAD, FRONT PUSH-BUTTON, GRID STRAINER, VANDAL RESISTANT BOTTOM PLATES AND ACCESS PANELS TO TRAP AND STOP. FURNISH WITH DF1 MOUNTING PLATE. PROVIDE WALL STOP & SUPPLY, AND P-TRAP.
P-7	SINGLE SINK (ADA)	ELKAY MODEL LRAD2522	COUNTERTOP SEE ARCH. FOR HEIGHT	1/2"	1/2"	2"	1-1/2"	25"x22"x6.5" DEEP, SINGLE BOWL, 18 GAUGE TYPE 304 STAINLESS STEEL, 3 HOLES. LK35 DRAIN. FURNISH WITH MOEN MODEL NO. 8790 HIGH-ARC FAUCET WITH 1.0 GPM AERATOR. PROVIDE WITH LOOSE KEY STOPS & SUPPLIES, P-TRAP, AND TRUBRO #102 HANDI LAV-GUARD KIT (IF REQUIRED).
P-8	DOUBLE SINK (ADA)	ELKAY MODEL LRAD250	COUNTERTOP SEE ARCH. FOR HEIGHT	1/2"	1/2"	2"	1-1/2"	33"x22"x6.5" DEEP, DOUBLE BOWL, 18 GAUGE TYPE 304 STAINLESS STEEL, 4 HOLES. LK35 DRAIN. FURNISH WITH MOEN MODEL NO. 8792 HIGH-ARC FAUCET WITH SIDE SPRAY AND 1.0 GPM AERATOR. PROVIDE WITH IN-SINK-ERATOR BADGER 5, 1/2 HP MOTOR, 8.0 AMPS, 120V-1 PH-60 HZ DISPOSAL. PROVIDE WITH CONTINUOUS WASTE, LOOSE KEY STOPS & SUPPLIES, P-TRAP, AND TRUBRO #102 HANDI LAV-GUARD KIT & #107 CONTINUOUS WASTE COVER (IF REQUIRED)
P-9	SHOWER	COMFORT DESIGN MODEL XSS-3636 SH 4.0	STANDARD	1/2"	1/2"	2"	1-1/2"	POLYESTER GELCOATED SURFACE WITH CENTER DRAIN. NON-ADA WITH 4" THRESHOLD, AND CURTAIN ROD. PROVIDE WITH AMERICAN STANDARD NO. 1662.211 PB VALVE W/ STOPS, VALVE TRIM W/ LEVER HANDLE, 1.5 GPM HANDHELD SHOWERHEAD WITH FLEXIBLE 60" METAL HOSE, WALL CONNECTION WITH FLANGE, VAC. BREAKER, 36" SLIDE BAR-POLISHED CHROME FINISH. CURTAIN AND HOOKS FURNISHED BY OTHERS. PROVIDE WITH ZURN Z-415 DRAIN WITH ROUND STRAINER.
P-10	SHOWER (ADA)	COMFORT DESIGN MODEL XST-6232-BF-5P	STANDARD	1/2"	1/2"	2"	1-1/2"	POLYESTER GELCOATED SURFACE WITH CENTER DRAIN. ADA: BACK AND SIDE GRAB BARS, L-SHAPED FOLD-UP SEAT. PROVIDE WITH AMERICAN STANDARD NO. 1662.211 PB VALVE W/ STOPS, VALVE TRIM W/ LEVER HANDLE, 1.5 GPM HANDHELD SHOWERHEAD WITH FLEXIBLE 60" METAL HOSE, WALL CONNECTION WITH FLANGE, VAC. BREAKER, 36" SLIDE BAR-POLISHED CHROME FINISH. CURTAIN ROD AND CURTAIN WITH HOOKS BY OTHERS. PROVIDE WITH ZURN Z-415 DRAIN WITH ROUND STRAINER.
P-11	MOP BASIN	FIAT MODEL TSBC6010	FLOOR	1/2"	1/2"	3"	2"	WITH 1453-BB STRAINER, NO. 830-AA FAUCET AT 42" AFF, NO. 832-AA HOSE AND HOSE BRACKET, STAINLESS STEEL CAP, NO. 889-CC MOP HANGER, AND SEALED AROUND WITH NO. 833-AA SILICONE SEAL.

MISCELLANEOUS PLUMBING FIXTURE SCHEDULE

SYMBOL	FIXTURE TYPE	MODEL	CONNECTIONS				COMMENTS
			CW	HW	WASTE	VENT	
FCO	FLOOR CLEANOUT (BUILDING, SEE ARCH. FOR FINISH)	ZURN NO. ZN-1400 NH	---	---	SEE PLANS	---	ZURN NO. ZN-1400-X NH, RECESSED FOR TILE. ZURN NO. ZN-1400-CF NH FOR CARPET, WITH MARKER
CO	CLEANOUT (OUTSIDE OR AT UNFINISHED AREA)	ZURN NO. Z-1400-HD NH CAST IRON TAP	---	---	SEE PLANS	---	BRONZE TOP IN OUTSIDE AREAS, CAST IRON TOP, VANDAL PROOF SCREWS.
WCO	WALL CLEANOUT	ZURN NO. Z-1468 ZS	---	---	SEE PLANS	---	INSTALL WHERE C.O. BELOW FIXTURE CONNECTION IS REQUIRED BY CODE AND WHERE SHOWN ON PLANS. BRONZE PLUG WITH STAINLESS STEEL FACE WALL PLATE, WITH VANDAL-PROOF SCREWS.
FD-1	FLOOR DRAIN	ZURN ZN-415 W/TYPE B	---	---	2"	2"	ROUND TOP WITH VENTED P-TRAP. PROVIDE WITH PROSET TRAP GUARD. (EXCEPT IN KITCHEN)
FS-1	FLOOR SINK	ZURN NO. Z-1900	---	---	3" OR 4"	2"	A.R.E. BODY (12"X12"X8") TOP GRATE, 8" DEEP SUMP, WITH PROSET TRAP GUARD (EXCEPT IN KITCHEN)
WHA-1	WATER HAMMER ARRESTOR	ZURN SHOKTROL	AS REQ'D	---	---	---	SIZED PER FIXTURE UNIT LOAD
AP	ACCESS PANEL	ELMDOR SLK 8"x8"	---	---	---	---	DRY WALL INSTALLATION, 14 GA MILD STEEL WITH PRIME COAT FINISH. PROVIDE AUTOMATIC SPRING BOLT TYPE LOCK AND KEY. INSTALL DOOR DIRECTLY IN FRONT OF WATER HAMMER ARRESTOR IN WALL.
WHY-1	WALL HYDRANT FREEZE RESISTANT	ZURN NO. Z-1310	3/4"	---	---	---	NON-FREEZE, ANTI-SIPHON, AND AUTOMATIC DRAINING, WITH P.B. BOX, AND LOOSE KEY. SEE ARCH. PLAN FOR WALL THICKNESS. 18" MOUNTING HEIGHT.
PRV-1	PRESSURE REDUCING VALVE	FEBCO 500YSBR	3"	---	---	---	25 TO 75 PSI SPRING, 110 GPM AT 15 PSI PRESSURE DROP, SET TO DELIVER 55 PSI TO BUILDING. PROVIDE WITH STRAINER AT INLET.
RPBP-1	REDUCED PRESSURE BACKFLOW PREVENTER	FEBCO 880V VERTICAL	3"	---	---	---	REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER, Y STRAINER AND REPLACABLE SEATS. BRONZE BODY CONSTRUCTION, MAXIMUM WORKING PRESSURE OF 175 PSI. USC CERTIFIED. DOMESTIC WATER SERVICE.
RPBP-2	REDUCED PRESSURE BACKFLOW PREVENTER	FEBCO 880V VERTICAL	6"	---	---	---	REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER, Y STRAINER AND REPLACABLE SEATS. BRONZE BODY CONSTRUCTION, MAXIMUM WORKING PRESSURE OF 175 PSI. USC CERTIFIED. FIRE PROTECTION WATER SERVICE.
RD	ROOF DRAIN	ZURN NO. Z-100	---	---	SEE PLANS	---	15" DIAMETER DUAL OUTLET ROOF DRAIN WITH PRIMARY OUTLET CONNECTION. DURA-COATED CAST IRON DEEP SUMP WITH COMBINATION MEMBRANE FLASHING CLAMP/ GRAVEL GUARD, AND LOW SILHOUTTE CAST IRON DOME.
ORD	OVERFLOW ROOF DRAIN	ZURN NO. Z-100-W2	---	---	SEE PLANS	---	15" DIAMETER DUAL OUTLET ROOF DRAIN WITH PRIMARY OUTLET CONNECTION. DURA-COATED CAST IRON DEEP SUMP WITH COMBINATION MEMBRANE FLASHING CLAMP/ GRAVEL GUARD, 2" HIGH INTERNAL WATER DAM, AND LOW SILHOUTTE CAST IRON DOME.
DSN	DOWNSPOUT NOZZLE	ZURN NO. Z199-SS	---	---	SEE PLANS	---	NICKEL BRONZE BODY, THREADED INLET AND DECORATIVE FACE WALL FLANGE AND NOZZLE, SCREEN
GI-1	GREASE INTERCEPTOR	SCHIER MODEL NO. GB-250 TRAFFIC	---	---	4"	2"	100 GPM FLOW RATE, 1060 LBS. MAXIMUM CAPACITY, SEAMLESS MOLDED POLYETHYLENE TANK WITH BUILT-IN FLOW CONTROL, INLET AND OUTLET DIFFUSERS REMOVABLE FOR INSPECTING AND CLEANING, INTEGRAL AIR RELIEF/ANTI-SIPHON/VISUAL INSPECTION. PROVIDE RISERS AS REQUIRED. TRAFFIC RATED.
TMV-1	THERMOSTATIC MIXING VALVE	LEONARD NO. TM-186-8015- PRV-RO-0	1"	1"	---	---	1-1/4" OUTLET, HIGH-LOW MANIFOLD FACTORY PREASSEMBLED/TESTED

