



Office of General Services

DESIGN & CONSTRUCTION GROUP
THE GOVERNOR NELSON A. ROCKEFELLER
EMPIRE STATE PLAZA
ALBANY, NY 12242

ADDENDUM NO. 2 TO PROJECT NO. 45382

HAZARDOUS, CONSTRUCTION, HVAC, PLUMBING, AND ELECTRICAL WORK RENOVATE BUILDING 8, 8TH & 9TH FLOOR STATE OFFICE BUILDING CAMPUS 1220 WASHINGTON AVE. ALBANY, NY 12226

October 21, 2024

<p>NOTE: This Addendum forms a part of the Contract Documents. Insert it in the Project Manual. Acknowledge receipt of this Addendum in the space provided on the Bid Form.</p>
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BIDDING REQUIREMENTS – COMMON DOCUMENTS

1. DOCUMENT 001114 ADVERTISEMENT FOR BIDS: Add Paragraph to Read: “ An additional time for prospective bidders to be allowed to visit the jobs site to take field measurements and examine existing conditions of the project area has been added at 10:00 a.m. on October 24, 2024 at State Office Campus - Building 8, Loading Dock/Security Desk, 1220 Washington Ave., Albany NY 12226.”

GENERAL REQUIREMENTS – COMMON DOCUMENTS

2. Page 011000 – 4, Subparagraph 1.05.B.5.c.: Change Paragraph to Read:

“c. Abatement and removal of wall sections within each stairwell from the basement through the 9th floor to facilitate new fire standpipe installations. Work shall be performed Monday through Friday from 6:00 pm to 6:00 am and on weekends so as not to disrupt the building occupants and daily operations. (Sequenced work needs to be coordinated with all contracts involving all floors in Building 8 to maintain code compliant egress). Stairwell work will be completed one stairwell at a time.”
3. Page 011000 – 4, Subparagraph 1.05.B.5.d: Add Paragraph d to Read:

“d. Abatement and floor slab removals within each bathroom from the ground floor through the 9th floor to facilitate plumbing installations. Work shall be performed Monday through Friday from 6:00 pm to 6:00 am and on weekends so as not to disrupt the building occupants and daily operations. (Sequenced work needs to be coordinated with all contracts involving all floors in Building 8 to maintain code compliant egress). Bathroom work will be completed two floors at a time.”

GENERAL REQUIRMENTS - HAZARDOUS MATERIALS WORK

4. SECTION 015301 TEMPORARY EXTERIOR HOIST: Discard the section bound in the Project Manual and substitute the accompanying Section (Pages 015301-1 through 015301-5) noted "Revised 10/18/2024" with footer "Project No. 45382-B".

GENERAL REQUIRMENTS – CONSTRUCTION, HVAC, PLUMBING AND ELECTRICAL WORK

5. SECTION 015301 TEMPORARY EXTERIOR HOIST: Discard the section bound in the Project Manual and substitute the accompanying Section (Pages 015301-1 through 015301-5), noted "Revised 10/18/2024" with footer "Project No. 45382-C,H,P,E".

HVAC WORK SPECIFICATIONS

6. SECTION 230923 DIRECT DIGITAL BUILDING CONTROL SYSTEM: Discard the section bound in the Project Manual and substitute the accompanying Section (Pages 230923-1 through 230923-58), noted "Revised 10/18/2024".
7. Page 233600-4, Paragraph 1.01 B.: Change Paragraph to read:

"Configuration: Free standing induction unit with an air-water heat exchanger."
8. Page 233600-4, Paragraph 1.01 D.: Change Paragraph to read:

"Unit with replaceable white secondary air filter"
9. Page 233600-4, Paragraph 1.01 E.: Change Paragraph to read:

"Nozzle box as primary air box and seals for high tightness class, with interchangeable acoustic developed nozzles, designed for induction with high efficiency to achieve the airflow, temperature, and sound performance scheduled. Sound performance shall not be exceeded when up to three units are connected in series to the primary air system."
10. Page 233600-4, Paragraph 1.01 G.: Add the following sentence to the Paragraph:

"Units shown connected in series shall have primary air inlet and outlet on both ends of the induction unit."
11. Page 233600-4, Paragraph 1.01 H.: Change Paragraph to Read:

"Sloped stainless steel condensate drain pan extending under entire unit and coil connections. Underside of drain pan shall be thermally insulated."

APPENDIX DOCUMENTS – COMMON DOCUMENTS

12. Revised Pre-Renovation Hazardous Materials Survey Report – Revised 10/07/2024:
 - a. Page 21, Window Glazing Compound: Change "friable" to "Non-friable".
 - b. Page 22, Window Glazing Compound: Change "friable" to "Non-friable".

GENERAL DRAWINGS

13. Revised Drawings:
- a. Revise Table of Contents to change Drawing No. C-101 from Construction Contract to General Drawing after Drawing No. G-201
 - b. Drawing No. C-101 Site Plan, noted "ADDENDUM DRAWING 10/18/24" accompanies this Addendum and supersedes the same number originally issued drawing.

HAZARDOUS WORK DRAWINGS

14. Drawing No. H-102:
- a. GENERAL SHEET NOTES, Add Note 3. to Read:

"3. COORDINATE WITH BUILDING MANAGER AND DIRECTOR'S REPRESENTATIVE 48 HOURS IN ADVANCE FOR USE OF FREIGHT ELEVATOR FOR ACCESS DURING ABATEMENT ON FLOORS NOT ACCESSIBLE VIA THE EXTERIOR LIFT. USE IS LIMITED TO WEEKDAY NIGHTS 6:00 PM TO 6:00 AM, AND WEEKENDS."

CONSTRUCTION WORK DRAWINGS

15. Drawing No. HC-105:
- a. GENERAL SHEET NOTES, Change Note 1. to Read:

"1. THE FLOOR/CEILING SLABS AND PLASTER WALLS ON THE 7TH AND 8TH FLOORS ARE CONTAMINATED WITH ASBESTOS. THE FLOOR SLABS AND PLASTER WALLS ON THE 9TH FLOOR ARE CONTAMINATED WITH ASBESTOS. IF ANCHORING INTO THESE SURFACES, THAT WORK SHALL BE PERFORMED IN ACCORDANCE WITH ICR 56 AND THE APPROVED SITE-SPECIFIC VARIANCE (FILE NO. 23-1078)."
 - b. 7th, 8th, & 9th FLOOR ABATEMENT PLANS, Change note between columns B and C to Read:

"LOCATION of C-Contract Temporary Exterior Hoist System. Off-Limits to B-Contract Contractor. Provided by C contract"
 - c. 7th, 8th, & 9th FLOOR ABATEMENT PLANS, Change note between columns J and K to Read:

"LOCATION OF B-CONTRACT TEMPORARY EXTERIOR HOIST SYSTEM. OFF-LIMITS TO C, H, P, E-CONTRACT CONTRACTORS. PROVIDED BY B CONTRACT"

16. Drawing No. S-001:
- a. GENERAL SHEET NOTES, Add Note 13. to Read:

“13. REFER TO SECTION 028304 HANDLING OF LEAD CONTAINING MATERIALS FOR ALL WORK IMPACTING THE LEAD-BASED PAINT PRIMER ASSUMED TO BE PRESENT ON THE STRUCTURAL STEEL (E.G. TIE-INS, STRIPPING OF PRIMER PRIOR TO GRINDING/CUTTING, ETC.). PERFORM ALL WORK IN ACCORDANCE WITH SECTION 028304 AND THE OSHA LEAD IN CONSTRUCTION STANDARD (1926.62) FOR WORKER PROTECTION.”
17. Drawing No. A-301, noted “REVISED DRAWING 10/18/24” accompanies this Addendum and supersedes the same numbered originally issued drawings.

HVAC WORK DRAWINGS

18. Drawing No. M-400:
- a. GENERAL NOTES, Add Note 3. to read:

“3. THE ROUGHENING OF THE EXISTING ASBESTOS-CONTAMINATED CONCRETE FLOOR SLAB FOR EQUIPMENT PAD EXTENSION INSTALLATIONS IS REQUIRED TO BE PERFORMED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR PROVIDED BY THE H-CONTRACT IN ACCORDANCE WITH THE APPROVED SITE-SPECIFIC VARIANCE PROVIDED WITHIN THE PROJECT MANUAL.”
19. Drawing No. M-703, noted “REVISED DRAWING 10/18/24” accompanies this Addendum and supersedes the same numbered originally issued drawings.

PLUMBING DRAWINGS

20. Drawing No. P-301: Add Coded Note 1 to tags “FD-1” to all floor plans on the sheet.

ELECTRICAL DRAWINGS

21. Drawing No. E-001:
- a. TELECOMMUNICATIONS, TV: Change description to read:

“TELEVISION WITH DATA OUTLET. SEE DETAILS 8 AND 14 ON E-701 FOR TELEVISION BOX.”
22. Drawing No. E-110:
- a. PH-HV-3, Add General Note to Read:

“4.5”X7.4”, 800A BUSDUCT FROM SUBSTATION #2 TO PANEL PH-HV-3 ON PENTHOUSE LEVEL.”
 - b. VFD Pump P-13 and P14, Change leader to Read “MCC-3”.

23. Drawing No. E-602:
 - a. DETAIL 4 / E110 MCC-3 Side 1: Change P-13 and P-14 to Read:

“HEATING HOT WATER PUMP, 15A”
24. Drawings No. E-101, E-101A, E-108, E-109 and E-601, noted “REVISED DRAWING 10/18/24” accompany this Addendum and supersede the same numbered originally issued drawings.

END OF ADDENDUM

Brady Sherlock, P.E.
Director, Division of Design
Design & Construction

SECTION 015301

TEMPORARY EXTERIOR HOIST

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. Modifications to Existing Warrantied Roof System: Section 070150.

1.02 REFERENCES

- A. AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
- B. ASME HST-4M, Performance Standard for Overhead Electric Wire Rope Hoists.
- C. AWS D1.1, Code for Welding in Building Construction.
- D. Hoist Manufacturer's Institute Standard Specification for Electric Wire Rope Hoists.
- E. ANSI/NFPA 70 National Electric Code, Article 610, Cranes and Hoists.
- F. OSHA and NYSDOL requirements pertaining to operation of temporary construction hoists.

1.03 DESCRIPTION

- A. Construction Work Contractor:
 - 1. Provides temporary exterior hoist system necessary for the Work, unless otherwise specified.
 - 2. Maintain temporary exterior hoist system operational for the work of all related contracts at all times Work is being performed.
 - a. Provide hoist rental including cost of operators for the duration of the project.
 - b. Provide all labor necessary to provide operation of the exterior hoist system for 8 hours a day for all workdays, Monday- Friday.
 - c. C-Contract to provide all labor necessary to provide operation of the exterior hoists for use by all related contracts excluding the B contract for 8 hours a day for all workdays, Monday – Friday for the contract duration.
 - d. Coordinate hoist availability to execute the work of all related contracts excluding the B contract.
 - 3. Provide and operate any additional hoists, scaffolding, swing staging, lifts, or cranes along with any other miscellaneous equipment required to perform the Work.

- B. HVAC Work, Plumbing Work, and Electrical Work Contractors:
 - 1. Any Work requiring a hoist operator outside of normal working hours as stated above in Paragraph 1.03 A shall be at the cost of the contractor performing the work. Pay the contractor the hourly wage for the hoist operator for the duration of the work.
 - 2. Notify the Construction Work Contractor a minimum of 48 hours in advance when a hoist operator is required for the work being performed outside of the normal working hours.
 - 3. Provide and operate any additional hoists, scaffolding, swing staging, lifts, or cranes along with any other miscellaneous equipment required to perform the Work.
 - 4. Notify the Construction Work Contractor a minimum of 48 hours in advance of large quantity equipment deliveries that will require more than 2 hours of lift usage per 8 hour work day.

1.04 SUBMITTALS

- A. Waiver of Submittals: The "Waiver of Certain Submittal Requirements" in Section 01330 does not apply to this Section.
- B. Submittals Package: Submit the shop drawings, product data, and quality control submittals specified below at the same time as a package.
- C. Shop Drawings- NYS PE reviewed and stamped drawings:
 - 1. Show the construction details of the hoist system and the support structure. Show all raised platforms with railing systems. Show all shoring as required to impose platform loads onto the building structural and foundations. Show all building tie in details.
 - 2. Show the electric wiring and control system.
 - 3. Show installation details.
- D. Product Data:
 - 1. Catalog sheets, specifications, and installation instructions.
 - 2. Name, address, and telephone number of nearest fully equipped service organization.
- E. Quality Control Submittals:
 - 1. Design data, including safety factor of materials.
 - 2. Test report of hoist and crane system.
 - 3. Certificate required under Quality Assurance.
- F. Contract Closeout Submittals:
 - 1. Operation and maintenance data.
 - 2. Warranty.
 - 3. Test reports of the completed hoist system.

1.05 QUALITY ASSURANCE

- A. Company Field Advisor: Secure the services of a Company Field Advisor for a minimum of 24 hours for the following:

1. Render advice regarding installation of the hoist system.
2. Witness final system test and then certify with an affidavit that the hoist system is installed in accordance with the contract requirements and is operating properly.
3. Provide a complete and thorough safety inspection at least once per month or more frequently if required by the local authority and immediately after heavy rains, snow, wind and severe cold. At a minimum inspect all ties, brackets, bracing, connection cables, tower members, hoisting motor, electrical components, safeties, platforms, ramps, doors, etc. Replace nylon rollers on rack & pinion as necessary. Submit a complete written report to the Director's Representative within 3 days after inspection.
4. Furnish copies of all permits and approvals prior to installation.

PART 2 PRODUCTS

2.01 HOIST SYSTEM

- A. Hoist System: The system specified will consist of one temporary construction hoist with ramped platforms that connect the car to the building from the hoist tower and platform supports. Hoist will provide a single car that serves from the exterior grade level to the ninth floor. Include the following as needed for the operation of this system:
1. Dual rack & pinion service from finished grade to floors 7, 8 & 9.
 2. Common raised platforms for floors 7,8 & 9 . Provide a continuous apron around the raised platforms. Provide an at grade level platform in order to level the cars.
 3. Include rental and operators for the hoist for the duration of the project beginning within 6 weeks of contract award.
 4. Include exterior doors and plywood panels located at the building line. Panels to totally enclose openings in a watertight condition. Doors are to swing into the building from the 1st floor to roof level. Access to hoist from the outside shall be at grade and at roof level.
 5. Include operable doors on two sides of car (on each end of the car).
 6. Include all necessary concrete slab/pads, dunnage and buffer springs and temporary power connections to switchgear in basement.
 7. Provide temporary protection of existing roof including dunnage which is held down and will not blow off roof during windy conditions.
 8. Provide 12" of type 2 stone with filter fabric at base of tower. Compact to 95% compaction.

2.02 DESIGN REQUIREMENTS

- A. System Requirements:
1. Minimum Capacity: 6000#.
 2. Size: Inside clear dimensions at gates/doors to allow materials to pass are: 12'-2" length X 7'-0" high X 4'-11" wide.
 3. Temporary Electrical Requirements: 208V/480V, 3 Phase. All wiring will provided by the Contractor as necessary to complete the work.

Electrical usage charges will be paid for by the State. Tie into existing switchgear located in the basement of the building.

- B. Hoist: Electric wire rope hoist as manufactured by Alimak or Champion, with all parts and accessories necessary to meet the following requirements:
 - 1. Minimum Lifting Capacity: 6000#.
 - 2. Lifting Speed: 0 to 300 feet per minute.
 - 3. Electrical: 480 Volt/3 Phase/100 Amp.
 - 4. Car Size (inside car dimension): 12'-2" length X 7'-0" high X 4'-11" wide.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install the Work in this Section in accordance with the manufacturer's printed installation instructions, shop drawings, and directions of the Company Field Advisor. Lift tie in points into the building to utilize previously abated tie in points as shown on A-203
- B. Rack & pinion car to include brackets or carriage system for traveling to maintain cable during high winds.
- C. Provide all supplemental steel and supports as required at the hoist tower and platforms as needed to provide the designed building tie in reaction.
- D. Provide all necessary toe boards, guard rails, handrails, and screening on common platforms and ramps. Include screening of machines, kickers, and tie downs. All enclosures are to meet any and all safety requirements of OSHA, the State of New York, and the City of Albany.
- E. Common platforms and ramps to extend to the building line from the car. Ramps shall be installed so that it does not interfere with Work on each floor. The hoist stop will align with the window sill height at each floor level- provide ramps from the building line to the platform in order that materials can be delivered or removed on a rolling dolly or cart.
- F. Provide winterizing of all rack & pinion hoist cars. This will include Plexiglas surrounds at the car. Maintain platforms etc..free from snow and ice.
- G. All cables, planks, door lumber and hardware are to be new. Replace all weathered materials as required or directed.
- H. Provide wire swing gates on each platform in front of each rack & pinion car. Doors/gates at the building are to be constructed of wood with a vision cutout (1' X 1' min.) with wire mesh screen. Include wire swing gates on each common platform in front of each material hoist.
- I. Insure that all protection, cables, bracing, gauges and safety controls conform to all applicable OSHA, NYS and local regulations. Confirm Albany Fire

Department approval of cars and make accommodations for AFD use as required for on and off hours.

- J. Provide plank and weather protection on the tops of the rack & pinion car.
- K. Provide for all factor of safety requirements per applicable codes for the design and construction of the hoists.
- L. Provide all hoist maintenance and repairs at no additional cost if required. All hoist component parts shall arrive painted and be maintained like new for the duration of the job. Hoists are to be greased weekly and/or after heavy rains whichever is more frequent.
- M. Repair and replace all limestone removed in order to provide connections to the building structural systems for the hoist and platforms. Match existing finish with any caulking, mortar, or grout used to patch connection penetrations.
- N. Provide for all weather proofing and flashing of all building structural connections for the hoists and platforms for the life of the project.

END OF SECTION

SECTION 015301

TEMPORARY EXTERIOR HOIST

PART 1 GENERAL

1.01 REFERENCES

- A. AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
- B. ASME HST-4M, Performance Standard for Overhead Electric Wire Rope Hoists.
- C. AWS D1.1, Code for Welding in Building Construction.
- D. Hoist Manufacturer's Institute Standard Specification for Electric Wire Rope Hoists.
- E. ANSI/NFPA 70 National Electric Code, Article 610, Cranes and Hoists.
- F. OSHA and NYSDOL requirements pertaining to operation of temporary construction hoists.

1.02 DESCRIPTION

- A. Construction Work Contractor:
 - 1. Provides temporary exterior hoist system necessary for the Work, unless otherwise specified.
 - 2. Maintains temporary exterior hoist system operational for the work of this contract while Work is being performed.
 - a. Provide hoist rental including cost of operators for the duration of the work of this contract.
 - b. Provide all labor necessary to provide operation of the exterior hoist system for 8 hours a day for all workdays, Monday- Friday.
 - c. Any Work requiring a hoist operator outside of normal working hours as shall be at the cost of the contractor performing the work.
 - 3. Provide and operate any additional hoists, scaffolding, swing staging, lifts or cranes along with any other miscellaneous equipment required to perform the Work.
 - 4. See drawing H-100 for the location of the hoist-way and connection points.

1.03 SUBMITTALS

- A. Waiver of Submittals: The "Waiver of Certain Submittal Requirements" in Section 01330 does not apply to this Section.

- B. Submittals Package: Submit the shop drawings, product data, and quality control submittals specified below at the same time as a package.
- C. Shop Drawings- NYS PE reviewed and stamped drawings:
 - 1. Show the construction details of the hoist system and the support structure. Show all raised platforms with railing systems. Show all shoring as required to impose platform loads onto the building structural and foundations. Show all building tie in details.
 - 2. Show the electric wiring and control system.
 - 3. Show installation details.
- D. Product Data:
 - 1. Catalog sheets, specifications, and installation instructions.
 - 2. Name, address, and telephone number of nearest fully equipped service organization.
- E. Quality Control Submittals:
 - 1. Design data, including safety factor of materials.
 - 2. Test report of hoist and crane system.
 - 3. Certificate required under Quality Assurance.
- F. Contract Closeout Submittals:
 - 1. Operation and maintenance data.
 - 2. Warranty.
 - 3. Test reports of the completed hoist system.

1.04 QUALITY ASSURANCE

- A. Company Field Advisor: Secure the services of a Company Field Advisor for a minimum of 24 hours for the following:
 - 1. Render advice regarding installation of the hoist system.
- 2. Witness final system test and then certify with an affidavit that the hoist system is installed in accordance with the contract requirements and is operating properly.
- 3. Provide a complete and thorough safety inspection at least once per month or more frequently if required by the local authority and immediately after heavy rains, snow, wind and severe cold. At a minimum inspect all ties, brackets, bracing, connection cables, tower members, hoisting motor, electrical components, safeties, platforms, ramps, doors, etc. Replace nylon rollers on rack & pinion as necessary. Submit a complete written report to the Director's Representative within 3 days after inspection.
- 4. Furnish copies of all permits and approvals prior to installation.

PART 2 PRODUCTS

2.01 HOIST SYSTEM

- A. Hoist System: The system specified will consist of one temporary construction hoist with ramped platforms that connect the car to the building from the hoist tower and platform supports. Hoist will provide a single car that serves from the exterior grade level to the roof level. Include the following as needed for the operation of this system:
1. Dual rack & pinion service from finished grade to floors 7, 8 & 9.
 2. Common raised platforms for floors 7,8 & 9 . Provide a continuous apron around the raised platforms. Provide an at grade level platform in order to level the cars.
 3. Include rental and operators for the hoist beginning within 6 weeks of contract award.
 4. Include exterior doors and plywood panels located at the building line. Panels to totally enclose openings in a watertight condition. Doors are to swing into the building from the 1st floor to roof level. Access to hoist from the outside shall be at grade and at roof level.
 5. Include operable doors on two sides of car (on each end of the car).
 6. Include all necessary concrete slab/pads, dunnage and buffer springs and temporary power connections to switchgear in basement.
 7. Provide temporary protection of existing roof including dunnage which is held down and will not blow off roof during windy conditions.
 8. Provide 12” of type 2 stone with filter fabric at base of tower. Compact to 95% compaction.

2.02 DESIGN REQUIREMENTS

- A. System Requirements:
1. Minimum Capacity: 6000#.
 2. Size: Inside clear dimensions at gates/doors to allow materials to pass are: 12’-2” length X 7’-0” high X 4’-11” wide.
 3. Temporary Electrical Requirements: 208V/480V, 3 Phase. All wiring will provided by the Contractor as necessary to complete the work. Electrical usage charges will be paid for by the State. Tie into existing switchgear located in the basement of the building.
- B. Hoist: Electric wire rope hoist as manufactured by Alimak or Champion, with all parts and accessories necessary to meet the following requirements:
1. Minimum Lifting Capacity: 6000#.
 2. Lifting Speed: 0 to 300 feet per minute.
 3. Electrical: 480 Volt/3 Phase/100 Amp.
 4. Car Size (inside car dimension): 12’-2” length X 7’-0” high X 4’-11” wide.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install the Work in this Section in accordance with the manufacturer's printed installation instructions, shop drawings, and directions of the Company Field Advisor.
- B. Rack & pinion car to include brackets or carriage system for traveling to maintain cable during high winds.
- C. Provide all supplemental steel and supports as required at the hoist tower and platforms as needed to provide the designed building tie in reaction.
- D. Provide all necessary toe boards, guard rails, handrails, and screening on common platforms and ramps. Include screening of machines, kickers, and tie downs. All enclosures are to meet all safety requirements of OSHA, the State of New York, and the City of Albany.
- E. Common platforms and ramps to extend to the building line from the car. Ramps shall be installed so that it does not interfere with Work on each floor. The hoist stop will align with the window sill height at each floor level- provide ramps from the building line to the platform in order that materials can be delivered or removed on a rolling dolly or cart.
- F. Provide winterizing of all rack & pinion hoist cars. This will include Plexiglas surrounds at the car. Maintain platforms etc. free from snow and ice.
- G. All cables, planks, door lumber and hardware are to be new. Replace all weathered materials as required or directed.
- H. Provide wire swing gates on each platform in front of each rack & pinion car. Doors/gates at the building are to be constructed of wood with a vision cutout (1' X 1' min.) with wire mesh screen. Include wire swing gates on each common platform in front of each material hoist.
- I. Ensure that all protection, cables, bracing, gauges and safety controls conform to all applicable OSHA, NYS and local regulations. Confirm Albany Fire Department approval of cars and make accommodations for AFD use as required for on and off hours.
- J. Provide plank and weather protection on the tops of the rack & pinion car.
- K. Provide for all factor of safety requirements per applicable codes for the design and construction of the hoists.
- L. Provide all hoist maintenance and repairs at no additional cost if required. All hoist component parts shall arrive painted and be maintained like new for the duration of the job. Hoists are to be greased weekly and/or after heavy rains whichever is more frequent.
- M. Repair and replace all limestone removed in order to provide connections to the building structural systems for the hoist and platforms. Match existing finish with any caulking, mortar, or grout used to patch connection penetrations.

- N. Provide for all weather proofing and flashing of all building structural connections for the hoists and platforms for the life of the project.

END OF SECTION

SECTION 230923**DIRECT DIGITAL BUILDING CONTROL SYSTEM****PART 1 GENERAL****1.01 OVERVIEW**

- A. The intent of this specification is to provide a peer-to-peer, networked, stand-alone, distributed control system by companies in the HVAC control field.
- B. LonTalk BACnet, Arcnet, or Ethernet communication protocols will be used as the primary communication network for communications between multi-BAS/EMS vendors systems in a non-proprietary manner. Project implementation, as specified, requires transferring, receiving, and controlling information that resides in multi-BAS/EMS Vendors' "building controllers".
- C. LonTalk, BACnet, Arcnet, or Ethernet communications protocol will be used as the communication network between BAS/EMS Vendor Terminal Equipment Controllers (TECs) and secondary network management devices, and between network management devices and future "smart devices and sensors", as they become available. Secondary communications data protocol shall operate on a peer-to-peer open protocol communication network. Minimum system speed shall be 76k baud.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Wiring for Motors and Motor Controllers: Section 260523.
- B. Basic Electrical Materials and Methods for Direct Digital Building Control System: Section 260502.
- C. Ductwork Accessories: Section 233300.

1.03 ALLOWANCES

- A. An allowance for the following portions of the Work of this Section is included in Section 012100:
 - 1. Services of the Company Field Advisor as described in QUALITY ASSURANCE.
 - 2. All items listed in SUBMITTALS.
 - 3. Engineering and reprogramming associated with the installation of the new equipment and updating existing information.
 - 4. All products listed in PART 2 of this Section except:
 - a. Piping and wiring as indicated on drawings.
 - b. Controls devices noted on drawings to be provided by H-Contractor.
 - c. Associated control devices specified on the drawings to be supplied by the equipment manufacturer of equipment scheduled to be provided by the H-Contractor.

- d. Markers and nameplates.
- e. Labor for installation of the materials and devices shall be included in the Contract Sum (not the allowance).

1.04 REFERENCES

- A. ASHRAE Standard 135 - 1995 (1995; Publication pending) BACnet - A Data Communication Protocol for Building Automation and Control Networks
- B. ASHRAE Standard 114 - 1986 (1986; to be re-named as Guideline 13P) Recommended practices guide for verification of end-to-end accuracy in Energy Management and Control Systems (EMCS)
- C. NFPA 70 (1994) National Electric Code
- D. UL 916 (1984; Rev thru Dec 1992) Energy Management Equipment
- E. UL UUKL 864 (1991); Smoke Control Equipment

1.05 ABBREVIATIONS AND ACRONYMS

CSIP	Control System Interface Panel
BAS	Building Automation System
DCP	Distributed Control Processors
DDC	Direct Digital Control
EEPROM	Electrically Erasable Programmable Read Only Memory
EMS	Energy Management System
EPROM	Erasable Programmable Read Only Memory
FAIP	Fire Alarm Interface Panel
FTT	Free Topology Transceiver
FSCS	Fire Fighter's Smoke Control System
GDU	Graphic Display Unit
HOA	Hand-Off-Automatic
OS	Operating System
PCP	Digital Plant Control Processors
POS	Primary Operator Station
POT	Portable Operators Terminal
RAP	Remote Access Panel
SCAP	Status and Command Annunciator Panel
TEC	Terminal Equipment Controllers
TP	Time Programs
VAV	Variable Air Volume

1.06 SYSTEM DESCRIPTION

- A. The system shall operate as an integrated Direct Digital Building Control System (DDC).
1. Modify Existing DDC systems including associated equipment and accessories. Provide each control system complete and operating as specified. Manufacturer's products, including design, materials, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with ASHRAE Standard 114 - 1986, ASME B31.1 and NFPA 70, except as modified herein or indicated otherwise.
 2. Provide the DDC systems to maintain stable temperature control and all other conditions as indicated. The end-to-end accuracy of the system, including temperature sensor error, wiring error, A/D conversion, and display, shall be 1 degree F.
 3. Provide either a DDC system compatible with the existing system or provide a DDC system with a new workstation complete with software.
 - a. If providing a system compatible with an existing system, upgrade the workstation software with the manufacturers' latest software version that supports routers or gateways for LonWorks interoperable BAS/EMS vendor communications.
 - b. The existing DDC systems was manufactured by Honeywell.
 4. Changes in the status of monitored points are detected by the microprocessor based Primary Operators Station (POS) utilizing a primary data communication peer bus and microprocessor based distributed control processors (DCPs) located throughout the facility.
 5. Secondary networks managed by the DCPs may be employed to monitor status terminal equipment controllers (TECs).
 6. This system provides overall monitoring and control of all HVAC control functions for all analog and digital (binary, on/off, open/close) input control signals to microprocessor based digital controllers. The digital controllers perform all of the control logic, analog output and digital output signals to the HVAC field equipment.
 7. Alarms will be transmitted to printers located in the maintenance office.
 8. The HVAC Work Contractor shall integrate the Direct Digital Building Control Work System and the Combustion Control System.
 9. The Temperature Control Work Contractor shall work with the HVAC Work Contractor to integrate the Direct Digital Building Control System and Combustion Control System.
- B. This system will have interface ports to allow connection to a terminal, portable computer, and a central site computer utilizing a LonTalk, BACnet, Arcnet, or Ethernet communication protocol. BAS/EMS equipment will provide day to day control of HVAC systems, allowing system operators to enable and disable equipment, change set points, change operating schedules, receive trends and alarms, while dynamically uploading and downloading control programs.

1.07 DESIGN REQUIREMENTS

- A. The system shall be designed by the engineering staff of the Company producing the system or the engineering staff of a Company that specializes in the design of Direct Digital Building Control Systems.

- B. For LonMark System Architectures: Provide certification of interoperability for each LonMark device proposed for this project.

1.08 SUBMITTAL

- A. Waiver of Submittal: The “Waiver of Certain Submittal Requirements” in Section 013300 does not apply to this Section.
- B. Submittal Package: Submit the shop drawings, product data, and quality control submittal specified below at the same time as a package.
 - 1. Certification of interoperability is required for each LonMark device submitted for the project.
- C. Shop Drawings:
 - 1. Provide a system architecture drawing that diagrammatically shows all DCPs, their locations, how they connect to the overall communication riser, and the specified HVAC systems they each serve. The system architecture wiring layout must match specific site requirements.
 - 2. Sketches of all graphics.
 - 3. Graphic penetration tree showing all graphics and all points.
 - 4. Flow diagram of pneumatic portion of the system as proposed to be installed (standard diagrams will not be acceptable).
 - 5. Composite wiring and/or schematic diagrams of the complete system as proposed to be installed (standard diagrams will not be acceptable).
 - a. Include wiring diagrams showing interconnection with other Contractor’s systems.
 - 6. Scaled floor plan and elevation drawings showing location of all major components associated with the system.
 - 7. Scaled drawings of each primary operator’s station (POS) showing layout of, and indicating the function of each switch, button, lamp, and accessory.
 - a. Show front view and plan view of primary operators station console, including overall dimensions, and detail of each console section.
 - b. Show scale drawing (plan view and elevation) of each primary operator’s station console layout in its site location.
 - 8. Scaled drawings of the status and command annunciator panel (SCAP) showing layout of, and indicating the function of each switch, button, lamp, and accessory.
 - 9. Scaled drawings of each distributed control processor (DCP) showing layout of and indicating the function of each module and accessory.
 - 10. Scaled drawings of the control system interface panel (CSIP).
 - 11. Scaled drawings of the fire fighter smoke control panel showing layout of, and indicating the function of each annunciator module, switch module, and accessory.
- D. Product Data:
 - 1. Catalog sheets, specifications, and installation instructions.
 - 2. Bill of materials.
 - 3. Detailed description of system operation.
 - 4. Point description, program list, and sequences.

5. Data from the Company producing the system, proving that:
 - a. The system is UL listed.
 6. Total electrical load of the system which will be connected to the uninterruptible power supply system.
 7. State grade and number of leased telephone lines required for use with modem units.
 8. Name, address, and telephone number of nearest fully equipped service organization.
- E. Quality Control Submittal:
1. Installer's Qualifications Data:
 - a. Name of each person who will be performing the Work and their employer's name, business address and telephone number.
 - b. Names and addresses of 3 similar projects that each person has worked on during the past 3 years.
 2. Company Field Advisor Data: Include:
 - a. Name, business address and telephone number of Company Field Advisor secured for the required services.
 - b. Certified statement from the Company listing the qualifications of the Company Field Advisor.
 - c. Services and each product for which authorization is given by the Company, listed specifically for this project.
 3. Test Reports:
 - a. Existing sub-system test reports.
- F. Contract Closeout Submittal:
1. System acceptance test report.
 2. Certificates:
 - a. Affidavit, signed by the Company Field Advisor and notarized, certifying that the system meets the contract requirements and is operating properly.
 3. Operation and Maintenance Data: Deliver 2 copies, covering the installed products, to the Director's Representative. Include:
 - a. Operation and maintenance data for each product installed in system.
 - b. Original licensed versions of all software loaded into the system, with disks and manuals.
 - c. Complete point to point wiring diagrams of entire system as installed. Identify all conductors and show all terminations and splices. (Identification shall correspond to markers installed on each conductor.)
 - d. Name, address, and telephone number of nearest fully equipped service organization.
 4. Provide 2 hard copy back-up disks and CD-ROM backup of all software programs and configurations as the system exists at final acceptance.
 - a. Deliver one set of back-up disks to the Directors Representative for turnover to the facility.
 - b. Deliver one set of back-up disks and the CD-ROM to:
Office of General Services
Facilities Services Unit
Service Team Leader

34th Floor, Corning Tower
Albany, NY 12242

- c. Upon closeout with the first year, send updated disks and CD-ROM to the above listed personnel.
- 5. Provide all revisions and/or upgrades made to the system software during the one-year guarantee warranty period, at no additional cost to the State.

1.09 QUALITY ASSURANCE

- A. Equipment Qualifications for Products Other Than Those Specified:
 - 1. At the time of submission provide written notice to the Director of the intent to propose an “or equal” for products other than those specified. Make the “or equal” submission in a timely manner to allow the Director sufficient time to review the proposed product, perform inspections and witness test demonstrations.
 - 2. If products other than those specified are proposed for use furnish the name, address, and telephone numbers of at least 5 comparable installations that can prove the proposed products have performed satisfactorily for 3 years. Certify in writing that the owners of the 5 comparable installations will allow inspection of their installation by the Director's Representative and the Company Field Advisor.
 - a. Make arrangements with the owners of 2 installations (selected by the Director) for inspection of the installations by the Director's Representative. Also obtain the services of the Company Field Advisor for the proposed products to be present. Notify the Director a minimum of 3 weeks prior to the availability of the installations for the inspection and provide at least one alternative date for each inspection.
 - b. Only references from the actual owner or owner’s representative (Security Supervisor, Maintenance Supervisor, etc.) will be accepted. References from dealers, system installers or others, who are not the actual owners of the proposed products, are not acceptable.
 - 1) Verify the accuracy of all references submitted prior to submission and certify in writing that the accuracy of the information has been confirmed.
 - 3. The product manufacturer shall have test facilities available that can demonstrate that the proposed products meet the contract requirements.
 - a. Make arrangements with the test facility for the Director's Representative to witness test demonstrations. Also obtain the services of the Company Field Advisor for the proposed product to be present at the test facility. Notify the Director a minimum of 3 weeks prior to the availability of the test facility and provide at least one alternative date for the testing.
 - 4. Provide written certification from the manufacturer that the proposed products are compatible for use with all other equipment proposed for use for this system and meet all contract requirements.
- B. UL Listing: The system shall be UL listed for Energy Management UL 916 and Smoke Control UL UUKL 864.

- C. Qualifications: The persons installing the Work of this Section and their Supervisor shall be personally experienced in building control system work and shall have been regularly employed by a Company installing direct digital building control systems for a minimum of 3 years.
 - 1. For LonMark System Architectures: BAS/EMS vendors shall be certified in LonMark system installation.

- D. Test Facility: The Company producing the system shall have test facilities available which can demonstrate that the proposed system meets contract requirements.

- E. Company Field Advisor: Secure the services of a Company Field Advisor for a minimum of 200 working hours for the following:
 - 1. Render advice regarding installation and final adjustment of the system.
 - 2. Assist in initial programming of the system.
 - 3. Render advice on the suitability of each monitor and control device for its particular application.
 - 4. Witness final system test and then certify with an affidavit that the system is installed in accordance with the contract documents and is operating properly.
 - 5. Train facility maintenance personnel in operation, programming and routine maintenance of the system.
 - a. Provide the services of competent instructors to instruct designated personnel in the adjustment, operation and maintenance, including pertinent safety requirements, of the equipment and system specified. The training shall be oriented toward the installed system rather than being a general (canned) training course. Each instructor shall be thoroughly familiar with all aspects of the subject matter they are to teach. The number of man-days of instruction furnished shall be as specified below. All equipment and material required for classroom training shall be provided.
 - b. Provide a minimum of one complete computer (desktop or color laptop model) for every two trainees during the entire training period. The computers shall be linked as to provide real-time ability to all trainees to monitor the site's systems controlled by the EMS.
 - c. For each trainee (minimum of 8), provide workbooks, worksheets, sample problems and other printed matter to serve as illustrative reference material. Unless deemed unnecessary by OGS, Contractor shall include copies of all overheads used in the training either separately or as part of said printed matter. Contractor shall provide all overhead projectors, computer LCD panels, video players or projectors, projection screens, hands-on materials, etc. as required for the training.
 - d. Submit for OGS review and approval, at least four weeks in advance of each phase of the training, the following:
 - 1) A detailed proposed outline of training, including timing.
 - 2) All printed materials, visual aids and hands-on material.
 - 3) All overheads (transparencies or computerized)

- 4) All other training aids.
- 5) Qualifications of all proposed training personnel.
- e. Training Program: A training day is defined as 8 hours of instruction including two 15-minute breaks and excluding lunch time.
 - 1) For a period of 3 days prior to the acceptance test period at a time mutually agreeable between the Contractor and the State. Operating personnel will be trained in the functional operations of the installed system, the procedures employed for system operation and the maintenance of DDC equipment.
 - a) The first 2 days of training shall include:
 - (1) General System Architecture.
 - (2) Operation of Computer and Peripherals.
 - (3) Command Line Mnemonics.
 - (4) Report Generation.
 - (5) Operation Control Functions.
 - (6) Graphics Generation.
 - (7) Input Function and Identification.
 - (8) Logging ON and OFF.
 - (9) Point Naming Convention.
 - (10) Point Logs.
 - (11) Trending.
 - (12) Alarms.
 - (13) Executing Commands.
 - b) The third day of training shall include:
 - (1) General equipment layout.
 - (2) Troubleshooting of DDC components.
 - (3) Preventive Maintenance of DDC components.
 - (4) Sensor maintenance and calibration.
 - (5) Hand-held Terminal operation.
 - c) Three neatly bound vinyl notebooks shall be provided containing a summary of each topic discussed during the three phases of training.
 - f. The training room shall be clean, well-lit, well-ventilated, and isolated from noise (including HVAC noise) and other distractions. The Contractor shall arrange, via delamping, covering fixtures or by light switches, for there to be adequate contrast lighting to take notes and fend off drowsiness.
 - g. Instructor shall employ an LCD panel, video projector or other suitable device to project large images of the EMS software and/or other training images.
 - h. Printed training materials shall be tailored to the task at hand and shall be well illustrated. Materials shall take students through the steps of learning the EMS and its software and shall provide sample exercises for the trainees to perform on the computers.
 - i. Training must steer clear of jargon and other confusing terminology and focus instead on learning how to use the system. Specific jargon may be addressed after the trainees have demonstrated a basic understanding of system operation.

- j. Training shall involve actual field-type equipment using a training demonstration package that simulates real-time temperatures, settings, alarms, etc. Training shall also spend substantial time observing the site's actual system, include point logs, graphics, and alarms. In addition, a brief field visit shall be included to familiarize trainees with the equipment installed at their site.
 - k. Training must include quizzes, tests, and exercises that compel trainees to demonstrate understanding of the system's most important concepts. These concepts shall include, but not be limited to, the elements of a monitoring checklist developed by the site.
 - l. The overall training approach shall be interactive and encourage students to discuss concepts, ask questions of the instructor and share experiences among one another.
6. Provide services to the Balancing Work Contractor for a minimum of 32 working hours for the following:
- a. Render instruction at the Site in the use of control equipment to set variable air volume devices to operate within the direct digital building control system.
 - b. Render advice and assist Balancing Work Contractor during the balancing process with component calibration, repair and replacement of components, explanation of component operation, and attend meetings with the VAV device manufacturer, etc.
7. Explain available service programs to facility supervisory personnel for their consideration.
- F. Company Field Advisor (Existing Sub-Systems): Secure the services of a Company Field Advisor from the Company of each sub-system for a minimum of 32 working hours for the following:
- 1. Render advice and witness test of existing sub-systems.
 - 2. Render advice on the interconnection of existing sub-systems with the new system.
 - 3. Witness the final test of the combined new system and existing sub-systems.

1.10 MAINTENANCE

- A. Service Availability: A fully equipped service organization capable of guaranteeing response time within 8 hours to service call shall be available 24 hours a day, 7 days a week to service the completed Work.
- B. Spare Parts:
- 1. 10 percent spare of each type temperature sensor.
 - 2. 10 percent spare of each type pressure sensor.
 - 3. 10 percent spare of each type relay.
 - 4. 10 percent spare of each size valve.
 - 5. 10 percent spare of each type I/O board.
 - 6. Printer paper (2 cases, 3200 sheets per case for fan fold style printer).
 - 7. Four ribbons for printers.

8. Two sets, per printer, ink jet print cartridges.
- C. Test Instrument: VAV box calibration instrument.
1. Turn over the calibration instrument to the Balancing Work Contractor, thru the Director's Representative.
 2. Upon completion of Balancing Work, the Balancing Work Contractor will turn the instrument over to the Director's Representative, which shall remain the property of the State.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General:
1. Control diagrams shown on the drawings, in general, indicate the equipment required for the control sequences specified. Variations in the selection of temperature control equipment, which will produce the required control sequences may be submitted for approval.
 2. All equipment shall be the standard product of one manufacturer, unless otherwise specified.
 3. Components and system capacity parameters specified are minimum and shall be increased as required by the Company producing the system to enable the system to perform the functions specified and indicated on the drawings.
- B. Standard utility grade power will be available for operation of the system. If power conditioning is required for proper operation of the system, all equipment and labor required to provide conditioned power shall be provided as part of the system.

2.02 STATUS AND COMMAND ANNUNCIATOR PANEL (SCAP)]

- A. Interface panel having predetermined points commanded or annunciated:
1. Graphic faceplate in which are located lamps for annunciation and switches for commands.
 2. Master enable/disable key switch on all control switches behind hinged and locked door having windows for visibility of system functions.

2.03 DISTRIBUTED CONTROL PROCESSORS (DCPs)

- A. For LonMark System Architectures DCPs shall be LonMark certified devices.
- B. Microprocessor based, with operating system (OS) and energy management system (EMS) programs, data file and control programs, 72-hour battery backed real time clock.
- C. DCPs shall operate stand alone and independent of a central computer for all specified control applications.