ENTIRE SHEET IS RE-ISSUED FOR CLARIFICATION
1

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BRIAN ARNOLD NEW MEXICO 14466 REGISTERED PROFESSIONAL ENGINEER
10/06/16
ENGINEER

Revision Schedule		
Revision Number	Revision Date	Revision Description
1	11/10/16	ADD.03

PROJECT NUMBER 2015.05 | DRAWN BY HRM | PROJ MGR BA
RVT FILE

Sheet Title: PLUMBING SCHEDULES

Sheet Number
P002
Sequence of

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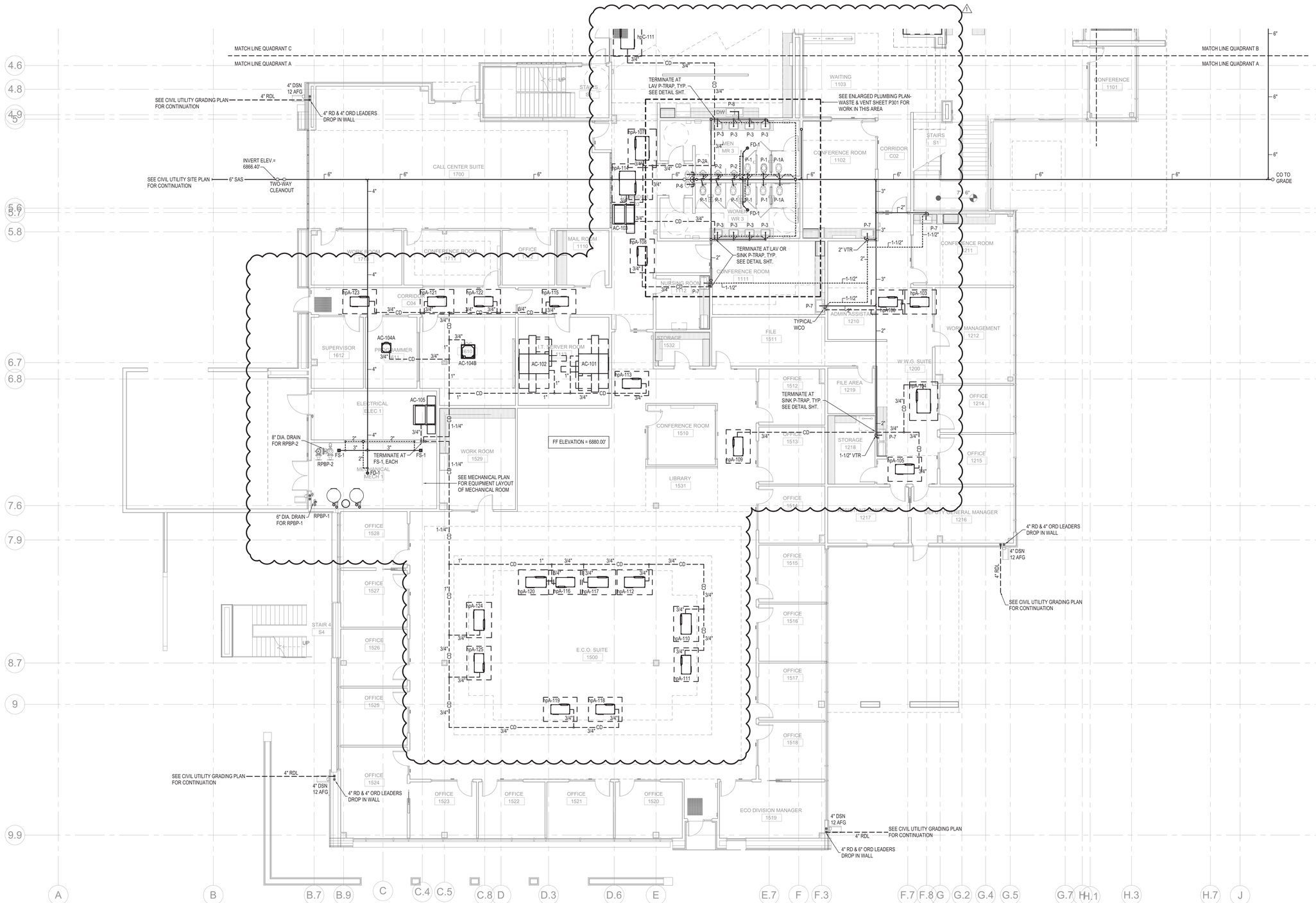

A6 **PLUMBING 1st FLOOR PLAN - QUADRANT A - WASTE & VENT**

1/8" = 1'-0"

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Revision Schedule		
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1	11/10/16	ADD. 03

PROJECT NUMBER	DRAWN BY	PROJ MGR
2015.05	HRM	BA

RVT FILE

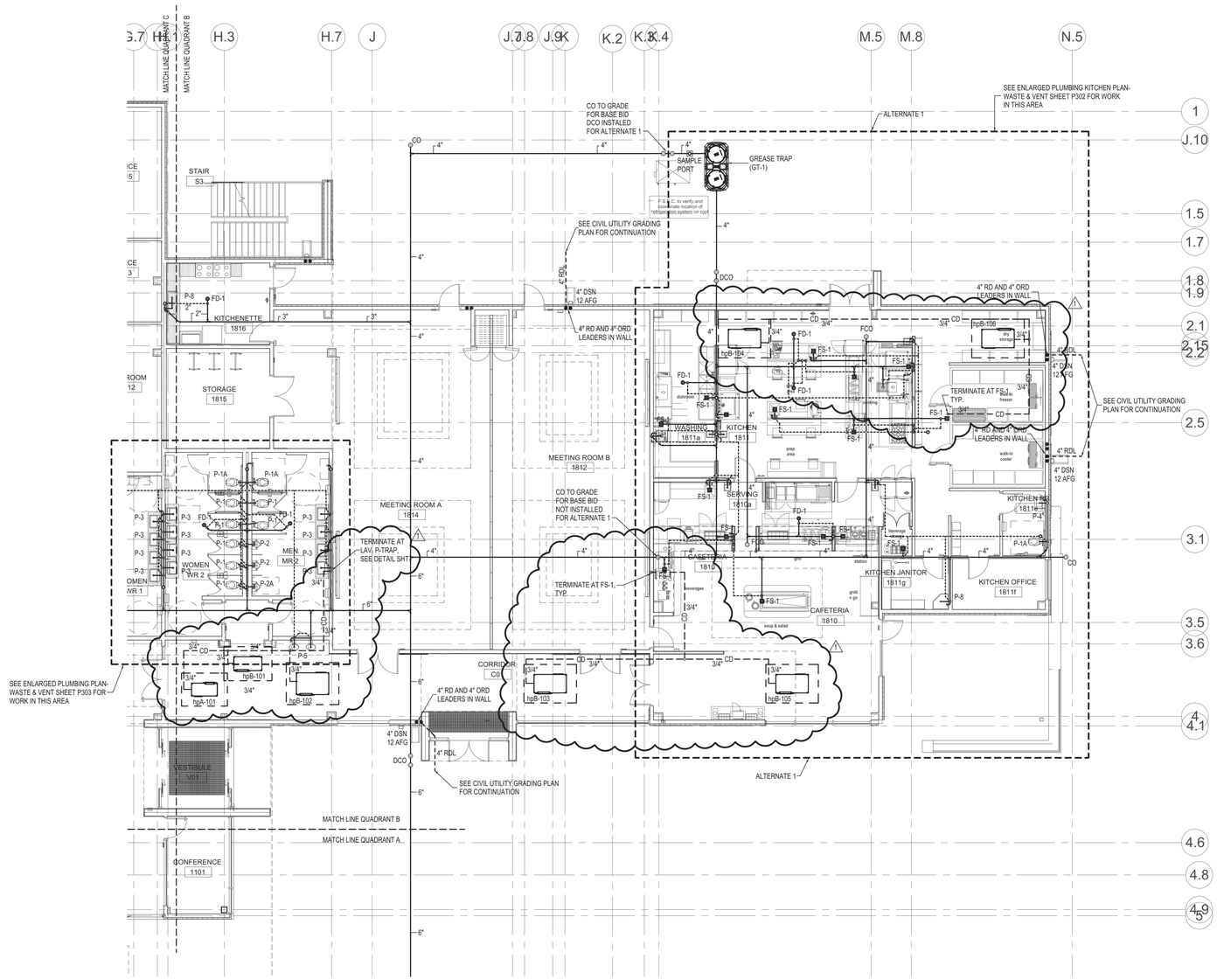
Sheet Title

PLUMBING 1st FLOOR PLAN - QUADRANT A - WASTE & VENT

Sheet Number

P101a

Sequence of



A4 **PLUMBING 1st FLOOR PLAN - QUADRANT B - WASTE & VENT**
1/8" = 1'-0"

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PROJECT NUMBER	DRAWN BY	PROJ MGR
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Sheet Title
PLUMBING 1st FLOOR PLAN - QUADRANT B - WASTE & VENT

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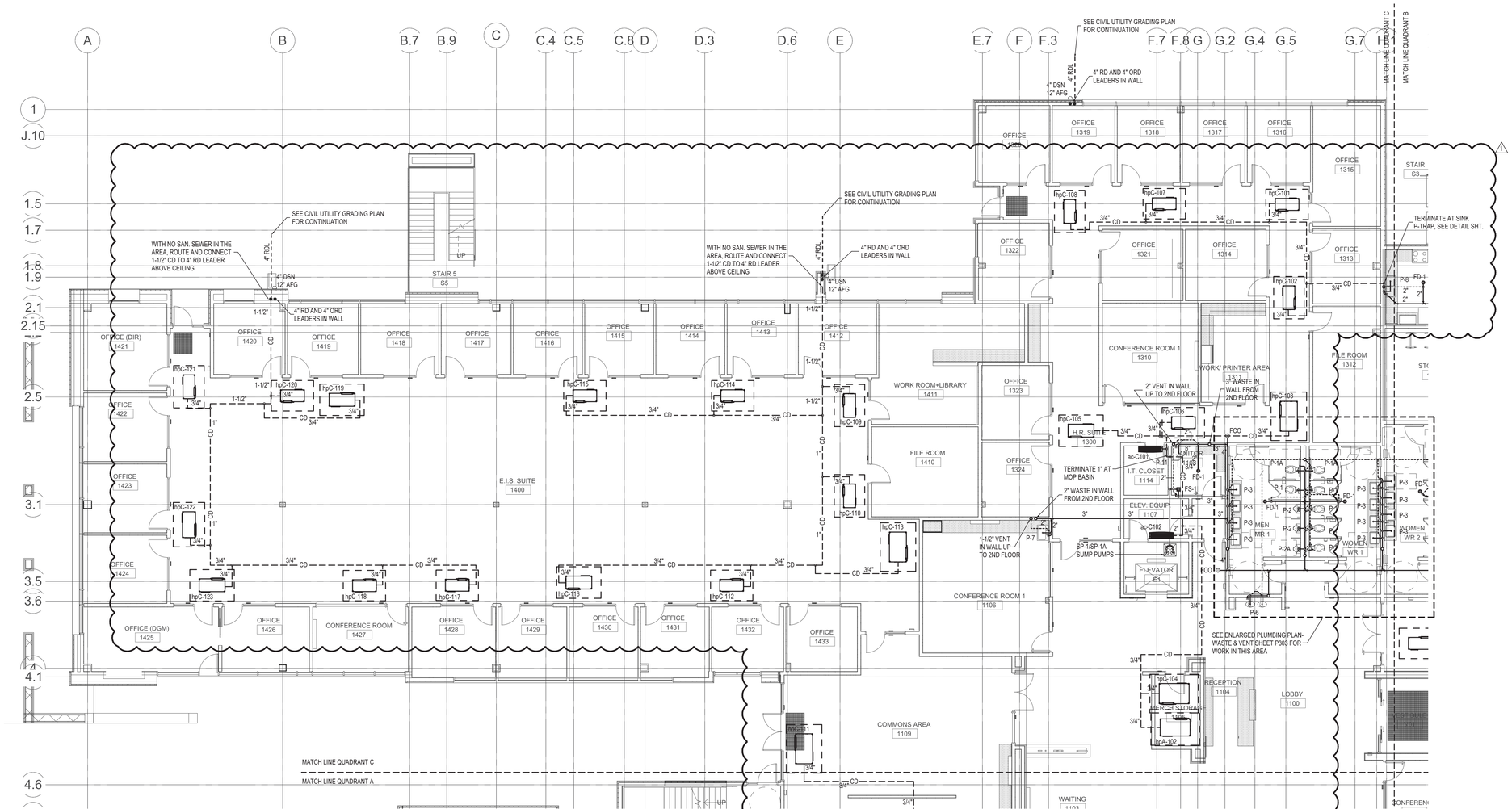

A6 **PLUMBING 1st FLOOR PLAN - QUADRANT C - WASTE & VENT**

1/8" = 1'-0"

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PROJECT NUMBER	DRAWN BY	PROJ MGR
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Sheet Title: **PLUMBING 1st FLOOR PLAN - QUADRANT C - WASTE & VENT**