- D. DCPs not utilizing “Smart Devices”, shall be modular and configured to accommodate analog and digital input and output boards to meet specific application requirements, including spares as specified.
- E. The DCPs including accessory devices such as relay, power supplies, etc., shall be factory mounted, wired and housed in a steel enclosure with a hinged door panel. LEDs and switches shall be visible without opening the panel door, but not accessible without opening the panel door.
- F. DCPs shall be equipped with LEDs for indication of power and operational status, status of each input and output, and diagnostic LED indicators.
- G. Separate discreet DCPs shall be provided to support each major HVAC system. In all cases where primary and back-up systems are specified, a single DCP shall not be used to control both primary and secondary systems. In addition, a single DCP shall not be used to control two or more major HVAC systems (i.e., chillers and heat exchangers controlled by one single panel.)

2.04 TERMINAL EQUIPMENT CONTROLLERS (TECs)

- A. TEC Controller types shall support fan coil, unit ventilator, heat pump, remote I/O modules, and air handler applications.
 - 1. For LonMark System Architectures: BAS/EMS Vendor Terminal Equipment Controllers (TECs) will operate on a LonMark certified LonWorks Free Topology Transceiver (FTT) peer-to-peer open protocol communication network.
- B. TECs shall be modular, field modifiable, expandable, and configured with an array of analog and digital inputs and outputs, and pulse counting totalizers to meet the application requirements.
 - 1. For LonMark System Architectures: TECs shall support any LonMark Functional Profile as shall be in existence at the time of architectural submittal.
- C. The TECs shall be factory mounted on the equipment, wired, and housed in a steel enclosure. BAS/EMS Vendors shall ship damper actuators and VAV controllers to VAV terminal equipment manufacturer for factory installation, including transformers, relays, and air flow devices. Wiring and installation instructions are to be provided by the BAS/EMS Vendor to the VAV terminal equipment manufacturer.
- D. TECs shall be able to operate at 90percent to 110percent of nominal voltage rating and shall perform an orderly shut-down below 80percent. Operation shall be protected against electrical noise of 5-120 Hz and from keyed radios up to 5 watts at 3 feet.
- E. VAV Box Controllers: Microprocessor - EEPROM based, with flash memory for date file and control programs. Controllers shall have the capability for wall mounted control of temperature occupied/unoccupied or fan control.

2.05 ROUTER AND GATEWAYS

- A. Provide certified Router and/or Gateway devices which connect two or more physical LonTalk or BACnet compatible equipment as required.
- B. Routers or Gateways if required, shall be a microprocessor-based communication device designed to provide seamless, two-way translation between two or more standard or non-standard network layer protocols.
- C. UL Listing: UL 916 required as a minimum.

2.06 DCP AND TEC SOFTWARE

- A. Energy Management Application Programs:
 - 1. Optimum Start, Night Cycling and Night Purge for free cooling shall address the unique requirement of each systems Unoccupied Period, which may include one or more of the following as specified:
 - a. Optimum start program shall delay equipment start-up based on global outdoor temperature, and system response to assure that comfort conditions are reached at scheduled occupancy time (occupancy schedules are defined under time programs) and operate in both heating and cooling cycles. In all cases, the optimum start program shall operate fully stand-alone in the local DCP.
 - b. Night Cycle program shall apply to heating cycle only (or both heating and cooling cycle) with the outdoor air dampers closed. The space temperature shall be used to determine the “fan on” and/or “supply heat” command to maintain a low limit of 50-55 degrees for the heating cycle and the “fan on” and “supply cooling” command to maintain 82 degrees for the cooling cycle.
 - c. Night Purge program shall apply to cooling cycle only. Night Purge shall introduce 100 percent outdoor air any time the outdoor air is above 50 degrees F, the space temperature is above 75 degrees F, and the outdoor air dewpoint is less than 60 degrees. Purging shall stop when outdoor air is below 50 degrees F, or space temperature is below 75 degrees F, or outdoor temperature is less than 5 degrees cooler than space temperature, or outdoor air dewpoint, is greater than 60 degrees.
 - 2. A load reset program shall be provided to assure that only the minimum amount of heating, cooling, and electrical energy is supplied to satisfy zone temperature requirements. The program shall be applicable where specified to hot decks, cold decks, chilled water supply, and AHU static pressure. Individual programs are to be provided each sensing the worst case zone requirements and providing only the minimum energy source media to satisfy the need.
- B. Control Software:
 - 1. Each DCP shall contain up to 20 unique user modifiable time programs (TP):
 - a. Each TP shall consist of daily, weekly, and annual programs plus a “TODAY” temporary function.

- b. DAILY programs shall be definable for day types such as working day, half day, holiday, weekend, etc. Each daily program shall allow a list of time based (or optimum time based analog and digital commands to be issued to user selected plant elements and points.
 - c. WEEKLY programs shall allow a user selected set of daily programs to be defined for each day of the week, Monday through Sunday.
 - d. The ANNUAL program shall initially be an automatic compilation of 52 weekly programs. Selecting a date of the ANNUAL program shall allow modification of the daily selection entered into the weekly program, such as changing Dec. 25 from a working day to a holiday.
- 2. Control Application Software shall be customized strictly to meet the detailed requirements of the “Sequence of Operation” specified in PART 3. DCPs shall be fully programmable. Initial software shall be fully modifiable, and not restricted by vendor’s specific configuration guidelines.
- C. Management Software:
- 1. Each DCP shall be provided with a trend archive of at least the last 200 events, digital transitions, or analog value changes, of any user selected group of points. A stored event shall include date and time, and value or status. Events occurring in excess of 200 shall overwrite the oldest events, except where a modem module is specified, events shall be uploaded to the modem module. Point events shall be displayable at the POS as trend logs for evaluation of control system performance.
 - 2. Each DCP shall monitor all analog input points and specified digital points for off-normal conditions. Each alarm shall have an “alarm delay” attribute which shall determine how long, in seconds, a point must be in an off-normal state prior to being considered in an alarm state. Alarms shall be displayable at the POS.
 - 3. DCPs managing sub-networks of TECs shall report TEC alarms and shall be programmed to perform data reduction, sorting, and AHU DCP optimizing routines. In no case shall mass TEC optimizing data be allowed on the peer bus.
- D. Communications Software:
- 1. LonTalk, BACnet, Arcnet, or Ethernet shall be used for communication between DCPs, and between operator interfaces. Each DCP shall have a full master peer-to-peer communications module to support all global data sharing, hierarchical control, and global control strategies specified. In addition, certain DCPs shall have hardware and software to support manage a secondary 9600 baud minimum bus of TECs, including hierarchical control specified, management, alarm processing and prioritization.
- E. TEC Software:
- 1. BAS/EMS Vendor Terminal Equipment Controllers (TECs) will operate on a peer-to-peer communications network. TEC Software shall be configured to meet the detailed requirements of the Sequence of

Operation and shall be field reconfigurable if required to accommodate future functional or additional I/O requirements. TEC software shall be compatible with all the requirements set forth in the POT specification regarding TEC data display and modification. TEC software shall support full PID control.

- a. For LonMark System Architectures: BAS/EMS Vendor Terminal Equipment Controllers (TECs) will operate on a LonMark Certified LonWorks Free Topology Transceiver (FTT) peer-to-peer protocol communication network.

2.07 DATA COMMUNICATIONS

- A. POS and DCPs shall directly reside on a primary peer communication bus such that communications may be executed directly between POS and DCPs, and directly between DCPs on a peer-to-peer basis, via fiber optic cable or via electronic cable, and routers as needed.
- B. TECs shall be connected together via peer-to-peer secondary communication network managed by the DCPs.
 1. For LonMark System Architectures: TECs shall be connected together via LonMark certified LonWorks Free Topology Transceiver (FTT) peer-to-peer open protocol communication network.
- C. Protect communication lines against incorrect wiring, static transients and induced magnetic interference.
 1. Provide static, transient, and short circuit protection on all inputs and outputs.
 2. AC couple, or optically isolate bus connected devices so that any single device failure will not disrupt or halt bus communication.
- D. Provide Modem telephone software for equipment used for point-to-point (PTP) applications for all dialup telephone connections as specified.
- E. Provide Radio Frequency (RF) software-for remote (WAN) site communications applications as specified.
- F. Provide Internet Protocol Access (IP) software for Internet access for remote (WAN) site communications applications as specified.

2.08 OPERATOR INTERFACE SOFTWARE

- A. Operator station software shall include as a minimum the Operating System (OS), Data Base Manager, Communications Control, Operator Interface (OI), Trend and History Files, Report Generator, Support Utilities, Scheduler and Time and Event Support Programs.
- B. Provide a hierarchical linked dynamic graphic operator interface for accessing and displaying system data and commanding and modifying equipment operation. The interface shall utilize a mouse, pull-down menus, dialog boxes, zoom, coloration and animation to facilitate operator understanding of the system. A minimum of 20 levels of graphic penetration shall be provided with

the hierarchy operator assignable (for example, area, building, wing, floor, air handler, sequence of operation pages, dynamic program display, point group). Dynamic system data points shall be assignable to each penetration level. Descriptors for graphics, points, alarms, etc. shall be modified through the operator's station under password control.

1. Operator access to the system is to be under password and personal ID control. Operators shall be able to access data from any operator's station in the system by entry of proper password and ID. Sign off from an operator's station shall be a manual operation. If no mouse or keyboard activity takes place, within an assignable time period an automatic Sign Off shall occur. All sign on/sign off activity is to be recorded on the system printer.

C. A graphics mode of operation shall be provided allowing full color displays of building floor plan, HVAC system, equipment, hot water and chilled water system configuration.

1. All graphic displays shall be online programmable via keyboard, trackball, or mouse selection of graphic library stored symbols and system profiles. Provide, in addition, the capability to create custom symbols, system profiles, floor plans, etc. and to store them in the graphics library.
2. Penetration within a graphic hierarchy shall display each graphic name as graphics are selected to facilitate operator understanding. A backtrack shall permit the operator to move upward in the hierarchy by mouse click on the backtrack. The backtrack shall show at least the previous 4 penetration levels. The operator shall be provided the option of showing each graphic full screen size with the backtrack as the horizontal header or by showing a stack of graphics, each with a backtrack.
3. All operator accessed data shall be displayed on the color monitor. The operator shall select further penetration via mouse click on an area, building, floor, fan, etc. The defined linked graphic below that selection shall then be displayed. Dynamic data shall be assignable to any and all graphics.
4. The operator shall be provided with means to directly access any graphic or any point without going through the penetration path.
 - a. Direct access to graphics shall be menu selectable wherein the operator may optionally enter the name of the graphic system desired or select the desired graphic via cursor positioning on a scroll bar listing of all graphics or may be selected via keyboard entry.
5. Points (physical and pseudo) shall be displayed with dynamic data provided by the system with appropriate text descriptors, status or value, and engineering unit. Coloration shall be used to denote status and alarm states. Coloration conventions shall be variable for each class of points. In addition, there shall be clear indication of latest status (e.g., fan rotation, damper position, fluid flow, etc.) where specified. All points shall be dynamic with update rates user adjustable on a per point basis from 20 seconds to 120 seconds depending upon the process dynamics.
6. For operators with the appropriate privilege(s), points shall be commanded directly from the color monitor via mouse selection. For a digital command point such as a state (e.g., CLOSED) and the operator

could select OPEN via mouse click. For most operations, a keyboard equivalent shall be available for those operators with that preference. Upon selection of analog commandable points (such as discharge air static pressure), a dialog box shall appear containing the following:

- a. The decimal value of the set point with adjacent up-down arrows.
 - b. The operator shall be afforded three methods of analog commanding from which to choose as follows:
 - 1) Click the cursor on the decimal set point value, and enter a new set point value via the keyboard decimal keypad.
 - 2) Drive the decimal value up or down via the up-down arrows.
 - 3) “Drag” the set point arrow up or down by moving the cursor to the desired position and clicking.
 - c. The bar chart shall also have an associated colored scale showing the current position (scaled value) of the alarm limits.
7. An operator shall be permitted to split or resize the viewing screen to show one graphic on the left half of the screen and another graphic, spreadsheet, bar chart, word processing, curve plot, etc., on the right half screen, to allow real time monitoring of one part of the system while displaying other parts of the system or data from the system to facilitate system operation.
 8. An on-line context-sensitive “help” utility shall be provided to facilitate operator training and understanding. The document shall contain text and graphics to clarify system operation. At a minimum, help shall be available for every menu item and dialog box.
 9. Sample graphics are appended to the end of this Section.
- D. Site Specific Customizing Software:
1. Provide all hardware and software required for complete system programming including system schematic development, I/O hardware point definition, hardware, and software text point descriptors, DDC algorithmic development, a controller software loading utility, and a live programming test facility. Color conventions shall be used throughout to support ready recognition of inputs, outputs, plant heating/cooling devices, control function modules, etc. Provide all hardware and software required for the modification of existing graphics and for the construction of new graphics.
 2. Provide software which will allow the user to modify and tailor the DDC system to the specific and unique requirements of the equipment installed, the programs implemented, and to staffing and operational practices. Online modification of system configuration, program parameters, and data base shall be provided via menu selection and keyboard entry of data into preformatted self-prompting templates. As a minimum, the following modification capability shall be provided.
 - a. Operator assignment capability shall include designation of operator passwords, privilege(s), starting graphic and auto sign off duration.
 - b. Peripheral assignment capability shall include assignment of segregation groups to consoles and printers, and designation of backup printers.

- c. System configuration/diagnostic capability shall include communications and peripheral port assignments, DCP enable/disable, assignment of command trace to points and initiation of diagnostics.
 - d. System text add/change capability shall include action messages for alarms and run time, and trouble condition messages.
 - e. Time/Schedule change capability shall include time/date set, time/occupancy schedules, holiday schedules, and daylight savings time schedules. All time and calendar scheduling and schedule modification shall be accomplished graphically via color bars and calendars in a hardware independent manner.
 - f. Points shall be uniquely defined as to coloration, animation (when used), flashing rate and duration, audible rate, and duration, point descriptors, operator messages (480 characters minimum), printer options, alarm archival option, alarm and warning limits, and engineering units. All messages specified and all physical and pseudo point descriptors shall be entered by the Company producing the system.
 - g. Point related change capability shall include system/point enable/disable; run time enable/disable; assignment of points to point classes, analog value offset, lockout, run time limits, and setting a fixed input value or output status.
 - h. All adjustable setpoints shall be resettable from a graphic.
- E. Alarm handler software shall respond to alarm conditions sensed and transmitted from DCPs and TECs. First in, first out handling of alarms in accordance with alarm priority ranking is required with buffer storage for a minimum of 20 alarms in case of simultaneous multiple alarms. Alarm handler shall be active in both the Signed On and Signed Off modes to assure that alarm will be processed even though and operator is not currently signed on.
- 1. Alarms shall be displayed in a dialog box of the color monitor. Display shall include as a minimum:
 - a. Indication of alarm condition, i.e., ABNORMAL Off, HI ALARM/LO ALARM, analog value or status, and English point identification.
 - b. A unique per point alarm action message, i.e., “The fan has shutdown due to an excessively high discharge duct pressure, There is a strong indication of a system malfunction such as an inlet vane drive failure, or major fire damper closure. The switch should not be manually reset until a thorough check of the cause is conducted” of up to 480 characters.
 - 2. Alarms are to be directed to appropriate operators, operator stations, and printers for segregation assignments as specified in previous sections of this specification.
 - 3. Alarm silencing shall be by selecting the “silence” button or by authorized operator’s acknowledgment. In all cases, alarm acknowledgment shall only be allowed by operators authorized to acknowledge a point in alarm.

4. Each point shall be assigned to an alarm class, with no limit to the quantity of alarm classes. Each alarm class shall be uniquely assignable to any combination of the following alarm processing attributes:
 - a. Audible beep duration: none, 10 seconds, 20 seconds, continuous.
 - b. Audible beep rate (slow-medium-fast).
 - c. Alarm historically archived (yes or no).
 - d. Alarm printed, with printer ID.
 - e. Associated coloration with any of 256 colors with separate brightness control, assignable to each alarm state (high alarm, etc.) and similarly be distinguished with different colors for each possible state.
 5. Alarms shall be displayed and/or printed at each peripheral to which its segregation allows, but only those operators having proper privilege level will be allowed to acknowledge alarms.
 6. An unacknowledged alarm indicator shall be provided on the color monitor display to alert the operator that there are unacknowledged alarms in the system.
 7. Symbols for points in a graphic display that are in an unacknowledged alarm state shall flash red; when in an acknowledged state, the symbol shall be non-flashing-red.
 8. Run time limit messages shall be presented and processed as alarm messages except the action message shall be of a maintenance directive nature.
- F. Standard reports shall be provided which shall be operator selectable to appear on the operator station, any selected printer or both. A “terminate report” command shall be available to allow the operator to stop any report in the process of being printed. In the event of failure of any printer, subsequent reports directed to that printer shall be automatically redirected to an operator preassigned backup printer dedicated at the operator station. The following standard pre-formatted reports shall include:
1. Point summary reports may be requested at any penetration level (building, area, system) and shall include only points at and below that level. Point summary reports shall include the current value/status and condition, English system and point descriptors for all points. Point summary reports shall be selectable for all points, only those points in alarm, fixed points, disabled points, locked out points, locked out and in alarm points, analog input or output points, digital input or output points. All reports shall be capable of being scheduled to run at a specific time and/or interval via an operator function supported by necessary data entry templates and interactive prompts.
 2. Dynamic trends shall show real time activity of the associated points. This information shall be printed and/or displayed in numeric, bar chart, curve plot, pie chart, etc., as selected by the operator. Graphic plots shall allow a unique color for each point. As new point values are sampled, they shall be processed, scaled, and dynamically appended to any plot being displayed. Sample interval of points selected for dynamic trend shall be user selectable from five seconds to sixty minutes.
 3. Alarm and run time reports shall be automatically issued to assigned printers immediately upon occurrence, and shall consist of the point

- descriptor, the status or value of the point with engineering unit, the time and date, and an action taking alarm message.
4. The user shall be provided with a command trace feature selectable on a per point basis allowing the archiving of all commands issued to each point. The archived trace shall include the command, the command source, the point ID, and the time and date. Command trace reports shall be output upon operator demand.
 5. A custom report capability shall be provided to allow the user to format reports of any mix of text, points with status/value and descriptors, and points with status/value only. Custom reports may be scheduled or requested manually. A spreadsheet program similar to Microsoft Excel shall be provided fully integrated with the DDC system data base, and available to the user. Spreadsheet packages which require offline execution or manual translation of data files from one program format to another are not acceptable.
- G. Trend reports shall allow the operator to randomly select logical arrays of points to be recorded at selectable time intervals.
1. Trend point archival - Each DCP trend point system (hardware and software) shall be assignable to PC archive files at user definable time intervals. Trend data sample resolution shall be a minimum of one degree or one percent of the points range, whichever is smaller. Each point trend file shall have a user assignable selectable archive duration of a day, a week, a month, or a year. For any duration period selected, the file shall retain one full duration period while it collects another (i.e., after collecting data for May, May is retained in total as June data is accumulated).
 2. Trend display points shall be subsequently printed/ displayed individually or in logical groups of up to any eight points in any group. Points may be assignable to multiple trend groups. The system shall have up to 500 trend groups which may be predetermined by the user for a unique set of logical points and display characteristics.
 - a. Single Point Displays: Single point trend reports shall be displayable by selecting the desired point from any system graphic upon which it is displayed or by entering its keyname. Display characteristics shall be user predeterminable for any desired display range (X-Axis period) and any desired data manipulation within the selected range.
 - b. Template-selectable display range options shall be “current”, “previous”, or “date range” with range and appropriate data intervals. “Current” ranges shall be time periods of one hour, two hours, etc., up to one year. Starting at the beginning of the range (i.e., a display of the “current” month shall start at 00:01AM the first day of the month and display selected values up to the present time). Data intervals within the selected ranges shall be selectable from ten seconds to one month, dependent upon the sample intervals. The X-Axis resolution shall accommodate up to 100 data values. “Previous” ranges shall be similar to current ranges, except that a full “range” of data (such as a full seven days of data for the past week, up to the Present time) shall be provided. Selectable range, data intervals, and X-

Axis resolution shall be as specified for the “current” display range. “Date range” selection shall provide templated for the entry of year, month, date, hour, and minute for the beginning and the end of X-Axis data. Selectable data intervals and X-Axis resolution shall be as specified for the “current” range.

- c. Data Manipulation: Within the selected X-Axis intervals of the selected A-Axis range of data, data manipulation options shall be template selectable as the actual, last, highest, lowest, or average of the actual data samples within each interval. For example, for data sampled every five minutes one might select the highest value within every two hours for the past week. From that display, noting the two-hour period with the peak value, the operator may subsequently request a display of actual values every five minutes for the related two-hour period.
 - d. Point Group Displays: Point group displays shall be set-up by selecting each point desired to be displayed in a logical trend group and either setting up a new group with appropriate group name (such as AHU RETURN AIR TEMPS) or selecting an existing group from a drop-down menu. Group displays shall then be initiated by selecting a top-level menu-bar option trend and selecting a trend group from a subsequent drop-down menu. From this point, template selectable display options shall be as specified for single point displays (i.e., current, previous, date range, actual, highest, lowest, average).
3. Trend Presentation Options: After defining a desired trend display as above, selectable presentation options of display, print, or spreadsheet shall be available.
- a. Display: Selecting “Print” shall initiate an immediate printout of the same data values used to construct the above curve plot. Print format shall include a header with a time column and eight eight-digit value columns of data. The appropriate engineering unit shall be at the head of each column. The print header shall include a column point descriptor legend and an English description of the trend display set-up options as specified for the “display” option.
 - b. Spreadsheet: Selecting the spreadsheet option shall present the display values (after data manipulation) in a spreadsheet (Microsoft Excel) format. From this screen, the user may edit the values to correct problems (missing data, failed sensors, errors). After editing, display or print options specified above may be executed, or any other standard spreadsheet data manipulation options may be exercised.