Sheet Number

P101c

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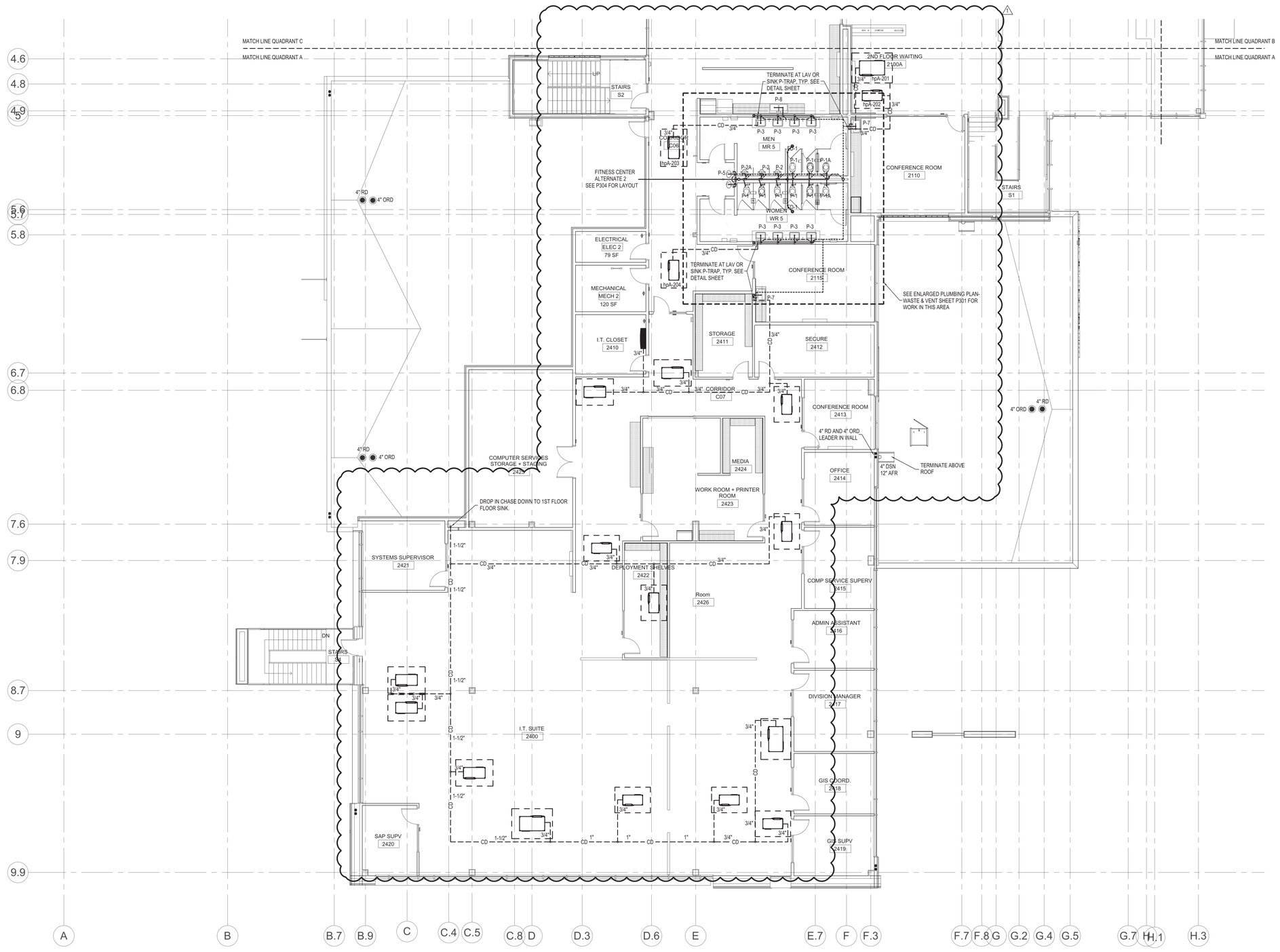

A6 **PLUMBING 2nd FLOOR PLAN - QUADRANT A - WASTE & VENT**
1/8" = 1'-0"

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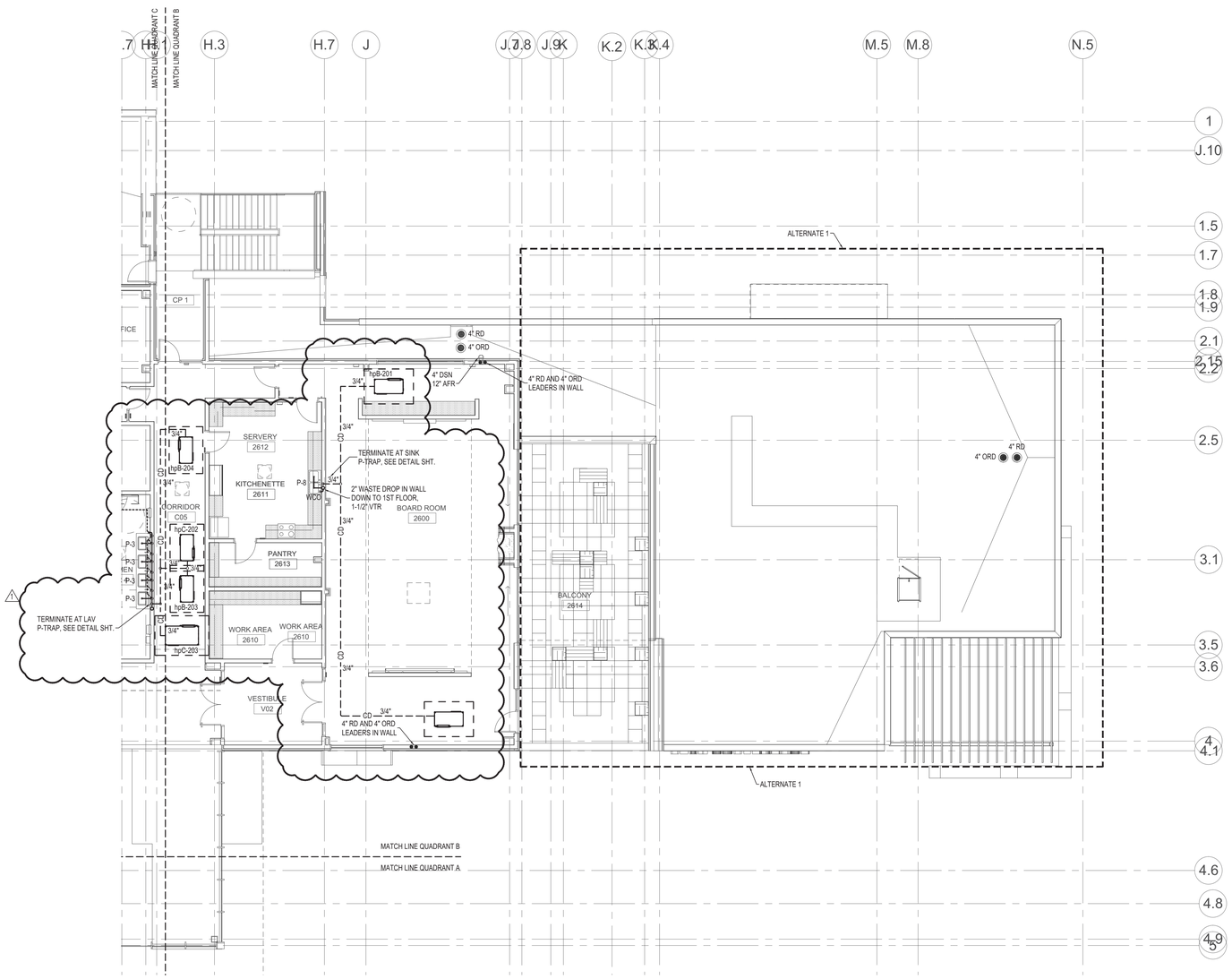
Sheet Title
PLUMBING 2nd FLOOR PLAN - QUADRANT A - WASTE & VENT

Sheet Number
P102a

Sequence of



A4 **PLUMBING 2nd FLOOR PLAN - QUADRANT B - WASTE & VENT**
1/8" = 1'-0"

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Revision Schedule		
Revision Number	Revision Date	Revision Description
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PROJECT NUMBER	DRAWN BY	PROJ MGR
2015.05	HRM	BA

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Sheet Title
PLUMBING 2nd FLOOR PLAN - QUADRANT B - WASTE & VENT

Sheet Number
P102b
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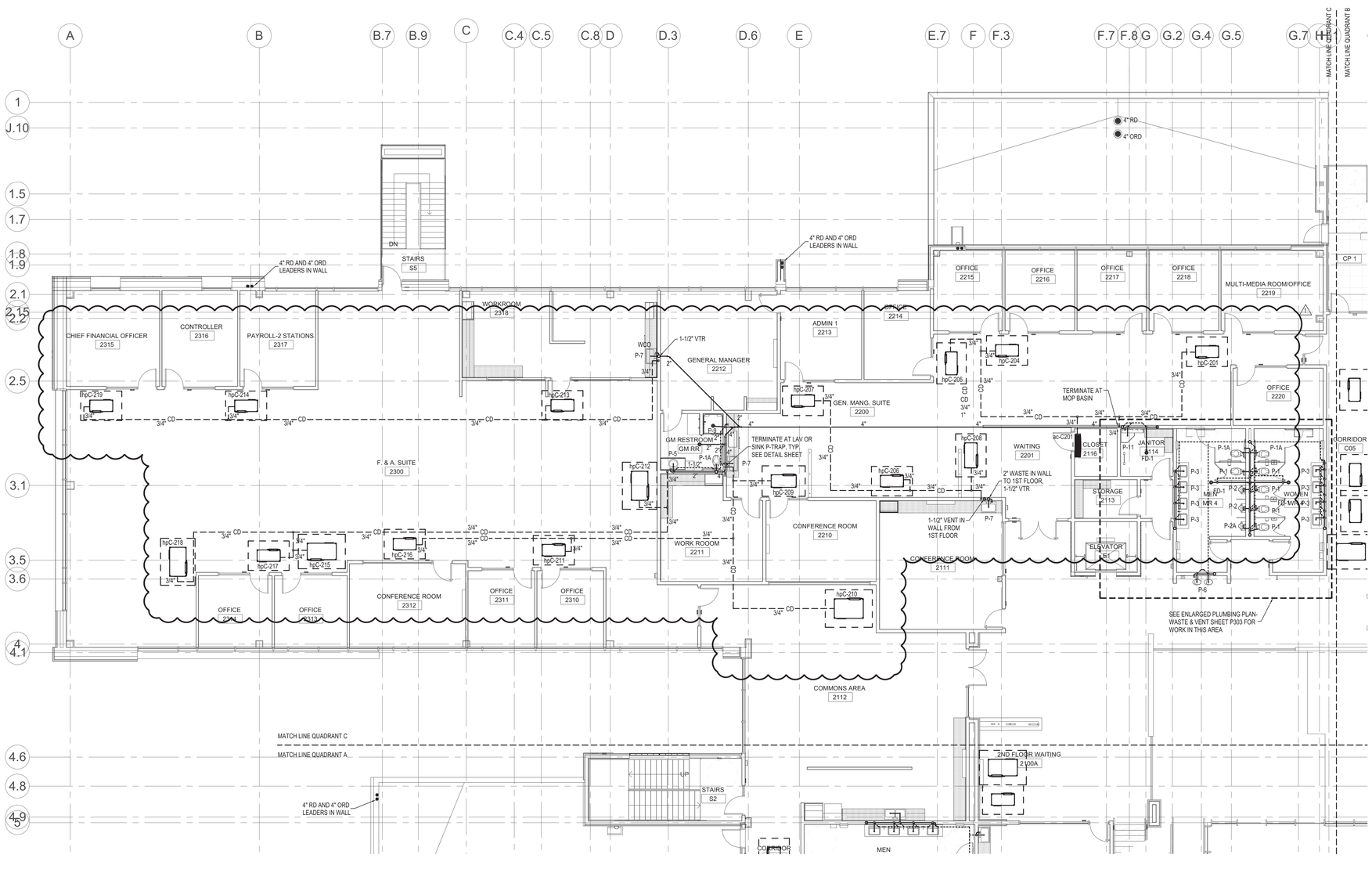

A6 **PLUMBING 2nd FLOOR PLAN - QUADRANT C - WASTE & VENT**

1/8" = 1'-0"

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Revision Number	Revision Date	Revision Description
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PROJECT NUMBER	DRAWN BY	PROJ MGR
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Sheet Title: **PLUMBING 2nd FLOOR PLAN - QUADRANT C - WASTE & VENT**

Sheet Number

P102c

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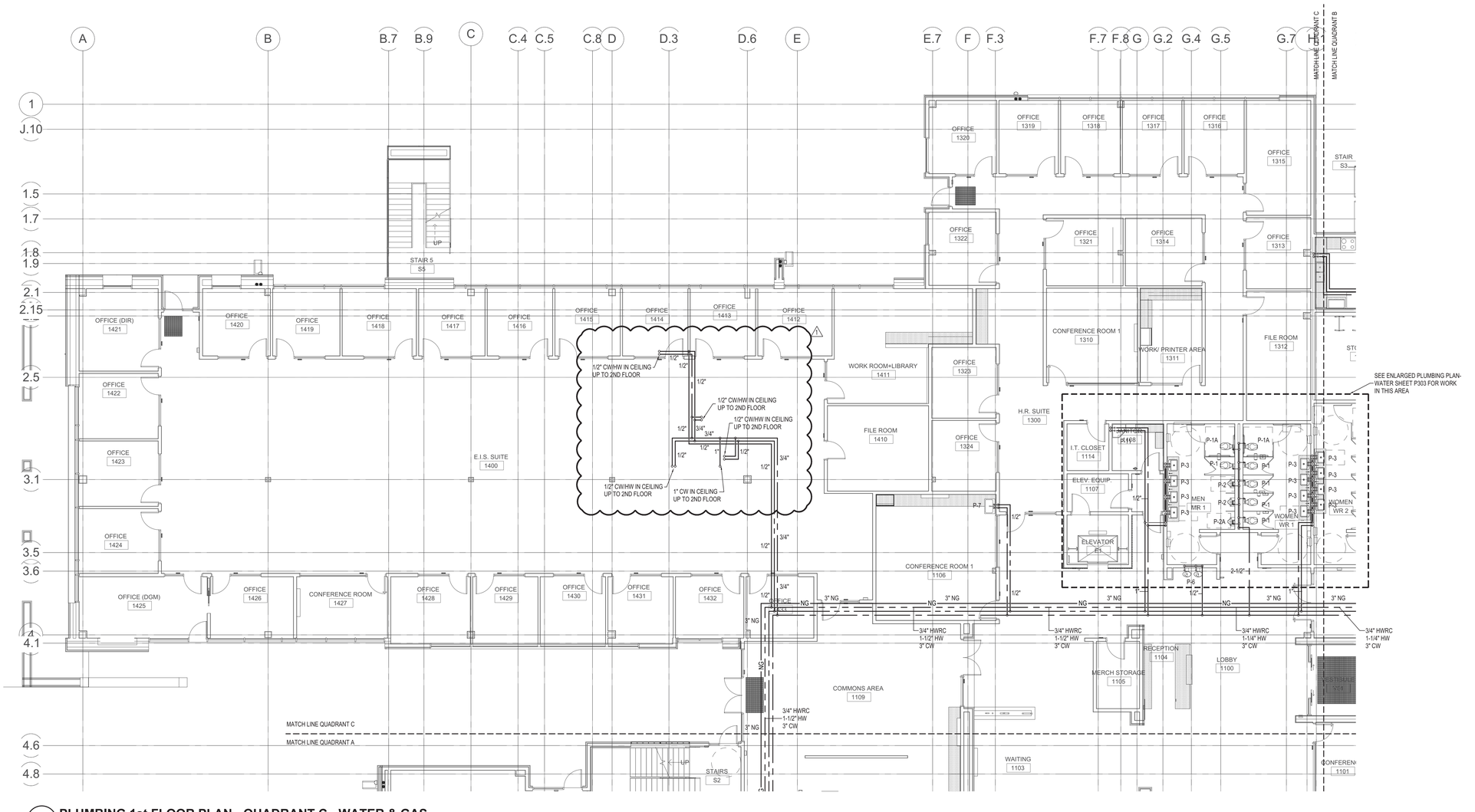