2.09 DATA AND CONTROL (D/C) SUMMARY

- A. Each analog point shall have unique DCP and TEC resident dual high and dual low limit alarm thresholds set in engineering units. Where specified, floating (a band above and below a set point) alarm limits shall be provided.

- B. Each digital output shall have a software-associated monitored input. Any time the monitored input does not track its associated command output within a programmable time interval, a “command failed” alarm shall be reported.
- C. Where calculated points (such as CFM) are shown, they shall appear in their respective logical groups. The respective unconditioned raw data (such as logarithmic differential pressure) points shall also be grouped into a special group for display and observation independent of the logical groups.

2.10 VARIABLE SPEED FAN CONTROL

- A. Temperature Transmitter: Selectable span to meet the individual application requirements.
- B. Optical Loop Isolator: To provide protection against RFI and signal line spike interference.
- C. Power Supply: 120 V ac to a maximum of 35 V dc while supplying the current necessary for the transmitter, receiver, and indicator.
- D. Receiver Controller: Input of 4 to 20 mA, adjustable output zero and span; proportional direct or reverse acting output of a signal level and type as required as an input to the fan speed controller; grounded or ungrounded output as needed by the drive, capable of PID control.
- E. Signal Selection: Low signal discrimination so that the drive is operated from the point in the hydronic system with the greatest offset below the set point temperature.
- F. Indication: The temperature at each transmitter shall be indicated at the receiver controller.
- G. Operation: Each noted point in the system shall have a receiver controller and a separate set point. The fan drive, speed, shall be automatically adjusted to maintain the temperature to satisfy the controlling set point. The speed of the drive shall ramp in the direction of large changes and shall soft start the fan.
- H. Signal Wire ,20 gauge shielded twisted pair: Provide signal wire as recommended by the Company producing the system. Soft ground the wire shield.

2.11 VARIABLE SPEED PUMP CONTROL

- A. Differential Pressure Transmitter: Selectable span to meet the individual application requirements, approximately 30-pound minimum span; 500 pound operating system pressure; wetted materials to be brass and beryllium copper; 4 - 20 mA transmission signal capable of operating with a loop resistance up to 1100 ohms.
- B. Optical Loop Isolator: To provide protection against RFI and signal line spike interference.

- C. Power Supply: 120 V ac to a maximum of 35 V dc while supplying the current necessary for the transmitter, receiver, and indicator.
- D. Bypass Block: A 3 valve manifold for the transmitter to include 2 shut-off valves and 1 by-pass valve.
- E. Receiver Controller: Input of 4 to 20 mA, adjustable output zero and span; proportional direct or reverse acting output of a signal level and type as required as an input to the pump speed controller; grounded or ungrounded output as needed by the drive, capable of PID control.
- F. Signal Selection: Low signal discrimination so that the drive is operated from the point in the hydronic system with the greatest offset below the set point differential pressure.
- G. Indication: The differential pressure at each transmitter shall be indicated at the receiver controller.
- H. Operation: Each noted point in the hydronic system shall have a receiver controller and a separate set point. The pump drive, speed, shall be automatically adjusted to maintain the differential pressure to satisfy the controlling set point. The speed of the drive shall ramp in the direction of large changes and shall soft start the pump.
- I. Signal Wire, 20 gage shielded twisted pair: Provide signal wire as recommended by the Company producing the system. Soft ground the wire shield.

2.12 MISCELLANEOUS ELECTRIC/ELECTRONIC AND MECHANICAL DEVICES

- A. Input/output sensors and devices shall be closely matched to the requirements of the DCP for accurate, response, noise free signal input/output. Control input response shall be high sensitivity and matched to the loop gain requirements for precise and responsive control.
 - 1. In no case shall computer inputs be derived from pneumatic sensors or thermocouples.
- B. All electric switch devices shall be selected for the applied load and UL listed for the application.
- C. All aquastats shall be provided with a separable copper, monel or stainless steel well.
- D. Provide NEMA 1 enclosures for all switching devices.
- E. Unless otherwise specified or indicated, the following features are required for the equipment specified:
 - 1. Control valves shall be 125 or 150 lb. class. Valves shall have stainless-steel stems and spring-loaded Teflon packing with replaceable discs.
 - a. All modulating straight-through water valves shall be furnished with equal-percentage contoured throttling plugs. Valves shall

- be sized for a pressure drop equal to the coil they serve but not less than 4 psi. Size chilled water and heating hot water control valves, for a 4 psig drop, unless otherwise noted on drawings.
- b. All modulating steam valves shall have linear characteristic for 90 percent of the closing stroke and equal percentage for the final 10 percent. Size low pressure steam valves for a 10 psig inlet pressure and a pressure drop of 8 psig, unless otherwise noted on drawings. On low pressure steam systems, when load exceeds the capacity of 2-1/2" valve, provide two valves each controlling 50 percent of load.
2. Safety low limit shall be manual reset twenty-foot limited fill type responsive to the coolest section of its length.
 3. Temperature sensors shall be Resistance Temperature Detector (RTD) type with 500 ohm balco, 100 or 3000 ohm platinum.
 - a. Resistance shall be 100 ohms at 32 degree F with a minimum accuracy of 0.5 degree F through the range of 32 degree F to 212 degree F.
 - b. Space temperature sensors shall be provided with vandal resistant type locking covers.
 - c. Duct temperature sensors shall be averaging type elements for sensing mixed air temperatures in ductwork, with sufficient length or sufficient number of elements, so as to efficiently measure the air temperature through the entire cross section of duct.
 - d. Water temperature sensors shall be provided with a separable copper, monel or stainless steel well.
 - e. Outside air wall mounted sensors shall be provided with a sun shield.
 4. Thermistors:
 - a. Precision thermistors may be used in temperature sensing applications below 200 degrees F, as identified on the project drawings or where allowed in this specification.
 - b. Sensor accuracy over the application range shall be 0.36 degrees F or less between the range of 32 degrees F to 150 degrees F. Sensor manufacturer shall utilize 100 percent screening to verify accuracy. Thermistors shall be pre-aged, and inherently stable. Stability error of the thermistor over five years shall not exceed 0.25 degrees F cumulative.
 - c. Sensor element and leads shall be encapsulated. Bead thermistors shall not be allowed. A/D conversion resolution error shall be kept to 0.1 degrees F. Total error for a thermistor circuit shall not exceed 0.5 degrees F, which includes sensor error and Control Unit A/D conversion resolution error.
 - d. Provide thermistor and Control Unit manufacturer documentation including Contractor's engineering calculations, which support the proposed thermistor input circuit will have a total error of 0.5 degrees F or less.
 5. Water flow analog sensors shall be provided complete with flow element and shall be an all solid state precision industrial type with stainless steel meter body, maximum error of no more than 1-1/2 percent of span, at flow rates between 1 and 30 FPS and 4 to 20 mA output. Sensor shall be

- rated for 250 psi minimum. Sensor shall be replaceable while leaving piping in service at normal operating pressure.
6. Differential and Static Pressure Sensors and Switches:
 - a. Air flow and static pressure analog sensors shall be high accuracy suitable for the low velocity pressures to be encountered, be selected for approximately 50 percent over range, and have a 4 to 20 mA output. These differential pressure sensors shall be connected to the air flow measuring station with valved lines for testing and calibration and shall have adjustments for zero and span.
 - b. Pressure Transducer: All pressure transducers for sensing static pressure in ductwork shall be of the electronic type and provide an output signal of zero to ten volts DC, two to ten volts DC, or four to twenty milliamps. All transducers shall provide an accuracy of 2 percent of full scale or better, a repeatability of 0.5 percent of full scale or better, and a hysteresis of 1 percent or less. The effect of ambient temperature variations shall be less than 2 percent of full scale for ambient temperature changes from 10 degrees C to 40 degrees C (50 degrees F to 104 degrees F). The effects of variation in line voltage shall be less than 1 percent of full scale for voltage changes corresponding to 10 percent of the nominal line voltage. The span of each transducer shall be as indicated on the drawings. Each transducer shall have a zero and span adjustment.
 7. Air Flow Measuring Station:
 - a. Type: Permanent, in-place, direct reading velocity and static pressure measuring station; Model FMS-W by Cambridge Air Sentinel Products, Syracuse, NY.
 - b. Casing:
 - 1) 16 gage galvanized steel construction for installation in galvanized steel duct.
 - 2) 16 gage stainless steel for installation in stainless steel duct.
 - c. Sensors: One piece leak-free type of non-lifting airfoil configuration with copper collectors.
 - 1) Interconnecting Tubing: Internal to unit with exception of one total pressure and one static pressure connection.
 - 2) Total and Static Sensing Ports: Positioned in extruded sensor on equal area basis in accordance with ASHRAE pilot tube traverse guidelines.
 - a) Units with Face Area Less than 4 sq ft: Maximum of 16 sq in per total pressure port and 48 sq in per static pressure port.
 - b) Units with Face Areas 4 Sq Ft and Larger: Maximum of 36 sq in per total sensor port and not exceeding 64 ports.
 - c) Interconnected extruded sensors and collectors shall average and relate each type of pressure measurement into one total pressure and one static pressure metering port.

- d. Design Data:
 - 1) Maximum Resistance to Air Flow: 12 percent of velocity head at any given air flow.
 - 2) Maximum Temperature: 220 degrees F continuous operation with intermittent exposure up to 250 degrees F.
- 8. Air Flow Sensor: IAQ Enforcer, by EBTRON Inc., 1663 Hwy. 701 South, Lork, SC 29569.
 - a. IAQ Enforcer Central Processing Panel.
 - 1) Electronics: Microprocessor Based, totally solid state.
 - 2) Display: Back lighted 80 Character, multi-line, alpha numeric.
 - 3) Keyboard: Sixteen key.
 - 4) Satellite Sensor Inputs: 4 Satellite Sensor Ports.
 - a) Satellite per panel: 28 maximum.
 - 5) I/O: 12 Plug-in Cards.
 - a) Analog output: 0-5 or 0-10 VDC, 4-20 mA, 0.01 percent F.S. resolutions.
 - 6) Power Requirement: 24 VAC, isolated from other devices and not grounded. Multiple IAQ Enforcer Panels wired from a single transformer must be in phase.
 - 7) Dataloger: Outside Air Flow Rates.
 - a) Reading: 4096 events.
 - b) Frequency of events: Use programmable.
 - c) Download Method: RS 232 with factory provided software.
 - 8) Panel Operating Ranges:
 - a) Temperature: 45 degrees F to 120 degrees F.
 - b) Humidity: 0-95percent RH.
 - 9) User Programmable Options:
 - a) User selectable scaling and display output.
 - b) Multi-point recalibration routine.
 - 10) Diagnostics: Complete sensor hardware.
 - 11) Power Loss Protection:
 - a) Program Memory: EEPROM.
 - b) Log: Lithium Battery.
 - 12) Electronic Enclosure:
 - a) Powder Coated Steel, Indoor Use Only.
 - b. Air Flow and Temperature Measurement: Thermal anemometer using instrument grade self-heated thermistor sensors with thermistor temperature sensors. Flow measurement drift shall not exceed Manufacturers repeatability statement for the life of the equipment. Vortex shedding arrays are not acceptable. Pitot tube and differential pressure sensing arrays are not acceptable. Auto zeroing sensors are not acceptable.
 - 1) Flow Station Construction
 - a) Type: Duct Mounted.
 - b) Sensor: Glass excapsulated self-heated thermistor and epoxy encapsulated temperature sensor.
 - c) Sensor Housing: Noryl standard.

- d) Sensors per satellite probe: 1 to 8.
- e) Support Struts: Tubular aluminum 6061 standard.
- f) Supporting Bracket: Aluminum 6063 standard.
- 2) Electronics:
 - a) Type: Microprocessor Based, totally solid state, industrial grade integrated circuits.
 - b) Electrical Connections Electronics to IAQ Enforcer Panel: 3 conductor, 22 AWG.
 - c) Enclosure: Aluminum.
- 3) Performance:
 - a) Electronics temperature range: -20 degrees F to 160 degrees F.
 - b) Flow station temperature range: -20 degrees F to 160 degrees F.
 - c) Flow station velocity range: 0 to 5000 ft/min.
 - d) Flow station pressure drop: less than 0.005 inch wg at 2000 ft/min.
 - e) Flow station humidity range: 0 to 99 percent RH (non-condensing).
 - f) Digital Output Signals to IAQ Enforcer:
 - (1) Sensor velocity accuracy: +/- 10 ft/min. >500 ft/min., +/- 2 percent reading <500 ft/min.
 - (2) Sensor temperature accuracy: typical 0.18 degrees F, max. 0.36 degrees F.
 - (3) Repeatability, +/- 0.2 percent scale.
- c. Ebtron Series- P Duct Mounted Satellite Sensor:
 - 1) Flow Station Construction:
 - a) Type: Duct Mounted.
 - b) Sensors: Glass encapsulated self-heated thermistor and epoxy encapsulated temperature sensor.
 - c) Sensor Housing: Noryl standard.
 - d) Sensor per satellite probe: 1 to 8.
 - e) Support Struts: Tubular aluminum 6061 standard.
 - f) Supporting Bracket: Aluminum 5052 standard.
 - g) Connecting Cable: Plenum Rated PVC. UL Standard 13, Type CL2P with twist lock connector to remote electronic panel.
 - 2) Electronics:
 - a) Type: Microprocessor Based, totally solid state, industrial grade integrated circuits.
 - b) Electrical Connections Electronics to IAQ Enforcer Panel: 3 conductor, 22 AWG.
 - c) Enclosure: Aluminum.
 - 3) Performance:
 - a) Electronics temperature range: -20 degrees F to 160 degrees F.

- b) Flow station temperature range: -20 degrees F to 160 degrees F.
 - c) Flow station velocity range: 0 to 5000 ft./min.
 - d) Flow station pressure drop: less than 0.005 inches wg at 2000 ft./min.
 - e) Flow station humidity range: 0 to 99 percent RH (non-condensing).
 - f) Digital Output Signals to IAQ Enforcer:
 - (1) Sensor velocity accuracy: +/- 10ft./min. >500 ft./min, +/- 2 percent reading <500 ft./min.
 - (2) Sensor temperature accuracy: typical 0.18 degree F, max. 0.36 degree F.
 - (3) Repeatability: +/- 0.2 percent scale.
- d. Ebtron Series-Fan Inlet Satellite Sensor.
- 1) Flow Station Construction:
 - a) Type: Fan Inlet.
 - b) Sensors: Glass encapsulated self-heated thermistor and epoxy encapsulated temperature sensor.
 - c) Sensor Housing: Nylon.
 - d) Sensors per inlet: 2 sensors.
 - e) Support Struts: Steel, adjustable to fit inlet.
 - f) Supporting Bracket: Nylon.
 - 2) Electronics:
 - a) Type: Microprocessor Based, totally solid state, industrial grade integrated circuits.
 - b) Connecting Cable Flow Sensor to Electronics: Plenum Rated, NEC Type CL2P.
 - c) Electrical Connections Electronics to IAQ Enforcer Panel: 3 conductor, 22 AWG.
 - d) Enclosure: Aluminum.
 - 3) Performance:
 - a) Electronics temperature range: -20 degrees F to 160 degrees F.
 - b) Flow station temperature range: - 20 degrees F to 160 degrees F.
 - c) Flow station velocity range: 0 to 10,000 ft. min
 - d) Flow station humidity range: 0 to 99 percent RH noncondensing.
 - e) Digital Output Signal to IAQ Enforcer:
 - (1) Sensor velocity accuracy: +/- 10 ft./min. >500 ft. min., +/-2 percent reading <500 ft./min.
 - (2) Sensor temperature accuracy: typical 0.18 degree F, max. 0.36 degree F.
 - (3) Repeatability: +/- 0.2 percent scale.
9. Temperature or humidity control equipment with sensing elements or probes for insertion in insulated equipment or insulated ductwork: Provide flanges or sockets of the extension neck type, so as to finish flush with final insulated surface.

10. Flow Sensor for Water and Steam:
 - a. Type: Model DNT (1/2 inch to 2 inch sizes) and Model DCR (2 inch to 24 inch sizes) by Dieterich Standard Corp., Boulder, CO.
 - b. Features:
 - 1) Diamond cross sectional shaped sensing tube which causes flow separation to occur at a fixed point independent of flow rate, pressure or temperature, resulting in stable flow coefficient over a wide range of Reynolds numbers.
 - 2) Each flow sensing unit complete with blow out proof mounting hardware, instrument shutoff valves and connections for electronic transmitter.
 - 3) Nameplate: Permanently attached to flow sensor indicating design flow rate, meter reading for design flow rate, metered fluid, line size, and station number or location.
 - 4) Construction: Rated up to 600 psi ANSI equivalent (1440 psig at 100 degrees F) with type 316L stainless steel sensing element and mounting coupling constructed of material compatible with piping.
 - 5) Accuracy: Flow element shall be within +1 percent of actual flow rate over a minimum flow turndown of 10:1. The bi-directional primary sensing device shall be accurate to within +1 percent.
 - 6) Repeatability: +0.1 percent of actual valve over flow range.
 - 7) Differential Pressure Transmitter: Model FCX by ITT Barton.
 - a) Consists of silicone based variable capacitance sensor, Type 316 stainless steel body, Hastelloy C isolation diaphragm, silicone fill fluid, and NEMA 4X enclosure with local digital indication in engineering units.
 - b) Provides 4 - 20 mA outlet signal and capable of minimum 20:1 turndown with accuracy of +0.1 percent of calibrated span up to 10:1 turndown, including combined effects of linearity, hysteresis, and repeatability.
 - c) Power Supply: 11 - 45 Vdc two wire.
11. Current Sensor for Fan or Pump:
 - a. Unit Status: Solid-State Status Sensor.
 - 1) Output rating: 0.2 A at 30 Vdc.
 - 2) Input rating: 0 to 135 ampere continuous.
 - 3) Sensor supply current induced from monitored conductor. Minimum conductor current required 1A. Maximum rating 135.
 - 4) Isolation: 600 Vac RMS.
 - 5) Trip set-point: Adjustable to +1 percent.
 - 6) Temperature range: -15 degrees C to 85 degrees C.
 - 7) Humidity range: 0 to 95 percent non-condensing.

- b. Motor Amperage: Analog Current Sensor.
 - 1) Sensor Output rating: 0 to 5 Vdc.
 - 2) Monitor amperage 0 to 60 ampere continuous.
 - 3) Sensor supply current induced from monitored conductor.
 - 4) Isolation: 600 Vac RMS.
 - 5) Span: 0 to 10 ampere min., maximum 0 to 60 amperes.
 - 6) Accuracy: 2 percent, all scales, when current greater than 10 percent of scale.
 - 7) Humidity range: 0 to 95 percent non-condensing.
- 12. Humidity Sensor: Model 534636 by Landis and Staefa, Inc.

2.13 AUTOMATICALLY OPERATED DAMPERS

- A. Dampers:
 - 1. Size dampers for linear flow output, with a maximum damper leakage of 30 cfm per square foot of projected area at 3 inch static pressure.
 - 2. Provide dampers and seals suitable for service from -40 degrees F to 200 degrees F, with closed cell neoprene edging seals, spring-loaded stainless steel side seals and adjustable baffles for full size adjustment.
 - 3. Provide dampers in 2 inch size increments from 8 inches horizontal and vertical to 48 inches. For requirements over 48 inches in size provide standard modules with interconnecting hardware.
 - 4. Dampers shall be of the multiple interlocking V-grooved blade type with nylon or oil impregnated bronze bearings, zinc plated steel shafts and hardware with a corrosion resistant finish. Provide blades a maximum of 8 inches in width with the overall construction designed to prevent leakage in the closed position, complete with solid stops.
 - 5. Fabricate frames in steel ductwork from No. 13 USS gage galvanized steel and blades of No. 16 USS gage galvanized steel, with a factory baked black enamel finish.
 - 6. Fabricate frames in aluminum ductwork from No. 14 B & S gage extruded aluminum and blades of No. 14 B & S gage aluminum.
 - 7. Proportional control dampers shall be rated by the manufacturer as suitable for use at 3000 fpm face velocity.
 - 8. Equipped with required type of actuator, pneumatic or electric/electronic.

2.14 ACTUATORS

- A. Type: All actuators shall be electric/electronic.
 - 1. VAV box damper electronic actuators and stepdown transformers shall be provided by the Controls Allowance
 - 2. Controls Allowance shall provide controllers suitable for control of pneumatic VAV damper actuators.
- B. Actuators shall be factory selected, mounted, and tested for proper operation based on unit size, type, and torque requirements.

- C. Electric/Electronic Actuators:
 - 1. Damper Actuators:
 - a. Electric/Electronic, positive positioning, spring return, sized to stroke damper smoothly throughout its range.
 - 1) All outdoor air dampers shall fail closed upon electric power loss.
 - b. Actuator response shall be linear in response to sensed load.
 - c. Voltage to suit system voltage.
 - 2. Valve Actuators:
 - a. Electric/Electronic, positive positioning to suit valve body and service.
 - b. Fully proportional, spring return for normally open or normally closed operation as required.
 - 1) All heating valves to fail open upon electric power loss.
 - 2) All cooling valves to fail closed upon electric power loss.
 - 3) All secondary water valves to fail open upon electric power loss.
 - c. Voltage to suit system voltage.

- D. Pneumatic Actuators: Pneumatic actuators shall be sized to operate their appropriate loads with sufficient reserve power to provide smooth modulating action and tight close off.
 - 1. Provide actuators with pilot positioners for modulating damper operators and temperature control valves in steam piping and for hot water and chilled water control valves 1-1/2 inch and larger.
 - 2. For control of pneumatic valve or damper operators, the voltage output of each controller shall be converted to a proportional pneumatic signal with an electronic-to-pneumatic transducer.
 - a. The voltage input of the transducer shall match the output voltage range of the controller and the pneumatic output of the transducer shall be sufficient to provide full operation of the pneumatic operator.
 - b. All transducers shall provide a conversion accuracy of 5 percent of full scale or better, a linearity of 2 percent of full scale or better, and a hysteresis of 1 percent of full scale or less.
 - c. The output shall change less than 5 percent for changes in air supply pressure from 18 psig to 30 psig.
 - d. The output shall change less than 5 percent of full scale for changes in ambient temperature from 10 to 40 degrees C (50 to 104 degrees F).