A6 **PLUMBING 1st FLOOR PLAN - QUADRANT C - WATER & GAS**

1/8" = 1'-0"

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Revision Schedule		
Revision Number	Revision Date	Revision Description
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PROJECT NUMBER	DRAWN BY	PROJ MGR
2015.05	HRM	BA

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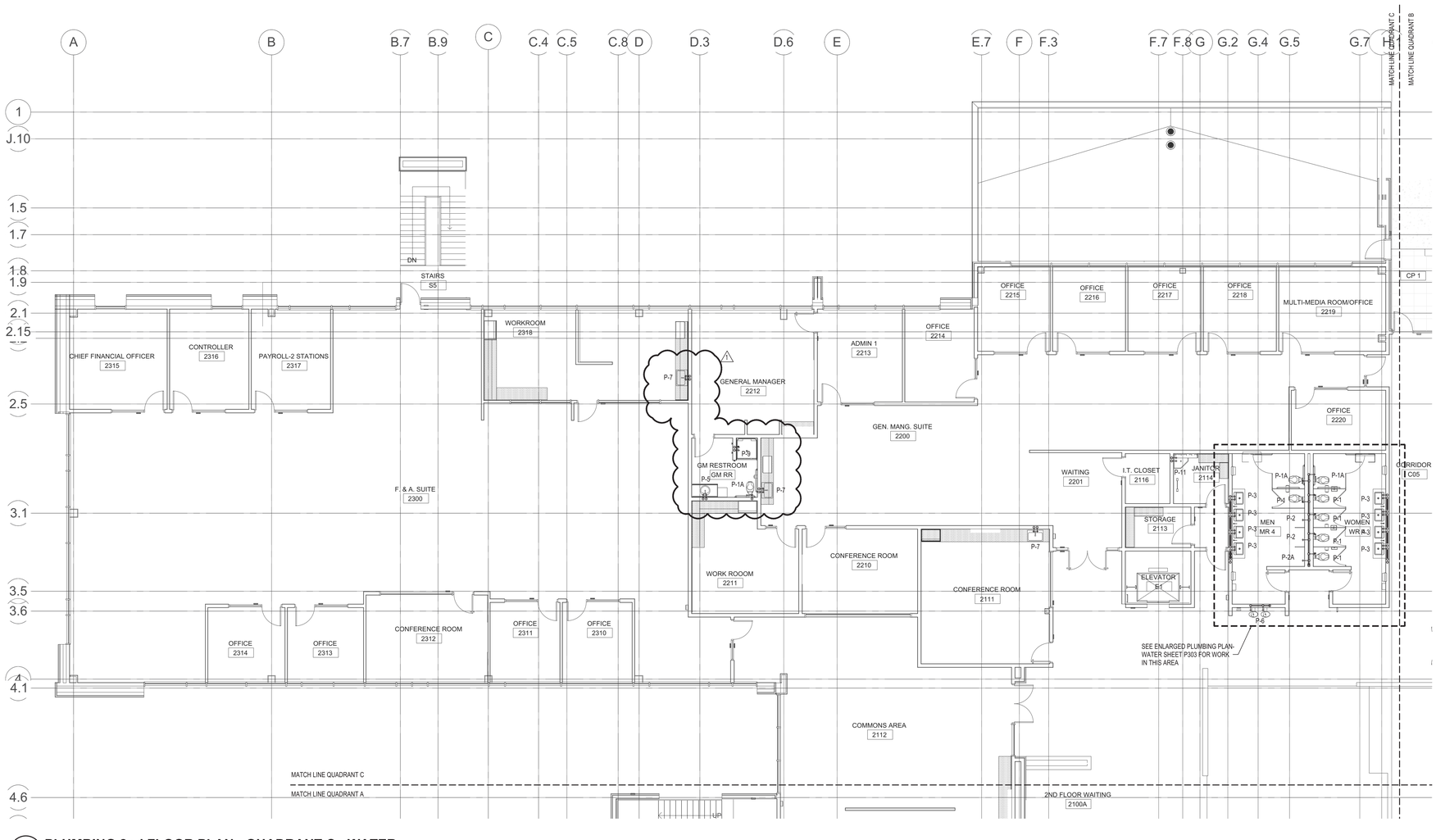
Sheet Title: **PLUMBING 1st FLOOR PLAN - QUADRANT C - WATER & GAS**

Sheet Number

P111c

Sequence of



A6 **PLUMBING 2nd FLOOR PLAN - QUADRANT C - WATER**
1/8" = 1'-0"

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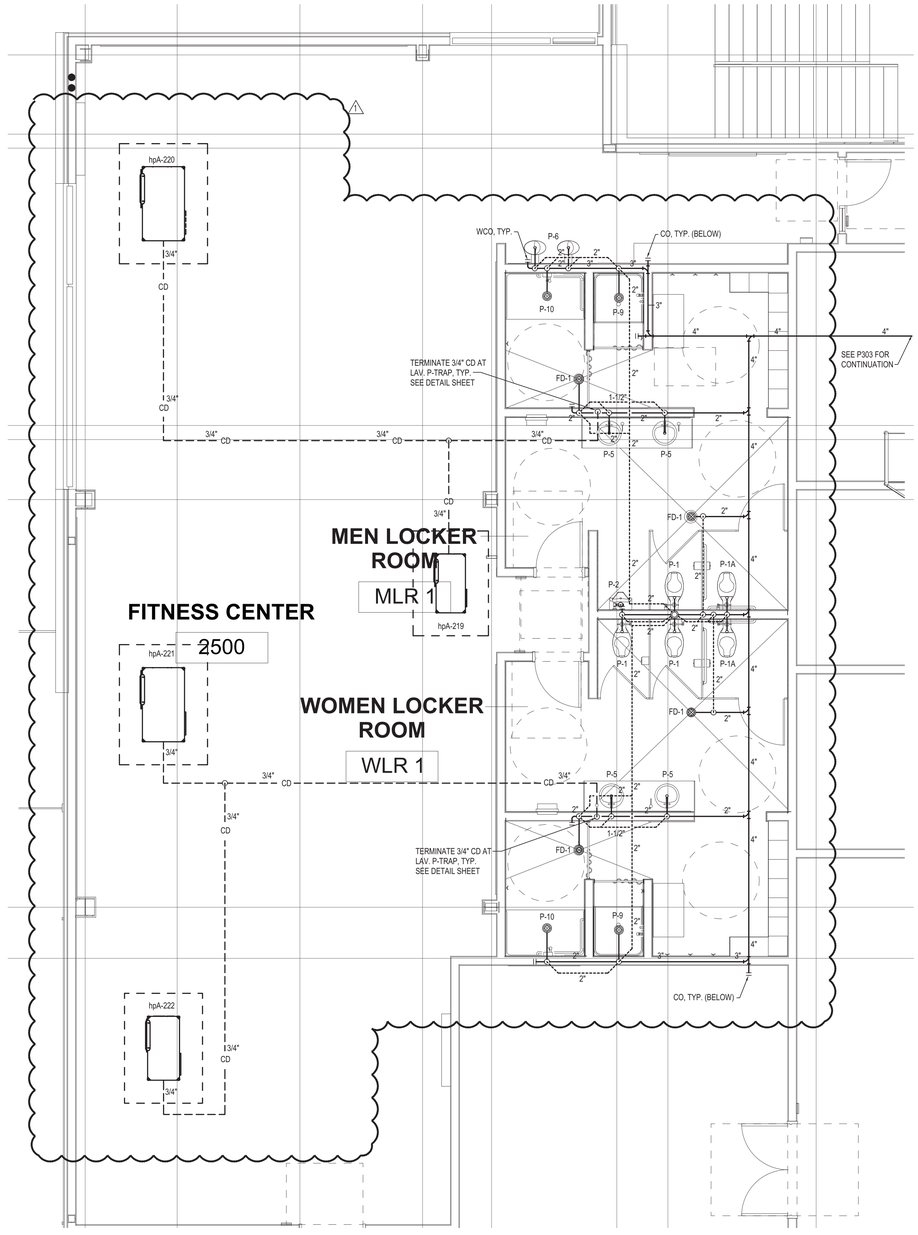
PROJECT NUMBER	DRAWN BY	PROJ MGR
2015.05	HRM	BA