2.15 AIR PIPING

- A. Copper: Seamless copper tubing, with copper or brass solder fittings and Type 1 solder.

- B. Non-metallic: Virgin polyethylene tubing, conforming to ASTM Type 1, Grade 5, Class B or C meeting stress crack test in accordance with ASTM D 1693 - 60T. Individual air tubes in multi-tube instrument tubing harnesses shall conform to the above, complete with a Mylar barrier and a solid vinyl outer

jacket a minimum of .062" thick. Fittings shall be brass, aluminum or delrin, of the compression or barb push-on type, designed for instrument service.

2.16 MARKERS AND NAMEPLATES

- A. Markers: Premarked self-adhesive; W.H. Brady Co.'s B940, Thomas and Betts Co.'s E-Z Code WSL self-laminating, Ideal Industries' Mylar/Cloth wire markers, or Markwick Corp.'s permanent wire markers.
- B. Nameplates: Precision engrave letters and numbers with uniform margins, character size minimum 3/16 inch high.
 - 1. Phenolic: Two color laminated engraver's stock, 1/16 inch minimum thickness, machine engraved to expose inner core color (white).
 - 2. Aluminum: Standard aluminum alloy plate stock, minimum .032 inches thick, engraved areas enamel filled or background enameled with natural aluminum engraved characters.
 - 3. Materials for Outdoor Applications: As recommended by nameplate manufacturer to suit environmental conditions.

2.17 ACCESSORIES

- A. Include accessories required to perform the functions specified and indicated on the drawings.

2.18 WIRING

- A. See Section 260502.

2.19 THERMOSTAT/TEMPERATURE SENSOR GUARDS

- A. Model TG Series 16 by Shaw Perkins:
 - 1. Cover: Top, front and bottom, 16 gauge perforated steel, 1/8 inch perforations on 3/16 inch centers.
 - 2. Sides and mounting frame: 14 gauge steel.
 - 3. Fastener: 1/4x3/8 inch tamper resistant torx or allen head center post.
 - 4. Finish: Baked enamel finish.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Testing Existing Sub-Systems:
 - 1. Prior to installing the new system, test the existing sub-systems to ascertain their operating condition.
 - 2. Conduct tests that are disruptive to facility personnel after normal working hours as directed.
 - 3. Prepare a written report for the Director's Representative indicating the repairs required, if any, to make the existing sub-systems function properly.

4. Repairs to the existing sub-systems are not included in the Work unless requested by Order on Contract.
- B. Interruptions to Existing Sub-Systems:
1. Maintain the existing sub-systems in their present condition to the extent possible while installing new Work.
 2. Prior to making changes or removals relative to the existing sub-systems, notify the Director's Representative and have procedures approved.

3.02 INSTALLATION

- A. Install system in accordance with the Company's printed instructions unless otherwise indicated.
- B. Install and properly support all ductstats, dial thermometers, thermostat bulbs, temperature, and humidity controllers in the center of duct cross section, in a straight duct run.
- C. Temperature or humidity control equipment installed on insulated surfaces: Provide extension pieces or rigid insulating mounting back plates, of depth as required, so that equipment backs finish flush with final insulated surface.
- D. Identification, Labeling, Marking:
1. Identification of Circuits: Identify wires and cables by system and function in interconnection cabinets, POSs and DCPs to which they connect with premarked, self-adhesive, wraparound type markers. Designations shall correspond with point-to-point wiring diagrams.
 2. Battery Data: Insert a copy of the battery warranty in each battery compartment and mark on batteries the date placed in service.
- E. Air Piping:
1. Conceal air piping wherever possible. Air tubing in Mechanical Equipment, Steam Service, Machine and Boiler Rooms and Penthouse Mechanical Equipment Rooms may be installed exposed. Provide air piping a minimum of 1/4 inch OD.
 2. Install hard temper copper tubing where exposed; concealed piping may be hard temper or soft annealed copper tubing. Run tubing parallel to the building lines. Bend tubing with bending tools. Use copper or brass solder type fittings, with the exception that all connections to apparatus or equipment must be made with compression or flare type fittings.
 3. Support air tubing with all overhead lines run parallel to each other, supported by clevis or trapeze hangers on maximum 5 foot centers.
 4. Periodically test all tubing during the piping installation. Prior to connection blow out all tubing runs to rid system of dust, dirt and moisture, and test entire piping system under 40 lbs. air pressure for 24 hours, during which time pressure shall not drop more than 10 lbs.
 5. Where non-metallic air tubing is used, install in accordance with the following:
 - a. Install flame-resistant UL 94 V-2 flammability classification, multiple polyethylene tubing in flame-resistant protective sheath, or unsheathed polyethylene tubing in rigid metal, intermediate

metal, or electrical metallic tubing conduit for areas where tubing is exposed in Mechanical Equipment, Steam Service Rooms, Penthouse Mechanical Equipment Rooms, Finished Rooms or Finished Spaces. Single, unsheathed, flame-resistant polyethylene tubing may be used where concealed in walls or above ceilings and within control panels. Provide polyethylene tubing only for working pressures of 30 psig or less. Number each tube in sheathing each two feet minimum. Permanently identify unsheathed tubing at each end. Fittings shall be compression or barbed push-on type.

- b. Install hard temper copper tubing for individual terminal runs or for working pressure greater than 30 psig.
 - c. Non-metallic multi-tube tubing harness may be installed in concealed locations such as pipe chases, suspended ceilings or within wall construction. Single tube runs in the above locations must be copper.
 - d. Non-metallic tubing may be installed inside control panels, within enclosures and other similar locations as approved. Number or color code, neatly tie and support tubing. Neatly and securely fasten flexible tubing connections, bridging control cabinet and its panel door, along hinge side of door and protect from abrasion.
- F. Provide at least one DCP for each air handling system and for each mechanical equipment room. Separate discreet DCPs shall be provided to support each major HVAC system. In all cases where primary and back-up systems are specified, a single DCP shall not be used to control both primary and secondary systems. In addition, a single DCP shall not be used to control two or more major HVAC systems (i.e., chillers and heat exchanger controlled by one single panel).

3.03 FIELD QUALITY CONTROL

- A. Preliminary System Test:
 - 1. Preparation: Have the Company Field Advisor adjust the completed system and then operate it long enough to assure that it is performing properly.
 - 2. Run a preliminary test for the purpose of:
 - a. Determining whether the system is in a suitable condition to conduct an acceptance test.
 - b. Checking and adjusting equipment.
 - c. Training facility personnel.
 - 3. Also perform a witnessed validation demonstration consisting of:
 - a. Running each specified report.
 - b. Display and demonstrate each data entry template to show site specific customizing capability. Demonstrate parameter changes.
 - c. Execute menu tree.
 - d. Display graphics, demo update.
 - e. Execute digital and analog commands in English and graphic mode.

- f. Demonstrate freeform address assignments and commands.
 - g. Demonstrate all specified diagnostics.
 - h. Demonstrate DDC loop precision and stability via trend logs of inputs and outputs (6 loops minimum).
 - i. Demonstrate scan, update, and alarm responsiveness.
- B. System Acceptance Test:
- 1. Preparation: Notify the Director's Representative at least 3 working days prior to the test so arrangements can be made to have a Facility Representative witness the test.
 - 2. Make the following tests:
 - a. Test system operational functions step by step as summarized in the detailed description of system operation.
 - b. Test monitor and control devices.
 - c. For Lon Mark System Architectures: Demonstrate that each device meets Functional Profile for each application specified.
 - d. Test all remote devices such as valve and damper actuators to demonstrate full range of motion in the "controllable range".
 - 3. Supply all equipment necessary for system adjustment and testing.
 - 4. Submit written report of test results signed by Company Field Advisor and the Director's Representative. Mount a copy of the written report and in a Plexiglas enclosed frame assembly adjacent to the POS.

3.04 POINT DESCRIPTION, PROGRAM LIST, AND SEQUENCES

- A. General:
- 1. Points listed are the minimum number of points to be provided. Provide additional points as required to satisfy the sequence and operational requirements.
 - 2. Provide spare points. After the system has been completed and tested, the following minimum quantity of spare points shall be available for future connection at each DCP:
 - a. Binary inputs: 2.
 - b. Binary outputs: 2.
 - c. Analog inputs: 1.
 - d. Analog outputs: 1.
 - 3. Provide proportional-integral-derivative algorithms for all control programs.
 - 4. Determine, through operation of the system, proportional bands, interval time, integral periods, adjustment rates, and any other input information required to provide stable operation of the control programs.
 - 5. Where primary and standby pumps are provided, programming shall provide for alternating operation of pumps each time the system starts, and once per month during periods of continuous operation, unless otherwise indicated on Sequences. Provide automatic start-up of standby pump on failure of the pump which has been selected for operation. Failure is the inability to maintain the specified minimum differential pressure for a period of 60 seconds.
 - 6. Provide proof of flow for fans. Fan proof-of-flow switches shall be adjustable set point and differential pressure type. Switches shall be piped to fan discharge except where fans operate at less than one inch

- W.C., they shall be piped across the fan. For fractional horsepower and non-ducted fans, relays or auxiliary contacts may be used. Maximum pressure rating shall be at least 10 inches W.C.
7. Provide proof of flow for pumps. Pump proof-of-flow switches shall be adjustable set point and differential pressure type. For fractional horsepower pumps, relays or auxiliary contacts may be used.
 8. The system-wide outdoor air temperature and outdoor air humidity signals shall each consist of the average of 3 sensors. The sensors shall be located in the fresh air intake serving AHU-2, AHU-6, AHU-7.
 9. The following definitions apply to the letter descriptors used in the point lists:
 - a. RT - Run time of a piece of equipment. This shall be the total operating time since initial start-up of a piece of equipment.
 - b. T - Indicates the point shall be trendable.
 - c. A - Indicates the system shall alarm when the point is outside its range, or upon contact closure or opening.
 10. All alarms shall be trendable. All equipment start/stops shall be trendable.
 11. At a minimum, each sequence and accompanying point list shall be represented by an individual graphic. Each point listed shall appear on the graphic. Where appropriate and approved, multiple sequences and point lists may be combined into a single graphic.
 - a. For analog outputs, display on the graphic the percent of full signal (percent open for valves and dampers, percent of speed for variable speed drives, percent open for vortex dampers, etc.).
 - b. For analog outputs controlled by analog inputs, provide a probe at the graphic to redefine the proportional, integral, and derivative gains.
 - c. Alarm set points and ranges shall be resettable from the graphic. Control set points and ranges shall be resettable from the graphic.
 - d. Where average point values are called for in the sequence, the average value shall be displayed on the graphic. In response to a probe on the graphic, the individual sensor values and sensor locations shall be displayed.
 12. Where dampers operate in conjunction with fan operation, the damper open signal shall precede the fan start signal by 10-15 seconds. The damper close signal shall be delayed 10-15 seconds after the fan stop signal.

**3.05 INTERIOR CORE AIR HANDLING UNITS AND RETURN FANS:
AHU-1 THRU 10, RF-1 THRU 10.**

- A. Run Conditions - Continuous:
 1. The unit shall run continuously.
- B. Emergency Shutdown:
 1. The unit shall shut down and generate an alarm upon receiving an emergency shutdown signal.

- C. Freeze Protection:
 - 1. The unit shall shut down and generate an alarm upon receiving freezestat status.

- D. High Static Shutdown:
 - 1. The unit shall shut down and generate an alarm upon receiving a high static shutdown signal.

- E. Supply Air Smoke Detection:
 - 1. The unit shall shut down and generate an alarm upon receiving a supply air smoke detector status.

- F. Supply Fan:
 - 1. The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.
 - 2. Alarms shall be provided as follows:
 - a. Supply Fan Failure: Commanded on, but the status is off.
 - b. Supply Fan in Hand: Commanded off, but the status is on.
 - c. Supply Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).

- G. Return Fan:
 - 1. The return fan shall run whenever the supply fan runs.
 - 2. Alarms shall be provided as follows:
 - a. Return Fan Failure: Commanded on, but the status is off.
 - b. Return Fan in Hand: Commanded off, but the status is on.
 - c. Return Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).

- H. Heat Recovery Wheel - Constant Speed:
 - 1. The controller shall run the heat recovery wheel for energy recovery as follows.
 - a. Cooling Recovery Mode:
 - 1) The controller shall measure the heat wheel discharge air temperature and run the heat wheel to maintain a setpoint 2°F (adj.) less than the unit supply air temperature setpoint. The heat wheel shall run for cool recovery whenever:
 - a) The unit return air temperature is 5°F (adj.) or more below the outside air temperature.
 - 1) AND the unit is in a cooling mode.
 - 2) AND the economizer (if present) is off.
 - 3) AND the supply fan is on.
 - b. Heating Recovery Mode:
 - 1) The controller shall measure the heat wheel discharge air temperature and run the heat wheel to maintain a

setpoint 2°F (adj.) greater than the unit supply air temperature setpoint. The heat wheel shall run for heat recovery whenever:

- a) The unit return air temperature is 5°F (adj.) or more above the outside air temperature.
 - 1) AND the unit is in a heating mode.
 - 2) AND the economizer (if present) is off.
 - 3) AND the supply fan is on.

I. Periodic Self-Cleaning:

- 1. The heat wheel shall run for 10sec (adj.) every 4hr (adj.) the unit runs.

J. Frost Protection:

- 1. The heat wheel shall run for 10sec (adj.) every 600sec (adj.) whenever:
 - a. Outside air temperature drops below 15°F (adj.) OR the exhaust air temperature drops below 20°F (adj.).
 - b. The heat wheel bypass dampers will open whenever the heat wheel is disabled.
- 2. Alarms shall be provided as follows:
 - a. Heat Wheel Rotation Failure: Commanded on, but the status is off.
 - b. Heat Wheel in Hand: Commanded off, but the status is on.
 - c. Heat Wheel Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).

K. Supply Air Temperature Setpoint - Optimized:

- 1. The controller shall monitor the supply air temperature and shall maintain a supply air temperature setpoint reset based on zone cooling and heating requirements.
- 2. The supply air temperature setpoint shall be reset for cooling based on zone cooling requirements as follows:
 - a. The initial supply air temperature setpoint shall be 55°F (adj.).
 - b. As cooling demand increases, the setpoint shall incrementally reset down to a minimum of 53°F (adj.).
 - c. As cooling demand decreases, the setpoint shall incrementally reset up to a maximum of 72°F (adj.) .
- 3. If more zones need heating than cooling, then the supply air temperature setpoint shall be reset for heating as follows:
 - a. The initial supply air temperature setpoint shall be 82°F (adj.).
 - b. As heating demand increases, the setpoint shall incrementally reset up to a maximum of 85°F (adj.).
 - c. As heating demand decreases, the setpoint shall incrementally reset down to a minimum of 72°F (adj.).

L. Cooling Coil Valve:

- 1. The controller shall measure the supply air temperature and modulate the cooling coil control valve to maintain its cooling setpoint.
- 2. The cooling shall be enabled whenever:
 - a. Outside air temperature is greater than 60°F (adj.).
 - b. AND the economizer (if present) is disabled or fully open.
 - c. AND the supply fan status is on.

- d. AND the heating (if present) is not active.
- 3. Alarms shall be provided as follows:
 - a. High Supply Air Temp: If the supply air temperature is 5°F (adj.) greater than setpoint.

M. Heating Coil Valve:

- 1. The controller shall measure the supply air temperature and modulate the steam coil control valve to maintain its heating setpoint.
- 2. The heating shall be enabled whenever:
 - a. Outside air temperature is less than 65°F (adj.).
 - b. AND the supply fan status is on.
 - c. AND the cooling (if present) is not active.
- 3. The heating coil valve shall open whenever:
 - a. Supply air temperature drops from 40°F to 35°F (adj.).
 - b. OR the freezestat (if present) is on.
- 4. Alarms shall be provided as follows:
 - a. Low Supply Air Temp: If the supply air temperature is 5°F (adj.) less than setpoint.

N. Economizer:

- 1. The controller shall measure the mixed air temperature and modulate the economizer dampers in sequence to maintain a setpoint 2°F (adj.) less than the supply air temperature setpoint. The outside air dampers shall maintain a minimum adjustable position of 20% (adj.) open whenever occupied.
- 2. The economizer shall be enabled whenever:
 - a. Outside air temperature is less than 65°F (adj.).
 - b. AND the outside air enthalpy is less than 22Btu/lb (adj.)
 - c. AND the outside air temperature is less than the return air temperature.
 - d. AND the outside air enthalpy is less than the return air enthalpy.
 - e. AND the supply fan status is on.
- 3. The economizer shall close whenever:
 - a. Mixed air temperature drops from 40°F to 35°F (adj.)
 - b. OR the freezestat (if present) is on.
 - c. OR on loss of supply fan status.
- 4. The outside and exhaust air dampers shall close and the return air damper shall open when the unit is off. If Optimal Start Up is available, the mixed air damper shall operate as described in the occupied mode except that the outside air damper shall modulate to fully closed.

O. Minimum Outside Air Ventilation - Carbon Dioxide (CO2) Control:

When in the occupied mode, the BMS shall monitor zone CO2 concentrations served by the respective air handling unit. The controller shall take the highest zone CO2 concentration and modulate the outside air dampers open from minimum position on rising CO2 concentrations, overriding normal damper operation to maintain a CO2 setpoint of 750 ppm (adj.).

- 1. Alarms shall be provided as follows:
 - a. High Zone Carbon Dioxide Concentration: If the highest zone CO2 concentration is greater than 1000 ppm (adj.).

- P. Dehumidification:
1. The controller shall measure the return air humidity and override the cooling sequence to maintain return air humidity at 60% rh (adj.). Dehumidification shall be enabled whenever the supply fan status is on.
- Q. Final Filter Differential Pressure Monitor:
1. The controller shall monitor the differential pressure across the final filter.
 2. Alarms shall be provided as follows:
 - a. Final Filter Change Required: Final filter differential pressure exceeds a user definable limit (adj.).
- R. Mixed Air Temperature:
1. The controller shall monitor the mixed air temperature and use as required for economizer control (if present) or preheating control (if present).
 2. Alarms shall be provided as follows:
 - a. High Mixed Air Temp: If the mixed air temperature is greater than 90°F (adj.).
 - b. Low Mixed Air Temp: If the mixed air temperature is less than 45°F (adj.).
- S. Return Air Humidity:
1. The controller shall monitor the return air humidity and use as required for economizer control (if present) or humidity control (if present).
 2. Alarms shall be provided as follows:
 - a. High Return Air Humidity: If the return air humidity is greater than 70% (adj.).
 - b. Low Return Air Humidity: If the return air humidity is less than 55% (adj.).
- T. Return Air Temperature:
1. The controller shall monitor the return air temperature and use as required for setpoint control or economizer control (if present).
 2. Alarms shall be provided as follows:
 - a. High Return Air Temp: If the return air temperature is greater than 90°F (adj.).
 - b. Low Return Air Temp: If the return air temperature is less than 45°F (adj.).
- U. Supply Air Temperature:
1. The controller shall monitor the supply air temperature.
 2. Alarms shall be provided as follows:
 - a. High Supply Air Temp: If the supply air temperature is greater than 120°F (adj.).
 - b. Low Supply Air Temp: If the supply air temperature is less than 45°F (adj.).

Typical Air Handling Unit Points List (AHU-1 through AHU-10)	Hardware Points			
	AI	AO	BI	BO
Point Name				
Exhaust Air Temp	x			
Final Filter Differential Pressure	x			
Heat Wheel Discharge Air Temp	x			
Mixed Air Temp	x			
Outside Air Temp	x			
Return Air Humidity	x			
Return Air Temp	x			
Supply Air Temp	x			
Heating Valve		x		
Mixed Air Dampers		x		
Freezestat			x	
Heat Wheel Status			x	
High Static Shutdown			x	
Return Fan Status			x	
Supply Air Smoke Detector			x	
Supply Fan Status			x	
Cooling Valve		x		
Duct Static Pressure	x			
Heat Wheel Bypass Dampers				x
Heat Wheel Start/Stop				x
Return Fan Start/Stop				x
Return Fan Speed		x		
Supply Fan Start/Stop				x
Supply Fan Speed		x		
Smoke Detector			x	

3.06 PERIMETER ROOFTOP HANDLING UNITS: RTU-11A, 11B, 12A,12B,13A,13B,14A,14B.

- A. Run Conditions - Continuous:
 - 1. The unit shall run continuously during occupied mode and cycle during unoccupied mode as required to maintain unoccupied space temperature setpoints.

- B. Emergency Shutdown:
 - 1. The unit shall shut down and generate an alarm upon receiving an emergency shutdown signal.

- C. Freeze Protection:
 - 1. The unit shall shut down and generate an alarm upon receiving freezestat status.

- D. High Static Shutdown:
 - 1. The unit shall shut down and generate an alarm upon receiving an high static shutdown signal.

- E. Supply Air Smoke Detection:
 - 1. The unit shall shut down and generate an alarm upon receiving a supply air smoke detector status.

- F. Supply Fan:
 - 1. The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.
 - 2. Alarms shall be provided as follows:
 - a. Supply Fan Failure: Commanded on, but the status is off.
 - b. Supply Fan in Hand: Commanded off, but the status is on.
 - c. Supply Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).

- G. Return Fan:
 - 1. The return fan shall run whenever the supply fan runs.
 - 2. Alarms shall be provided as follows:
 - a. Return Fan Failure: Commanded on, but the status is off.
 - b. Return Fan in Hand: Commanded off, but the status is on.
 - c. Return Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).

- H. Heat Recovery Wheel - Constant Speed:
 - 1. The controller shall run the heat recovery wheel for energy recovery as follows.
 - a. Cooling Recovery Mode:
 - 1) The controller shall measure the heat wheel discharge air temperature and run the heat wheel to maintain a setpoint 2°F (adj.) less than the unit supply air temperature setpoint. The heat wheel shall run for cool recovery whenever:
 - a) The unit return air temperature is 5°F (adj.) or more below the outside air temperature.
 - 1) AND the unit is in a cooling mode.
 - 2) AND the economizer (if present) is off.
 - 3) AND the supply fan is on.