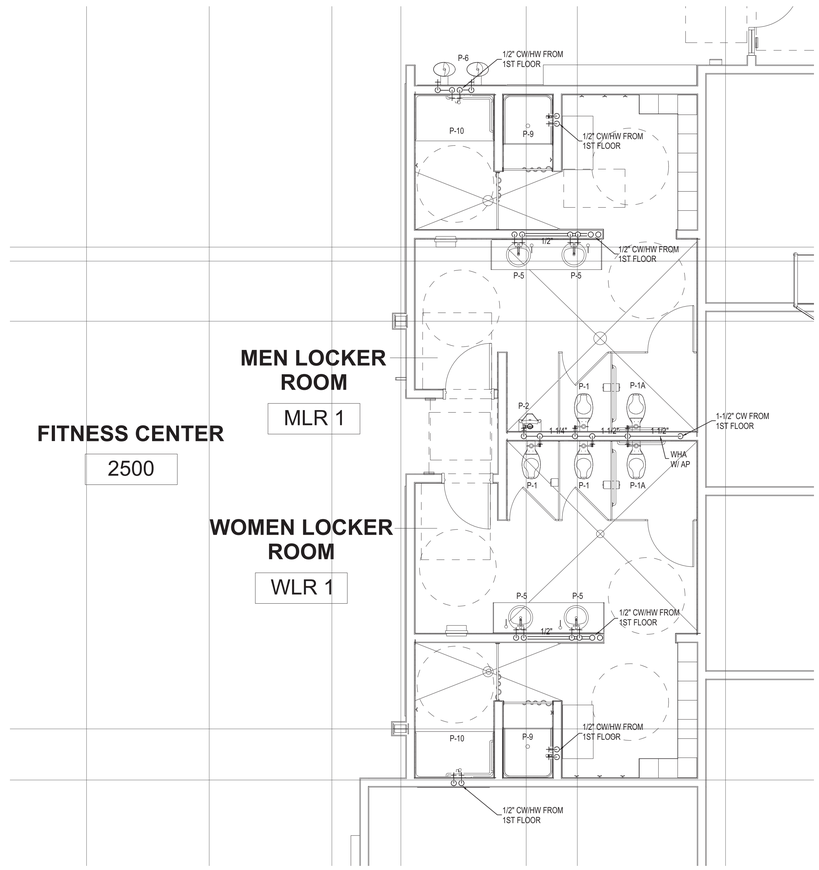
RVT FILE

Sheet Title: **PLUMBING 2nd FLOOR PLAN - QUADRANT C - WATER**

Sheet Number
P112c
Sequence of



A6 **ENLARGED PLUMBING 1ST FLOOR PLAN - WASTE & VENT**
1/4" = 1'-0"



A3 **ENLARGED PLUMBING 1ST FLOOR PLAN - WATER**
1/4" = 1'-0"

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OCTOBER 6, 2016

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BRIAN ARNOLD NEW MEXICO 14466 REGISTERED PROFESSIONAL ENGINEER
10/06/16
ENGINEER

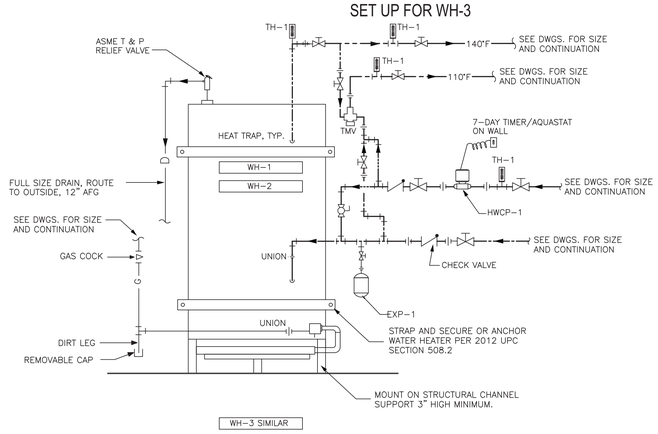
Revision Schedule		
Revision Number	Revision Date	Revision Description
1	11/10/16	ADD. 03

PROJECT NUMBER	DRAWN BY	PROJ MGR
2015.05	HRM	BA

RVT FILE

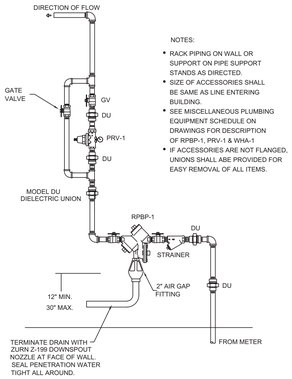
Sheet Title
ENLARGED PLUMBING FITNESS CENTER PLANS ALTERNATE 2

Sheet Number
P304
Sequence of



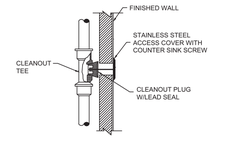
SCHEDULE	
SYMBOL	DESCRIPTION
TH-1	THERMOMETER: WEISS, "VARI-ANGLE", 9" CASE, 3-1/2" ELEMENT SEPARABLE SOCKET WITH IMMERSION WELL, 30"-300° F SCALE RANGE FOR HEATED WATER.

DOMESTIC WATER HEATER DETAIL
NOT TO SCALE (SEE PLANS FOR PIPE ROUTING & SIZES)

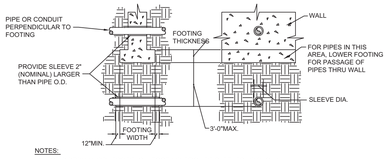


SCHEDULE	
SYMBOL	DESCRIPTION
PG-1 AND PG-2	PRESSURE GAUGE 0-100 PSIG Range

DOMESTIC WATER SERVICE ENTRY
NOT TO SCALE (SCHEMATIC)

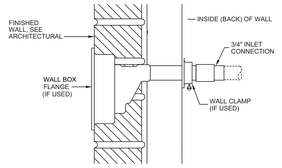


WALL CLEANOUT DETAIL
NOT TO SCALE

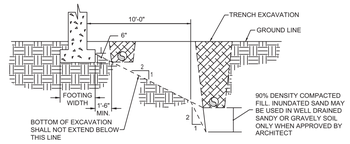


NOTES:
1. FOR PIPES 3'-0" OR LESS BELOW FOOTING, PROVIDE SLEEVES AS SHOWN.
2. FOR PIPES AND CONDUITS MORE THAN 3'-0" BELOW FOOTING, PIPE SLEEVE MAY BE ELIMINATED.
3. COORDINATE WITH ELECTRICAL, AND ALL OTHER AFFECTED TRADES.

INSTALL OF PIPES PERPENDICULAR TO FOOTING DETAIL
NOT TO SCALE

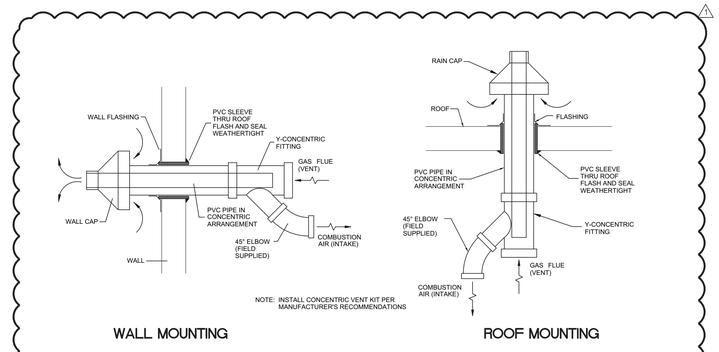


FREEZEPROOF WALL HYDRANT DETAIL
NOT TO SCALE

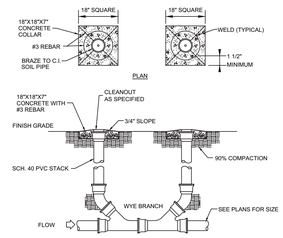


NOTE:
1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SHORING, SHEATHING, OR OTHERWISE MAINTAINING THE SIDES OF THE EXCAVATION FROM CAVE-IN AND OTHER HAZARDS UNTIL ALL BACKFILL IS COMPLETED. BACKFILL AS PER SPECIFICATIONS.