- b. Heating Recovery Mode:
 - 1) The controller shall measure the heat wheel discharge air temperature and run the heat wheel to maintain a setpoint 2°F (adj.) greater than the unit supply air temperature setpoint. The heat wheel shall run for heat recovery whenever:
 - a) The unit return air temperature is 5°F (adj.) or more above the outside air temperature.
 - 1) AND the unit is in a heating mode.
 - 2) AND the economizer (if present) is off.
 - 3) AND the supply fan is on.

- I. Periodic Self-Cleaning:
 - 1. The heat wheel shall run for 10sec (adj.) every 4hr (adj.) the unit runs.

- J. Frost Protection:
 - 1. The heat wheel shall run for 10sec (adj.) every 600sec (adj.) whenever:
 - a. Outside air temperature drops below 15°F (adj.) OR the exhaust air temperature drops below 20°F (adj.).
 - b. The heat wheel bypass dampers will open whenever the heat wheel is disabled.
 - 2. Alarms shall be provided as follows:
 - a. Heat Wheel Rotation Failure: Commanded on, but the status is off.
 - b. Heat Wheel in Hand: Commanded off, but the status is on.
 - c. Heat Wheel Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).

- K. Supply Air Temperature Setpoint:
 - 1. The controller shall monitor the supply air temperature and shall maintain a supply air temperature setpoint reset based on zone cooling and heating requirements.
 - 2. The supply air temperature setpoint shall be reset for cooling based on zone cooling requirements as follows:
 - a. The initial supply air temperature setpoint shall be 55°F (adj.).
 - c. As cooling demand decreases, the setpoint shall incrementally reset up to a maximum of 60°F (adj.).
 - 3. If more zones need heating than cooling, then the supply air temperature setpoint shall be reset for heating as follows:
 - a. The initial supply air temperature setpoint shall be 60°F (adj.).
 - b. As heating demand decreases, the setpoint shall incrementally reset down to a minimum of 55°F (adj.).

- L. Cooling Coil Valve:
 - 1. The controller shall measure the supply air temperature and modulate the cooling coil control valve to maintain its cooling setpoint.
 - 2. The cooling shall be enabled whenever:
 - a. Outside air temperature is greater than 60°F (adj.).
 - b. AND the economizer (if present) is disabled or fully open.
 - c. AND the supply fan status is on.
 - d. AND the heating (if present) is not active.

3. Alarms shall be provided as follows:
 - a. High Supply Air Temp: If the supply air temperature is 5°F (adj.) greater than setpoint.

- M. Heating Coil Valve:
 1. The controller shall measure the supply air temperature and modulate the hot water control valve to maintain its heating setpoint.
 2. The heating shall be enabled whenever:
 - a. Outside air temperature is less than 65°F (adj.).
 - b. AND the supply fan status is on.
 - c. AND the cooling (if present) is not active.
 3. The heating coil valve shall open whenever:
 - a. Supply air temperature drops from 45°F to 40°F (adj.).
 - b. OR the freezestat (if present) is on.
 4. Alarms shall be provided as follows:
 - a. Low Supply Air Temp: If the supply air temperature is 5°F (adj.) less than setpoint.

- N. Economizer:
 1. The controller shall measure the mixed air temperature and modulate the economizer dampers in sequence to maintain a setpoint 2°F (adj.) less than the supply air temperature setpoint. The outside air dampers shall maintain a minimum adjustable position of 25% (adj.) open whenever occupied, to be coordinated with the balancing contractor to provide scheduled minimum outdoor air flow rate.
 2. The economizer shall be enabled whenever:
 - a. Outside air temperature is less than 65°F (adj.).
 - b. AND the outside air enthalpy is less than 22Btu/lb (adj.)
 - c. AND the outside air temperature is less than the return air temperature.
 - d. AND the outside air enthalpy is less than the return air enthalpy.
 - e. AND the supply fan status is on.
 3. The economizer shall close whenever:
 - a. Mixed air temperature drops from 45°F to 40°F (adj.)
 - b. OR the freezestat (if present) is on.
 - c. OR on loss of supply fan status.
 4. The outside and exhaust air dampers shall close and the return air damper shall open when the unit is off. If Optimal Start Up is available, the mixed air damper shall operate as described in the occupied mode except that the outside air damper shall modulate to fully closed.

- O. Minimum Outside Air Ventilation - Fixed Percentage:
 1. The outside air dampers shall maintain a minimum adjustable position during building occupied hours and be closed during unoccupied hours.

- P. Dehumidification:
 1. The controller shall measure the return air humidity and override the cooling sequence to maintain return air humidity at 60% rh (adj.). Dehumidification shall be enabled whenever the supply fan status is on.

- Q. Final Filter Differential Pressure Monitor:
1. The controller shall monitor the differential pressure across the final filter.
 2. Alarms shall be provided as follows:
 - a. Final Filter Change Required: Final filter differential pressure exceeds a user definable limit (adj.).
- R. Mixed Air Temperature:
1. The controller shall monitor the mixed air temperature and use as required for economizer control (if present) or preheating control (if present).
 2. Alarms shall be provided as follows:
 - a. High Mixed Air Temp: If the mixed air temperature is greater than 90°F (adj.).
 - b. Low Mixed Air Temp: If the mixed air temperature is less than 45°F (adj.).
- S. Return Air Humidity:
1. The controller shall monitor the return air humidity and use as required for economizer control (if present) or humidity control (if present).
 2. Alarms shall be provided as follows:
 - a. High Return Air Humidity: If the return air humidity is greater than 70% (adj.).
 - b. Low Return Air Humidity: If the return air humidity is less than 30% (adj.).
- T. Return Air Temperature:
1. The controller shall monitor the return air temperature and use as required for setpoint control or economizer control (if present).
 2. Alarms shall be provided as follows:
 - a. High Return Air Temp: If the return air temperature is greater than 90°F (adj.).
 - b. Low Return Air Temp: If the return air temperature is less than 45°F (adj.).
- U. Supply Air Temperature:
1. The controller shall monitor the supply air temperature.
 2. Alarms shall be provided as follows:
 - a. High Supply Air Temp: If the supply air temperature is greater than 120°F (adj.).
 - b. Low Supply Air Temp: If the supply air temperature is less than 45°F (adj.).
- V. Supply Fan Control:
1. Supply fan shall modulate speed to maintain discharge static pressure setpoint as sensed by duct static pressure sensor installed in vertical duct riser on 7th floor.
 2. Return fan shall track supply fan speed.

Typical Rooftop Air Handling Unit Points List RTU-11A,11B,12A,12B,13A,13B,14A,14B	Hardware Points			
	AI	AO	BI	BO
Point Name				
Exhaust Air Temp	x			
Final Filter Differential Pressure	x			
Heat Wheel Discharge Air Temp	x			
Mixed Air Temp	x			
Outside Air Temp	x			
Return Air Humidity	x			
Return Air Temp	x			
Supply Air Temp	x			
Heating Valve		x		
Mixed Air Dampers		x		
Freezestat			x	
Heat Wheel Status			x	
High Static Shutdown			x	
Return Fan Status			x	
Supply Air Smoke Detector			x	
Supply Fan Status			x	
Cooling Valve		x		
Duct Static Pressure	x			x
Heat Wheel Bypass Dampers				x
Heat Wheel Start/Stop				x
Return Fan Start/Stop				x
Return Fan Speed		x		
Supply Fan Start/Stop				x
Supply Fan Speed		x		
Smoke Detector			x	

3.07 Variable Air Volume Box Sequence:

- A. General:
 1. The VAV boxes shall be shut off type with hot water reheat, primary air valve with floating point electric motor actuator.
 2. The DDC supplier shall provide all necessary appurtenances such as 2-way modulating hot water valves and actuators for VAV boxes, sensors, relays, and control and communication wiring for a complete installation. Control transformers shall be furnished with VAV boxes.

3. Sequences:
 - a. Temperature Control:
 - 1) Sensors: Temperature sensors shall be supplied mounted and wired as shown on the drawings for each respective VAV box.
 - 2) Temperature Setpoints: Each VAV box shall be assigned an occupied temperature setpoint and throttling range, and an unoccupied setpoint and throttling range.
 - b. Shut Off Type VAV Box:
 - 1) Occupied Mode:
 - a) Heating Mode: Should the space temperature drop below setpoint (68 DegF adj.) a heating demand signal shall be generated to energize the hot water pumps and the hot water valve shall be throttled open to maintain setpoint. The primary air valve shall be in the minimum position.
 - b) Cooling Mode: Should the space temperature rise above setpoint (76 DegF adj.), the hot water valve(s) shall be throttled closed to maintain setpoint. If additional cooling is required, the primary air valve shall be modulated open until setpoint is achieved.
 - c) Occupied Mode Zone occupancy override: When no occupancy is sensed by the local zone occupancy sensor the primary air valve shall be in its minimum unoccupied position. The associated air handling unit shall modulate its outdoor air damper to the associated minimum ventilation position, unless operating in economizer mode.
 - 2) Unoccupied Mode:
 - a) The VAV box shall operate only as required to satisfy the sequences below.
 - b) Night Cycle Mode shall apply to heating cycle only. If the space temperature drops to 58 DegF, the air handling unit shall be energized and the hot water reheat valve shall be opened until the space temperature reaches 60 DegF, then the hot water reheat valve shall be closed, and the air handling unit shutdown:

- c) Night Purge Mode shall only apply to cooling: modulate open until setpoint is achieved and then modulate to maintain setpoint.

Typical Variable Air Volume Box Points List (VAV)	Hardware Points			
	AI	AO	BI	BO
Point Name				
Airflow	x			
Zone Setpoint Adjust	x			
Zone Temp	x			
Reheating Valve		x		
Zone Damper		x		
Zone Override			x	
Airflow Setpoint		x		
Cooling Setpoint		x		
Heating Setpoint		x		
High Zone Temp			x	
Low Zone Temp			x	
Zone Occupancy OC (if applicable)				

3.08 EXHAUST FANS

- A. General: The DDC supplier shall provide all necessary appurtenances such as dampers actuators, sensors, relays, and control and communication wiring for a complete installation.
- B. Sequences:
 - 1. General: The fan motors shall be energized and de-energized via the Building Management System.
 - 2. Shut down: The fans shall be de-energized, and the associated spring return motorized dampers closed under the following conditions:
 - a. The fans are turned off through the Building Management System.
 - b. The fans are turned off using the selector switch on the start H-O-A switch if equipped.
 - 3. Start up: The fans shall be energized, and the motorized dampers opened when all the following conditions are met:
 - a. The fans are turned on during the occupied mode through the Building Management System.
 - b. The starter is in the "Hand" or "Auto" position.

- 4. Temperature Control (applies to EF-1,EF-2, EF-6, which are used for temperature control):
 - a. Sensors:
 - 1) Temperature sensors shall be supplied mounted and wired as shown on the Drawings.
 - b. Temperature setpoints: Each space served shall be assigned a temperature setpoint (80 DegF adj.) and throttling range.
- 5. Restroom Exhaust Control (applies to TX-1, TX-2):
 - a. Occupied Mode:
 - 1) Fan shall run continuously.
 - b. Unoccupied Mode:
 - 1) Fan shall be off.

Typical Exhaust Fan Points List	Hardware Points			
	AI	AO	BI	BO
Point Name				
Exhaust Air Damper Status			x	
Fan Status			x	
Exhaust Air Damper				x
Fan Start/Stop				x
Exhaust Air Damper Failure			x	
Fan Failure			x	

3.09 INDUCTION UNIT

- A. General: The Induction Unit controller shall operate a preprogrammed sequence of operation to control the VAV induction Unit Air Valve (IAV) and water valve in an optimized sequence to maintain the current zone setpoint. The DDC supplier shall provide all necessary appurtenances such as, sensors, relays, and control and communication wiring for a complete installation with the induction unit manufacturer’s provided controller to monitor and display all points from the Induction Unit control and additional BMS points scheduled.
- B. Sequences:
 - 1. Preprogrammed sequence of operation to control the IAV and water valve in an optimized sequence to maintain the current zone setpoint. Timers, time delays, percent thresholds, endpoints, etc. for all modes shall be adjustable in configuration variables over the network.
 - 2. Occupancy Operation
 - a. Occupancy States (Occupied/Unoccupied) shall be determined either by the default schedule within the controller set at 6AM-6PM, Monday through Friday, or by a network signal over the BACnet/IP network.
 - b. Ready/Standby States- Used with an Occupancy Sensor
 - 1) When the Occupancy State is “Occupied” then
 - a) When the Occupancy sensor senses presence, the controller maintains the occupied return air setpoint.

- b) When the Occupancy sensor no longer senses presence for at least 10 minutes (adjustable over the BACnet network), the controller maintains the standby setpoint as calculated by either adding or subtracting the offset to the return air setpoint. The resultant becomes the actual setpoint.
- 3. Heating/Cooling Mode Determination
 - 1) When the supply water temperature exceeds 75 degF., the unit will control in the heating mode.
 - 2) When the supply water temperature falls below 65 degF., the unit will control in the cooling mode.
 - 3) When the water temperature lies within those temperature, the unit will remain in its current mode.
- 4. Cooling in the Heating Mode Determination
 - 1) When the return air temperature exceeds the return air setpoint during the heating mode, and the primary air temperature is at least 3°F below the return air temperature, the controller will enter cooling in the heating mode.
- 5. Occupied Mode: The air valve shall close no more than its minimum position (default 15%)
 - a. Heating:
 - 1) In order to maintain the return air temperature at setpoint, a PI control loop shall open the secondary water valve when the loop output is at least 10%. As the loop output increases from 50% to 100% the air valve shall modulate from minimum to 100%.
 - 2) Secondary water valve shall be open for minimum duration of 2 minutes every 20 minutes.
 - b. Cooling Mode
 - 1) In order to maintain the return air temperature at setpoint, a PI control loop shall open the secondary water valve when the loop output is at 5%. As the loop increases from 20% to 100%, the air valve shall modulate from minimum to 100%.
 - c. Cooling In the Heating Mode
 - 1) This condition exists typically due to a sun load in the heating season.
 - 2) The secondary water valve shall close
 - 3) The air valve shall modulate open under a PI control loop from minimum to 100% to maintain the return air temperature at setpoint.
 - 4) The secondary water valve shall open for minimum duration of 2 minutes every 20 minutes, and then close while in this mode.
- 7. Unoccupied
 - a. Heating Mode: Should the return air temperature drop below the unoccupied heating setpoint, the heating valve shall open. As the return air temperature reaches the setpoint, the valve shall close. However, independent of return air temperature, the secondary water valve shall open for at least 2 minutes, every 20

minutes. The air valve shall remain closed in the unoccupied mode, except if the return air temperature falls 10°F below the unoccupied heating setpoint, then the air valve shall open. Once the return air temperature rises above this threshold, the air valve shall close.

- b. Cooling Mode: Should the return air temperature rise above the unoccupied cooling setpoint, the control action shall mirror the occupied cooling mode, using the unoccupied cooling settings. Once the return air temperature falls below the unoccupied cooling setpoint, the air valve and water valve shall close. The secondary water valve shall open for minimum duration of 2 minutes every 20 minutes, and then close while in this mode.
8. Standby
- a. Standby Mode- during the occupied time periods, when the occupancy sensor indicates the area is vacant, the BMS may index the controller into standby mode.
 - b. The sequence shall mirror the respective occupied sequences above, using the standby setpoints for return air control.

Induction Unit controller Point Description	BACnet Object	Trend	Alarm	Comments
Zone Temp	AI	Interval	High & Low Limit	
Zone Setpoint	AI	COS		Zone setpoint adjustable by occupant, otherwise AV
Zone Return Air Temperature	AI	Interval		
Secondary Water Supply Temperature	AI	Interval		
Primary Air Temp	AI	Interval		Primary air temperature to be alarmed at AHU
Occupancy Sensor	BI	COS		Occupied=True, Standby=False
Water Temp	AI	Interval		Water temperature to be alarmed at water system
Air Valve Position	AO	Interval		
Water Valve Position	BO	COS		
Min Air Valve Position	AV	COS		Default at 15%
Zone Setpoint High Limit	AV	COS		Highest value zone setpoint allowed
Zone Setpoint Low Limit	AV	COS		Lowest value zone setpoint allowed
Actual Setpoint	AV	Interval		
Standby Heating Setpoint Offset	AV	COS		
Standby Cooling Setpoint Offset	AV	COS		
Unocc Heating Setpoint Offset	AV	COS		
Unocc Cooling Setpoint Offset	AV	COS		
Occupied/Unoccupied	BV	COS		Sets the mode: Occupied=True
Remote Occupied Signal	BV	COS		Sets whether occupancy is from

Induction Unit controller Point Description	BACnet Object	Trend	Alarm	Comments
				local schedule or remote network
Configuration Variables	AV/BV			Provide an allowance of 20 additional variables per unit of BACnet integration
Capacity Alarm	BV	COS	Alarm	While in the Occupied/Ready Mode, air and water valves are open for at least 15 minutes, but zone temperature is more than 2°F from setpoint.

Typical Induction Unit Points List - BMS Control	Hardware Points			
	AI	AO	BI	BO
Point Name				
Primary Air static Pressure	x			
Induction Unit Controller			x	
Primary Supply Air Temperature	x			
Zone Temperature	x			

3.10 PENTHOUSE STEAM TO GLYCOL HEATING HOT WATER SYSTEM

- A. General: The heat exchanger shall be enabled to run whenever there is a defined call for heating from the hot water coils AND outside air temperature is less than 65degF (adj.)
- B. To prevent short cycling the heat exchanger hot water pumps shall run for and be off for minimum adjustable times (15min adj.)
- C. The heat exchanger shall be enabled whenever outside air temperature is less than 38degF (adj.).
- D. Hot Water Pumps: The two hot water pumps shall operate in lead/lag fashion.
 - 1. The lead pump shall run first, on a failure of the lead pump, the lag pump shall run and the lead pump turned off with an alarm generated at the operators workstation.
 - 2. On decreasing hot water differential pressure, the lag pump shall stage on and run in unison with the lead pump to maintain hot water differential pressure setpoint.
 - 3. The designated lead pump shall rotate upon one of the following conditions:
 - a. Manually through a software switch
 - b. Pump runtime (adj.) is exceeded
 - c. Daily
 - d. Weekly
 - e. Monthly
 - 4. Alarms shall be provided as follows:

- a. Pump failure: Commanded on, but the status is off
 - b. Pump Running in Hand: Commanded off, but the status is on.
 - c. Runtime Exceeded
- E. Hot Water Differential Pressure Control:
- 1. The Controller shall measure hot water differential pressure and stage the hot water pumps on in sequence to maintain its hot water differential pressure setpoint. The lead pump shall run first.
 - 2. The following setpoints are recommended values. All setpoints shall be field adjusted during the commissioning period to meet the requirements of actual field conditions.
 - 3. If the hot water differential pressure drops below a setpoint of 12lbf/in2 (adj.), the lag pump shall turn on and run in unison with the lead pump.
 - 4. If the hot water differential pressure rises back to 4lbf/in2 (adj.) above setpoint, the lag pump shall turn off and the lead pump shall continue to run.
 - 5. To prevent short cycling, there shall be a minimum user definable (adj.) delay between stages.
 - 6. Alarms shall be provided as follows:
 - a. High Hot Water Differential Pressure: If the hot water differential pressure is greater than 18lbf/in2 (adj.).
 - b. Low Hot Water Differential Pressure: If the hot water differential pressure is less than 10lbf/in2 (adj.).
- F. Hot Water Supply Temperature Setpoint Reset:
- 1. The hot water supply temperature setpoint shall reset based on outside air temperature.
 - 2. As outside air temperature rises from 0°F (adj.) to 70°F (adj.) the hot water supply temperature setpoint shall reset downwards from 180°F (adj.) to 160°F (adj.).
 - 3. Alarms shall be provided as follows:
 - a. High Hot Water Supply Temp: If greater than 200°F (adj.).
 - b. Low Hot Water Supply Temp: If less than 100°F (adj.).
- G. Heat Exchanger Steam Valves - Hot Water Control:
- 1. The controller shall measure the hot water supply temperature and modulate the two steam valves in sequence to maintain its setpoint.
 - 2. The steam valves shall be enabled whenever:
 - a. The heat exchanger is called to run.
 - b. AND hot water supply temperature is below setpoint.
 - 3. The steam valves shall open to 100% (adj.) whenever the heat exchanger is in freeze protection due to low outside air temperature.
 - 4. The steam valves shall close whenever the hot water supply temperature rises from 190°F to 200°F (adj.).

Penthouse steam to glycol heating hot water system points list	Hardware Points			
Point Name	AI	AO	BI	BO
Hot Water Differential Pressure	x			

Penthouse steam to glycol heating hot water system points list	Hardware Points			
	Hot Water Return Temp	x		
Hot Water Supply Temp	x			
Steam Valve 1/3		x		
Steam Valve 2/3		x		
Hot Water Pump Status, P-11			x	
Hot Water Pump Status, P-12			x	
Hot Water Pump Start/Stop, P-11				x
Hot Water Pump Start/Stop, P-12				x
Hot Water Differential Pressure Setpoint		x		
Hot Water Supply Temp Setpoint		x		

3.11 STEAM AND CHILLED WATER TO SECONDARY WATER SYSTEM

- A. General: The steam to hot water converters shall be enabled to run during heating season and disabled during cooling season based on user defined schedule (adj.). The system control valves of the secondary water system shall operate in the following manor to provide the specified fluid temperatures for the heating and cooling seasons:
 1. The heating season 2-position control valve (HS-CV) shall be normally open during heating season, and normally closed during cooling season based on user defined schedule (adj.).
 2. The cooling season 2-position control valve (CS-CV) shall be normally open during cooling season, and normally closed during heating season, based on user defined schedule (adj.).
 3. The secondary water return control valve (SWR-CV) shall be normally open during heating season. During cooling season, the valve shall modulate open to closed based on the inverse position of both the; chilled water supply control valve (CHWS-CV), and the secondary water to chilled water return control valve (SWR/CHWR-CV) to maintain cooling season supply setpoint temperature.
 4. The chilled water supply control valve (CHWS-CV) shall be normally closed during heating season. During cooling season, the valve shall modulate open to closed in unison with the secondary water to chilled water return control valve (SWR/CHWR-CV), and to the inverse position of the secondary water return control valve (SWR-CV) to maintain cooling season supply setpoint temperature.
 5. The secondary water to chilled water return control valve (SWR/CHWR-CV) shall be normally closed during heating season. During the cooling season, the valve shall modulate open to closed in unison with the chilled water supply control valve (CHWS-CV), and to the inverse position of the secondary water return control valve (SWR-CV) to maintain cooling season supply setpoint temperature.
 6. The low load bypass control valve (LLB-CV) shall be enabled be during heating season and cooling season. The valve shall be

normally closed, but shall modulate open when the following condition occurs:

- a. System differential pressure setpoint is exceeded, while the variable frequency drive of the lead pump is at its minimum speed.
- B. Secondary Water Pumps (SWP-1, SWP-2, SWP-3): The secondary water pumps shall operate in lead/lag/standby fashion.
1. The lead pump shall run first on a failure of the lead pump, the lag pump shall run and the lead pump turned off with an alarm generated at the operators workstation.
 2. On decreasing water differential pressure, the lag pump shall stage on and run in unison with the lead pump to maintain hot water differential pressure setpoint.
 3. The designated lead pump shall rotate upon one of the following conditions:
 - a. Manually through a software switch
 - b. Pump runtime (adj.) is exceeded
 - c. Daily
 - d. Weekly
 - e. Monthly
 4. Alarms shall be provided as follows:
 - a. Pump failure: Commanded on, but the status is off
 - b. Pump Running in Hand: Commanded off, but the status is on.
 - c. Runtime Exceeded
- C. Secondary Water Differential Pressure Control:
1. The Controller shall measure secondary water differential pressure at the 7th floor and stage the secondary water pumps on in sequence to maintain the differential pressure setpoint. The lead pump shall run first.
 2. The following setpoints are recommended values. All setpoints shall be field adjusted during the commissioning period to meet the requirements of actual field conditions.
 3. If the secondary water differential pressure drops below a setpoint of 12lbf/in² (adj.), the lag pump shall turn on and run in unison with the lead pump.
 4. If the secondary water differential pressure rises back to 4lbf/in² (adj.) above setpoint, the lag pump shall turn off and the lead pump shall continue to run.
 5. To prevent short cycling, there shall be a minimum user definable (adj.) delay between stages.
 6. Alarms shall be provided as follows:
 - a. High Secondary Water Differential Pressure: If the hot water differential pressure is greater than 18lbf/in² (adj.).
 - b. Low Secondary Water Differential Pressure: If the hot water differential pressure is less than 10lbf/in² (adj.).
- D. Secondary Water Supply Temperature Setpoint:
1. The secondary water supply temperature setpoint during heating season shall be 180degF (adj.).

2. As outside air temperature rises from 0°F (adj.) to 70°F (adj.) the hot water supply temperature setpoint shall reset downwards from 180°F (adj.) to 115°F (adj.).
 3. The secondary water supply temperature setpoint during cooling season shall be 52degF (adj.)
 3. Alarms shall be provided as follows:
 - a. Heating season High Hot Water Supply Temp: If greater than 200°F (adj.).
 - b. Heating season Low Hot Water Supply Temp: If less than 100°F (adj.).
 - c. Cooling season High Chilled Water supply temp: If greater than 65°F (adj.).
 - d. Cooling season Low Chilled Water supply temp: If less than 45°F (adj.).
- E. Heating Season Converter operation (HEX-1A, HEX-1B) - Hot Water Control: The converters shall operate in a lead/standby fashion.
1. The designated lead converter shall rotate upon one of the following conditions:
 - a. Manually through a software switch
 - b. Runtime (adj.) is exceeded
 - c. Daily
 - d. Weekly
 - e. Monthly
 2. The standby converter shall take over as the lead converter upon the following conditions.
 - a. Alarm is generated by one or more control devices associated with the designated lead converter currently in operation.
 3. Alarms shall be provided as follows:
 - a. HEX-1A water control valve SW-1A-CV failure: Commanded open, but respective flow switch fails to prove flow.
 - b. HEX-1B water control valve SW-1B-CV failure: Commanded open, but respective flow switch fails to prove flow.
 - c. HEX-1A steam control valve MPS-1A-CV failure: Commanded open, but no temperature differential is present between the secondary water system supply temperature sensor, and the secondary water system return temperature sensor.
 - d. HEX-1B steam control valve MPS-1B-CV failure: Commanded open, but no temperature differential is present between the secondary water system supply temperature sensor, and the secondary water system return temperature sensor.
 - e. Steam control valves CV-1A & CV-1B failure: Position modulation commanded, but no temperature differential is present between the secondary water system supply temperature sensor, and the secondary water system return temperature sensor.
 4. The HS-CV shall be enabled and open whenever:
 - a. The secondary water system is in the user defined heating season.

5. The controller shall measure the secondary water system supply temperature and modulate the two steam control valves in sequence to maintain its setpoint.
 6. The steam control valves (CV-1A, CV-1B, MPS-1A-CV, MPS-1B-CV) shall be enabled whenever:
 - a. The lead converter is called to run during the user defined heating season.
 - b. AND hot water supply temperature is below setpoint.
 7. The steam control valves shall open to 100% (adj.) whenever the heat exchanger is in freeze protection due to low outside air temperature.
 8. The steam control valves shall close whenever the hot water supply temperature rises from 190°F to 200°F (adj.).
 9. The lead converter hot water control valves (SW-1A-CV, SW-1B-CV) shall be enabled and opened to 100% whenever:
 - a. The lead converter is called to run during the user defined heating season.
 - b. AND hot water supply temperature is below setpoint.
- F. Secondary Water Control Valves – Cooling Season Chilled Water Control:
1. The CS-CV shall be enabled and open whenever:
 - a. The secondary water system is in the user defined cooling season.
 2. The controller shall measure the secondary water supply temperature and modulate the CHWS-CV, SWR-CV, and SWR/CHWR-CV in sequence to maintain its setpoint.
 3. The CHWS-CV, SWR-CV, and SWR/CHWR-CV shall modulate whenever:
 - a. The secondary water system is in the user defined cooling season.
 - b. AND secondary water temperature is below setpoint.

Secondary Water points list	Hardware Points			
	AI	AO	BI	BO
Point Name				
Secondary Water Differential Pressure	x			
Chilled Water Supply Temp	x			
Secondary Water System Return Temp	x			
Secondary Water System Supply Temp	x			
Heating Season Control Valve, HS-CV				x
Cooling Season Control Valve, CS-CV				x
Steam Control Valve 1/3, CV-1B		x		
Steam Control Valve 2/3, CV-1A		x		
HEX-1A Steam Control Valve, MPS-1A-CV				x
HEX-1B Steam Control Valve, MPS-1B-CV				x
HEX-1A Water Control Valve, SW-1A-CV				x

Secondary Water points list	Hardware Points			
HEX-1B Water Control Valve, SW-1B-CV	x			x
HEX-1A Water Flow Switch	x			
HEX-1B Water Flow Switch				
Chilled Water Supply Control Valve, CHWS-CV		x		
Secondary Water Return Control Valve, SWR-CV		x		
Secondary Water to Chilled Water Return Control Valve, SWR/CHWR-CV		x		
Secondary Water Pump Status, SWP-1			x	
Secondary Water Pump Status, SWP-2			x	
Secondary Water Pump Status, SWP-3				
Secondary Water Pump Start/Stop, SWP-1				x
Secondary Water Pump Start/Stop, SWP-2				x
Secondary Water Pump Start/Stop, SWP-3				x
Secondary Water Pump RPM, SWP-1		x		
Secondary Water Pump RPM, SWP-2		x		
Secondary Water Pump RPM, SWP-3		x		
Secondary Water Differential Pressure Setpoint		x		
Secondary Water System Supply Temp Setpoint		x		
Secondary Water System Heating Season				x
Secondary Water System Cooling Season				x
Low Load Bypass Control Valve, LLB-CV		x		

3.12 UNIT HEATERS

- A. Electric Heat Control: Line Voltage thermostat shall energize stages of heat as required to satisfy space temperature setpoint.
- B. Steam Heat Control: Line Voltage Control: Provide single-temperature room thermostat to open steam control valve and cycle fan motor to maintain constant space temperature. Provide strap-on aquastat on unit heater return piping, to de-energize fan motor when fluid temperature falls below adjustable setting of aquastat.

3.13 ADDITIONAL MONITORING POINTS

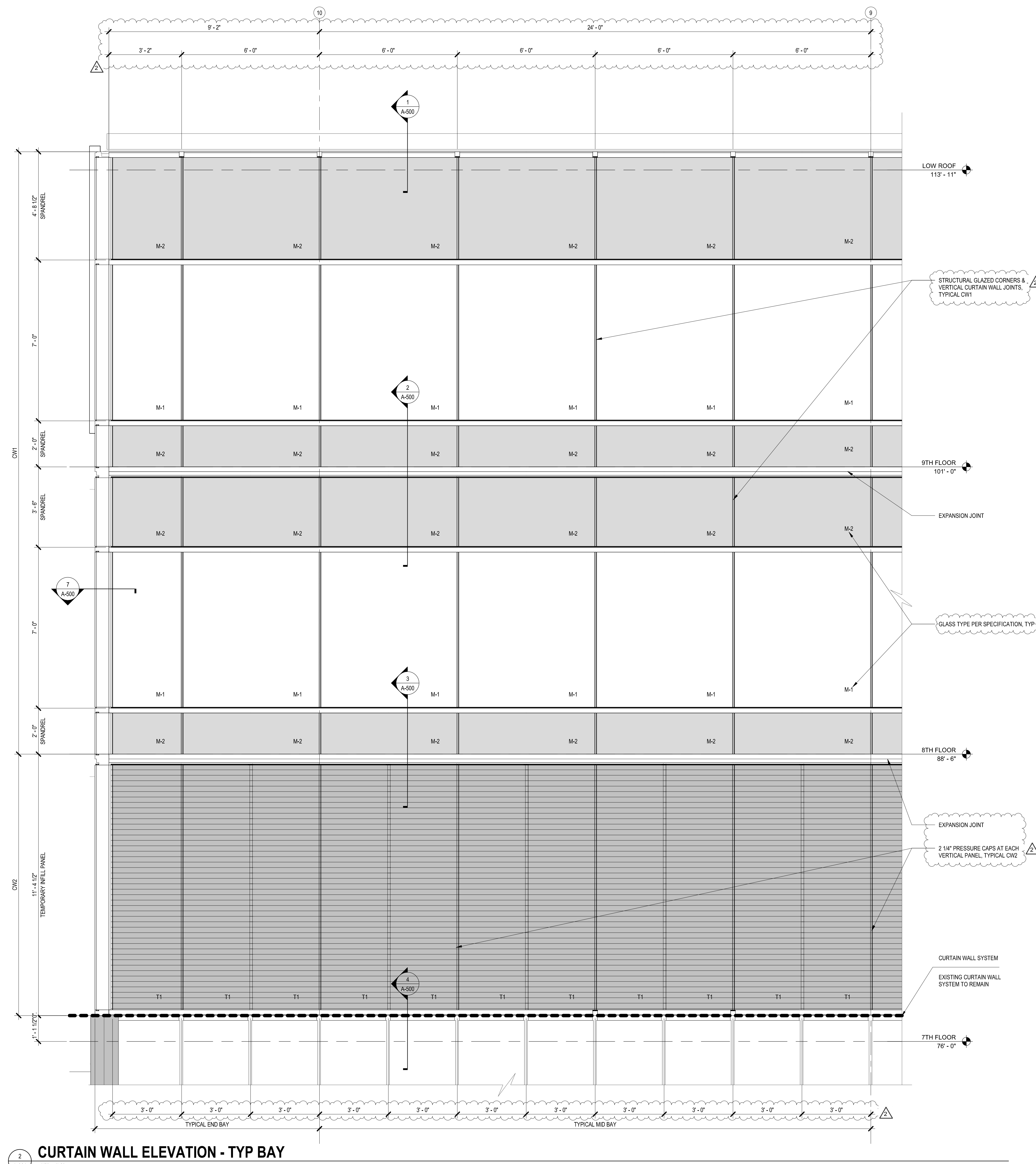
- A. Provide all programming and graphics to display, trend and record the following additional monitoring and alarm points:

Provide all graphics and	Hardware Points			
	AI	AO	BI	BO
Point Name				
Steam Flow Meter Station Flow Rate (Lbs/Hr)	x			
Steam Flow Meter Station BTUH	x			
Chilled Water Flow Meter Station GPM	x			
Chilled Water Flow Meter Station BTUH	x			
Domestic Water Booster Pump Alarm (x8)			x	
Glycol Injection System Failure / Low Level Alarm			x	

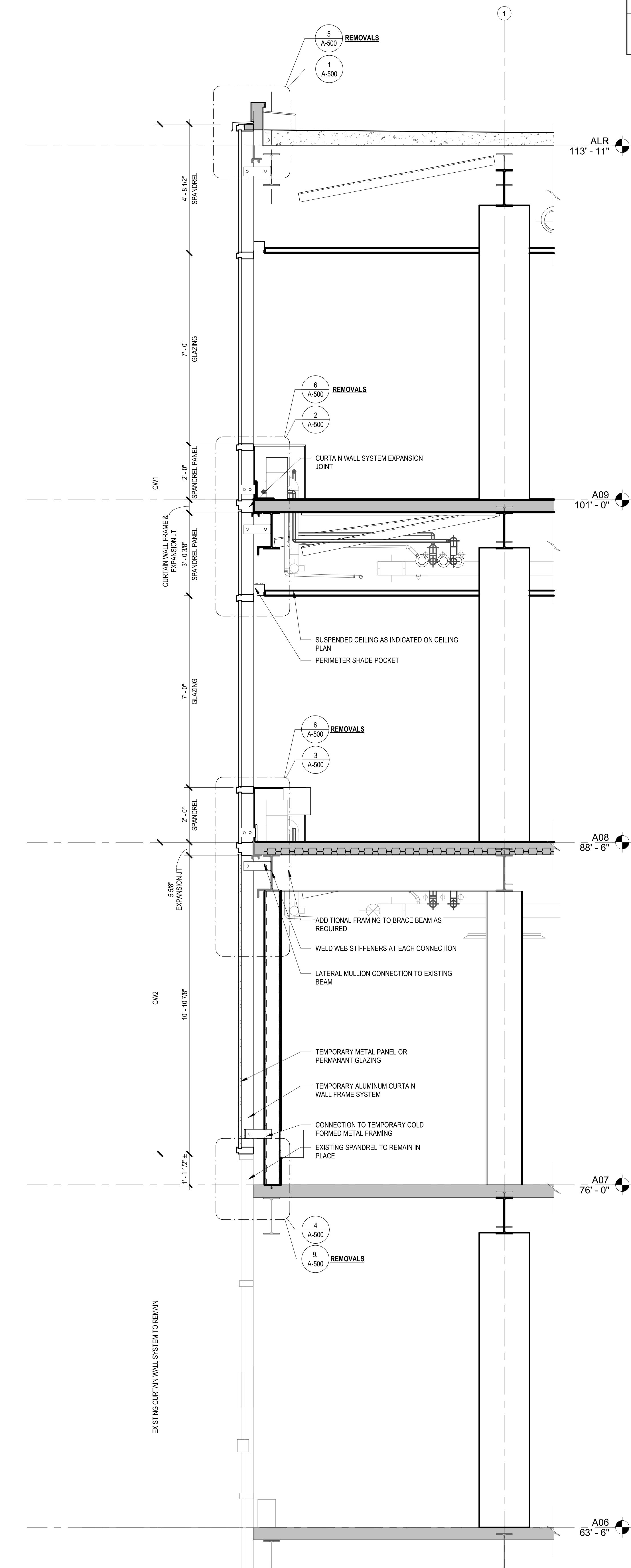
END OF SECTION

EXTERIOR MATERIALS			
MARK	PATTERN	MATERIAL	DESCRIPTION
M-1		INSULATED LOW-E VISION GLASS	MANUFACTURER: GUARDIAN PRODUCT: SUNGLARD 6 MM SNR 43 COLOR: CRYSTAL GRAY
M-2		INSULATED LOW-E SPANDREL GLASS	MANUFACTURER: GUARDIAN PRODUCT: 6MM CRYSTAL GRAY OPACIC04T-300 + SNR 43 RD + 6MM CLEAR COLOR: ARROWHEAD
T1		INSULATED METAL PANEL	MANUFACTURER: MATCH CURTAIN WALL PRODUCT: TYPICAL BY CURTAIN WALL MANUFACTURER COLOR: SELECTED FROM MANUFACTURER'S STANDARD
		BITUMINOUS DAMP PROOFING	PRODUCT: FIBERED ASPHALT EMULSION COLOR: MATCH EXISTING ADJACENT
		EXISTING ALUMINUM LOUVER SYSTEM	EXISTING TO REMAIN IN PLACE
		EXISTING ALUMINUM LOUVER SYSTEM	EXISTING TO BE REMOVED AND REINSTALLED. SEE KEYNOTE 1

- NOTES:
1. PROVIDE LOW E COATING ON #2 SURFACE. GLASS SHALL BE HEAT STRENGTHENED.
 2. ALL FINISHES INDICATED HEREIN ARE BASIS OF DESIGN AND CONTRACTOR MAY SUBMIT FOR EQUALS FOR APPROVAL TO BE CONSIDERED BY DIRECTOR'S REPRESENTATIVE FOR EACH PRODUCT LISTED.
 3. BEFORE FINAL FURNISHING OF MATERIALS, COORDINATE COLOR SCHEME WITH DIRECTOR'S REPRESENTATIVE VIA USE OF COLORED EXTERIOR ELEVATIONS TO VERIFY ALL AREAS INDICATED ARE CORRECT.
 4. ALL EXTERIOR DISSIMILAR MATERIALS SHALL BE SEALED WEATHER TIGHT WITH THE PROPER BACKER ROD AND SEALANT. COLOR SHALL MATCH ADJACENT MATERIALS. BARRIER COLOR SUPERSEDES COORDINATE ALL SEALANT COLOR SELECTIONS TO BE USED ON THE JOB WITH THE DIRECTOR'S REPRESENTATIVE USING ELEVATIONS FOR VERIFICATION OF LOCATION AND APPLICATION. MISCELLANEOUS AND CAP FLASHINGS FINAL SELECTION SHALL BE THROUGH DIRECTOR'S REPRESENTATIVE FROM PHYSICAL SAMPLES OF METAL FLASHINGS AND TRIM.



2 CURTAIN WALL ELEVATION - TYP BAY
1/2" = 1'-0"



1 SECTION - CURTAIN WALL REPLACEMENT
1/2" = 1'-0"

REVISED DRAWING
10/18/2024

UNIFORM CODE STATEMENT:
TO THE BEST OF THE REGISTERED DESIGN PROFESSIONAL'S KNOWLEDGE, BELIEF, AND PROFESSIONAL JUDGEMENT, THESE PLANS AND/OR SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 UNIFORM CODE.

ENERGY CODE WRITTEN STATEMENT:
TO THE BEST OF THE REGISTERED DESIGN PROFESSIONAL'S KNOWLEDGE, BELIEF, AND PROFESSIONAL JUDGEMENT, THESE PLANS AND/OR SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 ENERGY CODE.

WARNING:
THE ALTERATION OF THIS MATERIAL IN ANY WAY, UNLESS DONE UNDER THE DIRECTION OF A COMPARABLE PROFESSIONAL, IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW AND/OR REGULATIONS AND IS A CLASS B MISDEMEANOR.