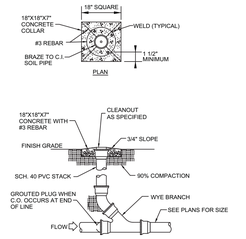
INSTALLATION OF PIPES PARALLEL TO FOOTING DETAIL
NOT TO SCALE



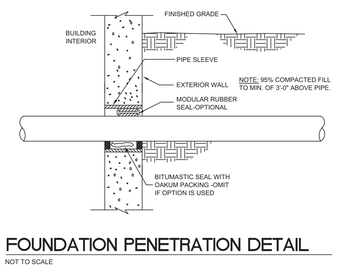
TYPICAL CONCENTRIC VENT DETAIL
NOT TO SCALE



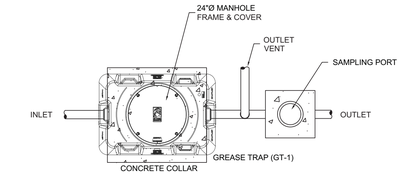
TWO-WAY CLEANOUT DETAIL
NOT TO SCALE

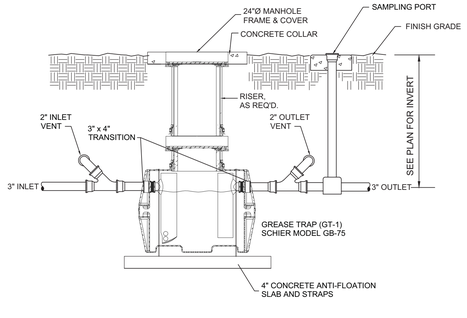


CLEANOUT DETAIL
NOT TO SCALE

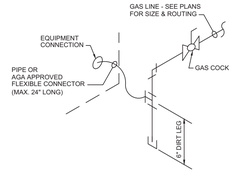


FOUNDATION PENETRATION DETAIL
NOT TO SCALE

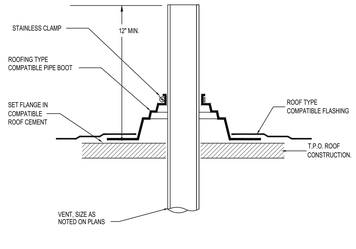




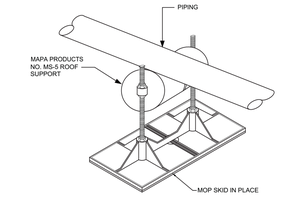
GREASE TRAP DETAIL
NOT TO SCALE



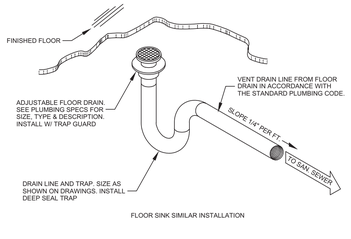
TYP. GAS CONNECTION
NOT TO SCALE



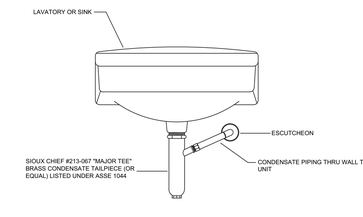
VENT THRU ROOF DETAIL
NOT TO SCALE



GAS PIPING ROOF SUPPORT
NOT TO SCALE



TYPICAL FLOOR DRAIN DETAIL
NOT TO SCALE



CONDENSATE DRAIN AT TRAP DETAIL
NOT TO SCALE

NTUA HQ COMPLEX OFFICE BUILDING

FT. DEFIANT, ARIZONA

100% CONSTRUCTION DOCUMENTS

OCTOBER 6, 2016

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BRIAN ARNOLD NEW MEXICO 14466 REGISTERED PROFESSIONAL ENGINEER
10/06/16
ENGINEER

Revision Schedule		
Revision Number	Revision Date	Revision Description
1	11/10/16	ADD. 03

PROJECT NUMBER	DRAWN BY	PROJ MGR
2015.05	HRM	BA

RVT FILE

Sheet Title: PLUMBING DETAILS

Sheet Number: P401

Sequence of

Allied Engineering
and Design Inc.

5101 Coors Blvd. NW
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(505)255-0466 fax

November 10, 2016

DYRON MURPHY ARCHITECTS, P.C.
4505 Montbel Place NE
Albuquerque, NM 87107

ATTN: OSCAR TOVAR,
ASSOC. AIA, SR. PROJECT MANAGER

RE: NTUA HQ COMPLEX OFFICE BUILDING
ADDENDUM #3
AEDI #50-15

Dear Mr. Tovar:

The following electrical questions and/or clarifications need to be included in an Addendum for the above referenced project:

ELECTRICAL

13. The light fixtures "WE", "GE", "S", "N24", "N24E", "N40" and "U12" are found on the drawings but not on the light fixture schedule. Please advise. Please see additional fixtures below.

14. Will any electrical details be provided? Refer to Electrical Drawings for details.

15. On sheet E501 note 17 says to coordinate rough-in and trenching requirements. What are these requirements? See General Notes on Drawing E001. All trenching to be by Electrical Contractor per NTUA Standards; all primary and telephone conduits, pull boxes to be provided and installed by NTUA.

16. Is the electrical contractor required to provide site concrete primary line volts? No, all primary conduits, cabling, etc. to be by NTUA.

17. Who is providing the VFD's on sheet E103a? No specs could be found. Refer to Mechanical/Plumbing Drawings for VFD information.

18. On sheet E501, are the feeders, 225KVA transformer, 600a disconnect and 3 section panel part of the bid alt? They are not stated as a bid on the one-line. The feeders, 225KVA transformer, 600a disconnect and 3 section panel are to be included in Alt. No. 1 Kitchen Bid. The 350A circuit breaker in "MDP" to be provided under Base Bid.

Electricians are inquiring about duct bank. I have not seen any indication of a duct bank on this project. Please confirm. No duct bank is required.

How many Cat 6 cables are required per WAP location? One (1)

Are horizontal/vertical management panels required in each communications closet rack? Electrical Contractor to provide horizontal and vertical cable management panels as required for proper cable distribution to racks.

Is there fiber optic cabling to be installed between closets? If so, # of strands, type (MM/SM) and connector types? Copper feeder pairs between closets as well? All backbone Fiber and Copper cabling to be by NTUA. Contractor to be responsible for pathways, i.e., conduits, sleeves, etc.

On Sheet E601 "Fixture Schedule":

1. ALL fixtures to be 277V.
2. Additional fixtures as follows:

GE – "Lithonia" #ZL1N L48 3000LM FST MVOLT 35K 80CRI WH EM
WE – "Peachtree" #8HLRD-S-85-N-35K-W-277-EM
S - "Lithonia" #2GTL 4 48L SWL MVOLT EZ1 LP835 N100
N24 – "PAL" #MLS5-I/D-MO/HO-K35-24-CN-DC/LOH-FXX-277
N24E – "PAL" #MLS5-I/D-MO/HO-K35-24-CN-DC/LOH-FXX-277-EMCKT
N40 – "PAL" #MLS5-I/D-MO/HO-K35-40-CN-DC/LOH-FXX-277
U2 – "Mark Architectural Lighting" #S4LF 12FT FL H 35 HI 277 SW

Specifications:

Section 26-0519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES WIRING DEVICES AND PLATES: Delete all references to NM-C type cabling.

This concludes the electrical items for this addendum. If you have any questions, please contact the undersigned.

Sincerely,

ALLIED ENGINEERING AND DESIGN INC.

By:

Dennis M. Scarcell, Jr.
Vice President, Proj. Manager