CONTRACT: CONSTRUCTION
TITLE: RENOVATE BUILDING 8, 8TH & 9TH FLOORS
LOCATION: STATE OFFICE BUILDING CAMPUS 1220 WASHINGTON AVENUE ALBANY, NY
CLIENT: NEW YORK STATE OFFICE OF GENERAL SERVICES

MARK	DATE	DESCRIPTION
2	10/18/2024	As noted in No. 002
1	08/02/24	FINAL SD DOCUMENTS

PROJECT NUMBER: 45382 - C
DESIGNED BY: DJR
DRAWN BY: SRK
FIELD CHECK BY:
APPROVED BY:
SHEET TITLE: WALL SECTIONS
DRAWING NUMBER: A-301
SHEET 41 OF 51



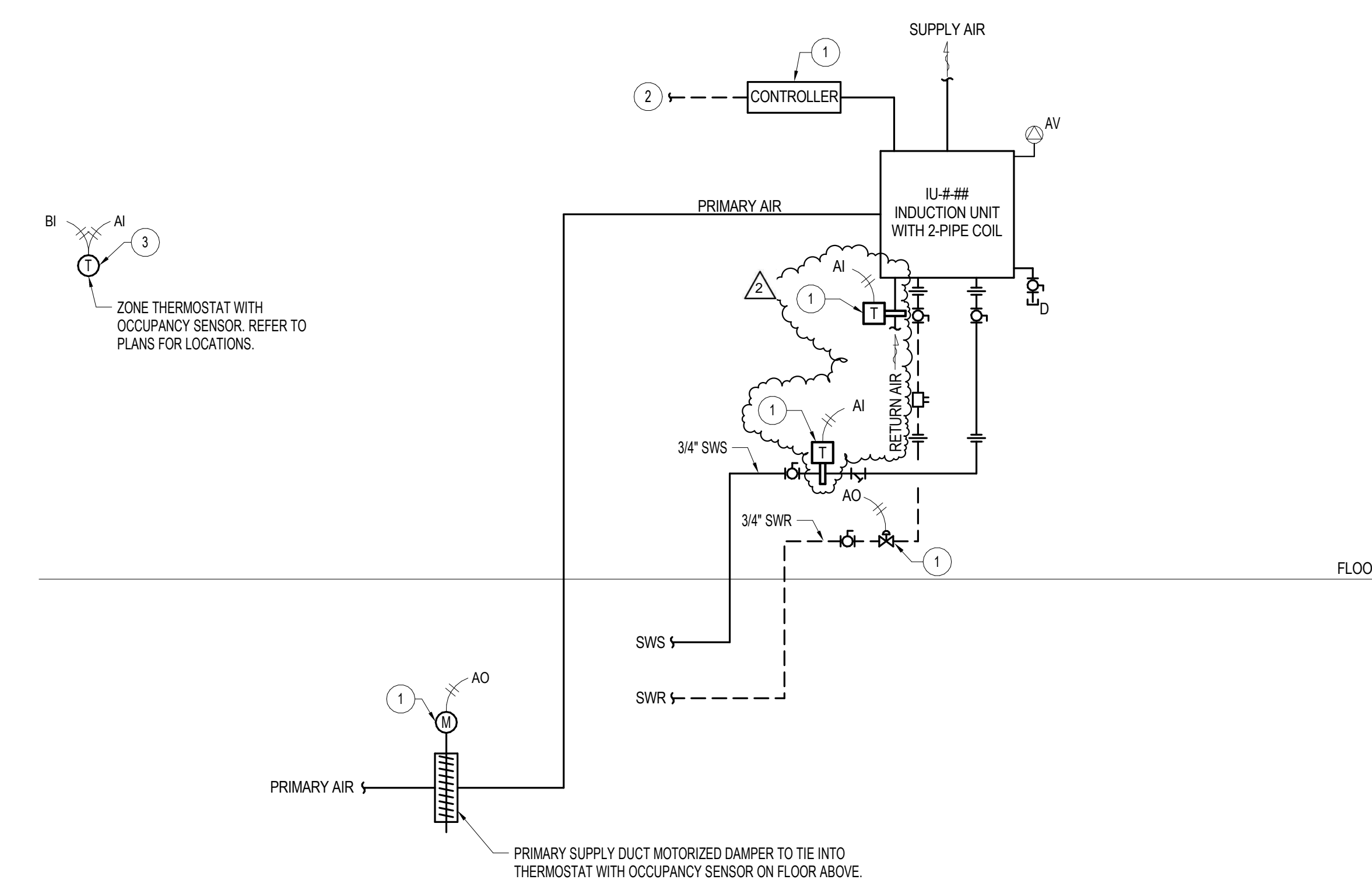
GENERAL NOTES:

1. THE INDUCTION UNIT MANUFACTURER SHALL OBTAIN CONTROL DEVICE INSTANCE NUMBER IDENTIFIERS FROM THE DIRECTORS REPRESENTATIVE. I/O'S WILL OBTAIN THE ASSIGNMENTS FROM THE CONTROLS ALLOWANCE. THE INDUCTION UNIT CONTROLLERS PROVIDED BY THE H-CONTRACTOR SHALL BE PRE-PROGRAMMED BY THE INDUCTION UNIT MANUFACTURER USING THE INSTANCE NUMBER IDENTIFIERS PROVIDED TO THEM BY THE DIRECTORS REPRESENTATIVE. THE INDUCTION UNIT CONTROLLERS SHALL ALSO HAVE REWRITE CAPABILITY TO ALLOW FOR SEAMLESS INTEGRATION INTO THE BAS PROVIDED BY THE CONTROLS ALLOWANCE.
2. H-CONTRACTOR SHALL PROVIDE COMMUNICATION CABLES FROM INDUCTION UNIT CONTROLLERS TO BAS CONTROL PANELS. BAS CONTROL PANELS SHALL BE PROVIDED BY CONTROLS ALLOWANCE. TERMINATE WIRING AT BAS PANELS WITH ASSOCIATED DEVICE LABELING AND 5 FT OF ADDITIONAL WIRE. FINAL CONNECTION TO BAS CONTROL PANELS SHALL BE PROVIDED BY CONTROLS ALLOWANCE. FINAL WIRE CONNECTION TO INDUCTION UNIT CONTROLLER SHALL BE PROVIDED BY H-CONTRACTOR.
3. CONTROL DEVICE PROVIDED BY CONTROLS ALLOWANCE. H-CONTRACTOR SHALL PROVIDE WIRING FROM DEVICE TO BAS CONTROL PANEL. BAS CONTROL PANELS SHALL BE PROVIDED BY CONTROLS ALLOWANCE. TERMINATE WIRING AT BAS PANEL WITH ASSOCIATED DEVICE LABELING AND 5 FT OF ADDITIONAL WIRE. FINAL WIRE CONNECTION TO BAS CONTROL PANEL SHALL BE PROVIDED BY CONTROLS ALLOWANCE. FINAL WIRE CONNECTION TO CONTROL DEVICE SHALL BE PROVIDED BY H-CONTRACTOR.

CODED NOTES

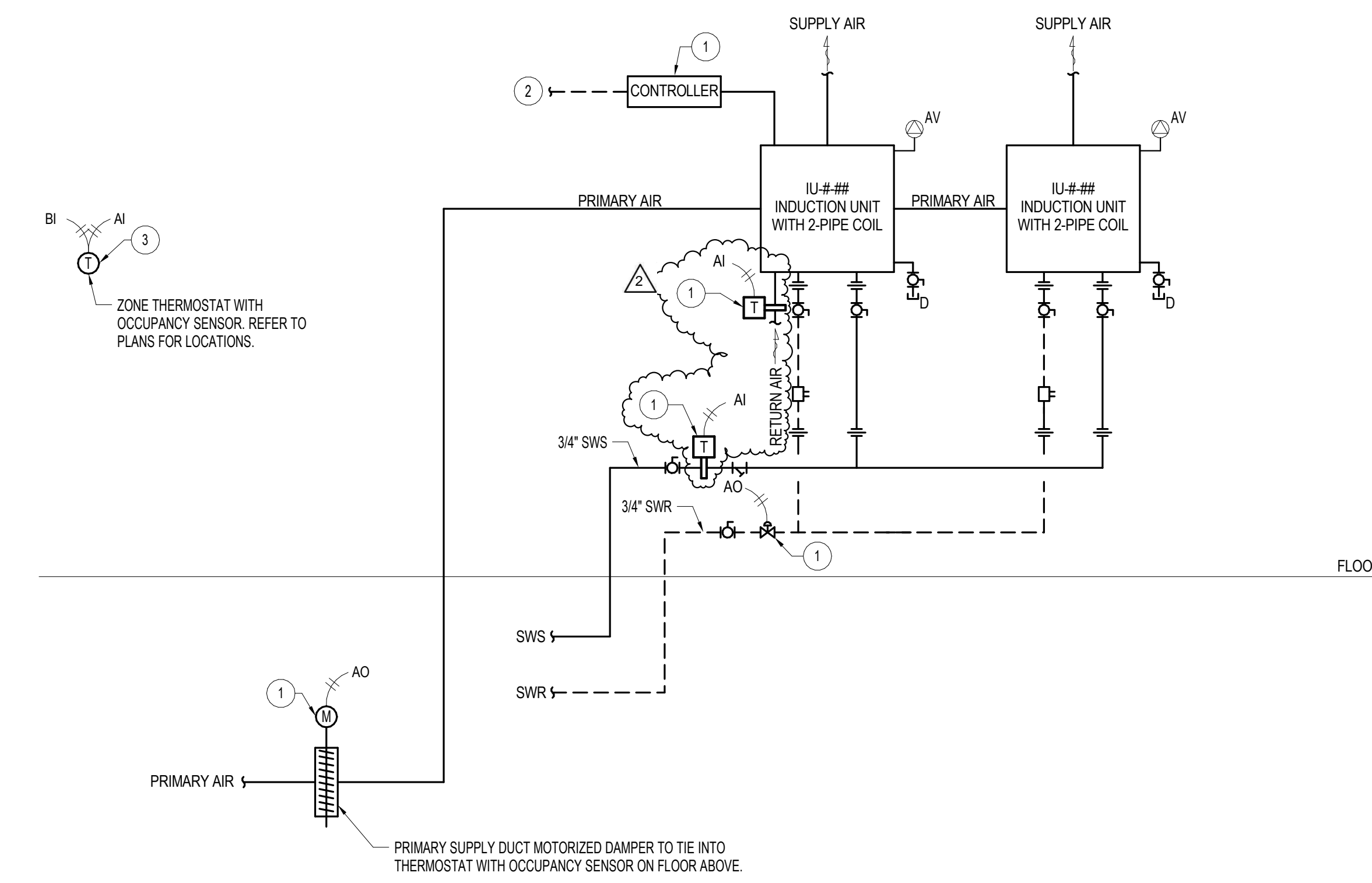
1. CONTROL DEVICE SUPPLIED WITH INDUCTION UNITS BY INDUCTION UNIT MANUFACTURER, PROVIDED AND WIRED BY H-CONTRACTOR.
2. H-CONTRACTOR SHALL PROVIDE COMMUNICATION CABLES FROM INDUCTION UNIT CONTROLLERS TO BAS CONTROL PANELS. BAS CONTROL PANELS SHALL BE PROVIDED BY CONTROLS ALLOWANCE. TERMINATE WIRING AT BAS PANELS WITH ASSOCIATED DEVICE LABELING AND 5 FT OF ADDITIONAL WIRE. FINAL CONNECTION TO BAS CONTROL PANELS SHALL BE PROVIDED BY CONTROLS ALLOWANCE. FINAL WIRE CONNECTION TO INDUCTION UNIT CONTROLLER SHALL BE PROVIDED BY H-CONTRACTOR.
3. CONTROL DEVICE PROVIDED BY CONTROLS ALLOWANCE. H-CONTRACTOR SHALL PROVIDE WIRING FROM DEVICE TO BAS CONTROL PANEL. BAS CONTROL PANELS SHALL BE PROVIDED BY CONTROLS ALLOWANCE. TERMINATE WIRING AT BAS PANEL WITH ASSOCIATED DEVICE LABELING AND 5 FT OF ADDITIONAL WIRE. FINAL WIRE CONNECTION TO BAS CONTROL PANEL SHALL BE PROVIDED BY CONTROLS ALLOWANCE. FINAL WIRE CONNECTION TO CONTROL DEVICE SHALL BE PROVIDED BY H-CONTRACTOR.

INDUCTION UNIT GROUP OF 1			
TAG	QTY. MOTORIZED CONTROL DAMPERS PER GROUP	QTY. CONTROL VALVES PER GROUP	QTY. OF GROUPS
IJ-5-##	1	1	2
IJ-6-##	1	1	2
IJ-7-##	1	1	2
IJ-8-##	1	1	2



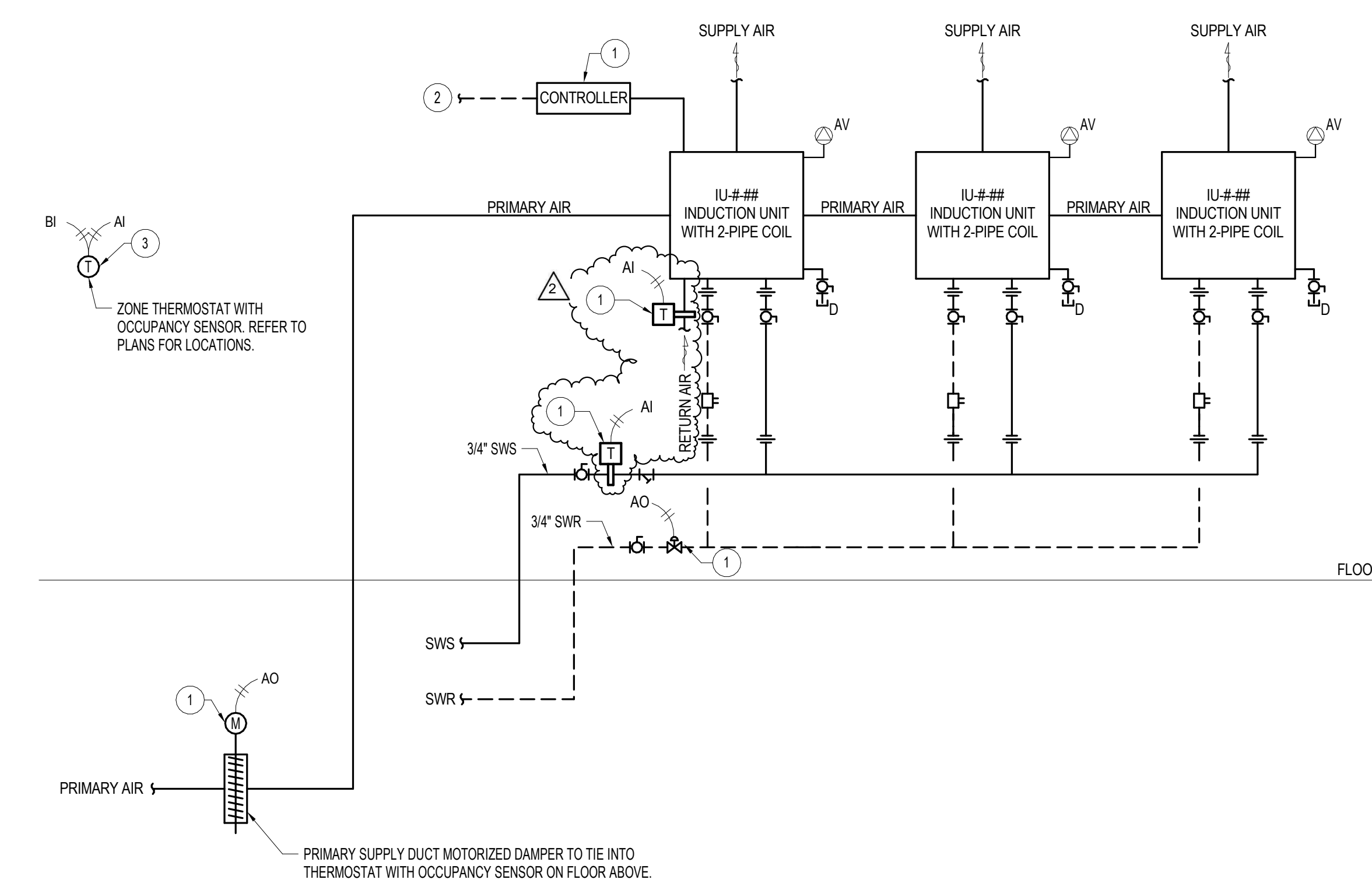
1 INDUCTION UNIT FLOW AND CONTROLS DIAGRAM (GROUP OF 1)
NOT TO SCALE

INDUCTION UNIT GROUP OF 2			
TAG	QTY. MOTORIZED CONTROL DAMPERS PER GROUP	QTY. CONTROL VALVES PER GROUP	QTY. OF GROUPS
IJ-1-##	1	1	16
IJ-2-##	1	1	16
IJ-3-##	1	1	16
IJ-4-##	1	1	16
IJ-5-##	1	1	16
IJ-6-##	1	1	16
IJ-7-##	1	1	16
IJ-8-##	1	1	16



2 INDUCTION UNIT FLOW AND CONTROLS DIAGRAM (GROUP OF 2)
NOT TO SCALE

INDUCTION UNIT GROUP OF 3			
TAG	QTY. MOTORIZED CONTROL DAMPERS PER GROUP	QTY. CONTROL VALVES PER GROUP	QTY. OF GROUPS
IJ-1-##	1	1	2
IJ-2-##	1	1	2
IJ-3-##	1	1	2
IJ-4-##	1	1	2



3 INDUCTION UNIT FLOW AND CONTROLS DIAGRAM (GROUP OF 3)
NOT TO SCALE

REVISED DRAWING
10/18/2024

UNIFORM CODE STATEMENT:
TO THE BEST OF THE REGISTERED DESIGN PROFESSIONAL'S KNOWLEDGE, BELIEF, AND PROFESSIONAL JUDGEMENT, THESE PLANS AND/OR SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 UNIFORM CODE.

ENERGY CODE WRITTEN STATEMENT:
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WARNING:
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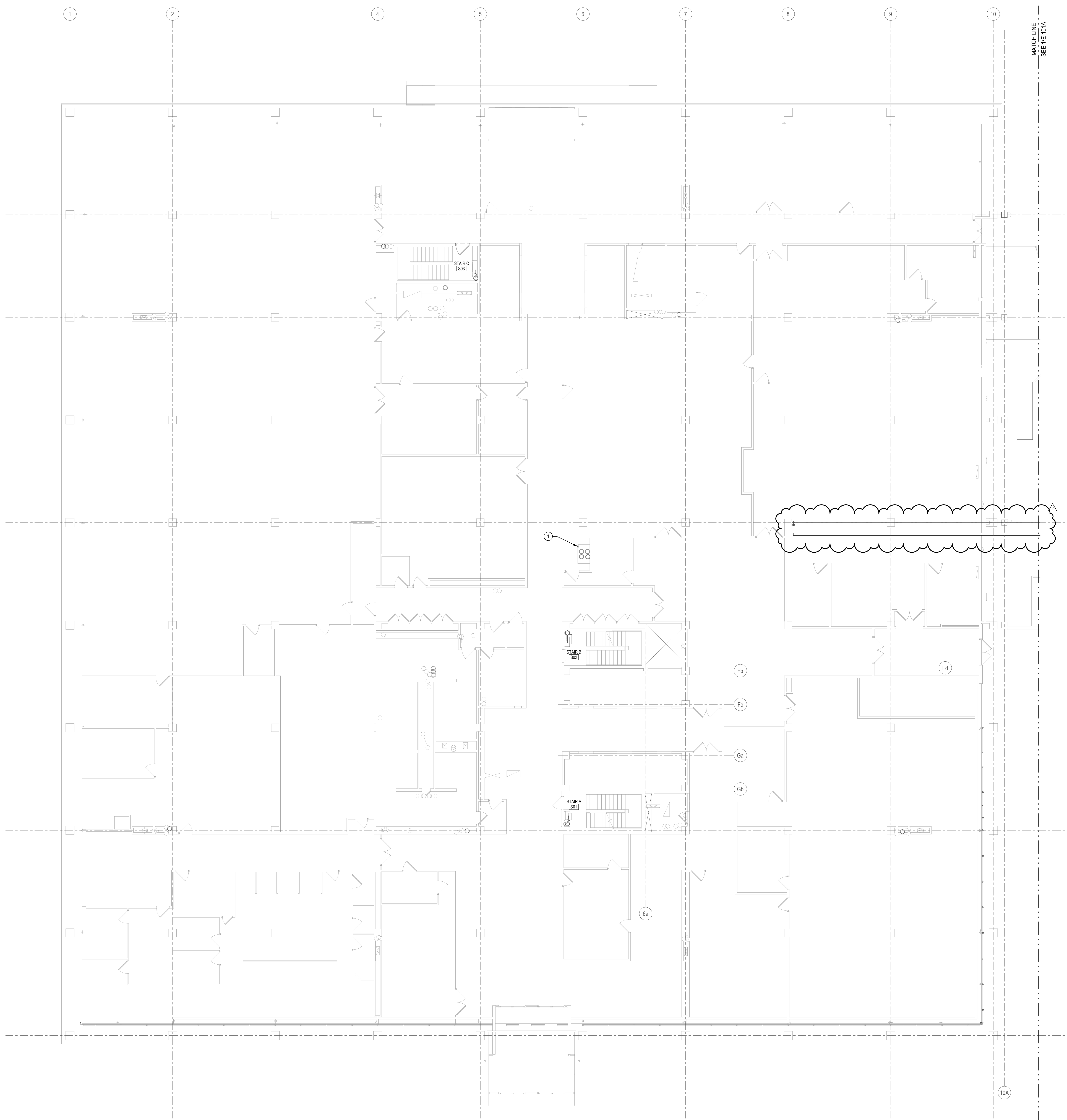


CONTRACT: HVAC
TITLE: RENOVATE BUILDING 8, 8TH & 9TH FLOORS
LOCATION: STATE OFFICE BUILDING CAMPUS 1220 WASHINGTON AVENUE ALBANY, NY
CLIENT: NEW YORK STATE OFFICE OF GENERAL SERVICES

MARK	DATE	DESCRIPTION
2	10/18/2024	ADDENDUM 2
A	09/20/24	FINAL BID DOCUMENTS

PROJECT NUMBER: 45382 - H
DESIGNED BY: SCS
DRAWN BY: KFM
FIELD CHECK BY:
APPROVED BY:

SHEET TITLE: FLOW AND CONTROLS DIAGRAMS
DRAWING NUMBER: M-703



- GENERAL ASBESTOS ABATEMENT NOTES:**
1. EXISTING CONCRETE FLOORS, METAL CEILING DECKS, PLASTER AND GAO WALLS ARE CONTAMINATED WITH ASBESTOS. ALL ELECTRICAL WORK IMPACTING THESE SURFACES SHALL BE COMPLETED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS, AS WELL AS SECTION 00513 AND THE APPROVED SITE SPECIFIC VARIANCE FILE NO. 23-1078. WORK INCLUDES: PULLING NEW WIRES IN EXISTING RACEWAYS, FEEDERS, ETC., MOUNTING BACKERBOARDS TO EXISTING CMU WALLS, INSTALLING HANGERS TO METAL DECK ON THE 7TH AND 8TH FLOORS ONLY, AND INSTALLING CORES IN THE 7TH AND 8TH FLOOR CEILING/FLOOR DECKS, AND INSTALLING CORES THROUGH EXISTING PLASTER/CMU WALLS.
 2. REFER TO SPECIFICATION SECTION 003126 FOR EXISTING HAZARDOUS MATERIALS INFORMATION AND THE PRE-RENOVATION HAZARDOUS MATERIALS SURVEY REPORT APPENDED TO THE PROJECT MANUAL.
 3. ALL FLOOR PENETRATIONS PRESENT AT THE BEGINNING OF WORK OR EXPOSED DURING WORK SHALL BE SEALED WATER-TIGHT AND REMAIN SO THROUGHOUT THE ASBESTOS ABATEMENT ACTIVITIES. IT IS CRITICAL THAT THE CONTAINMENT AREAS REMAIN WATER-TIGHT THROUGHOUT THE DURATION OF THE WORK AND THAT NO LEAKS REACH THE OCCUPIED FLOORS BELOW. THE CONTRACTOR SHALL MAKE EVERY EFFORT TO MINIMIZE SEAMS ON THE FLOORS OF CONTAINMENT ENCLOSURES.
- CODED NOTES:**
1. BUS/DUCT UP SHAFT FROM BASEMENT CONTINUING UP TO PENHOUSE, TO BE PERFORMED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR UNDER THIS CONTRACT.

UNIFORM CODE STATEMENT:
TO THE BEST OF THE REGISTERED DESIGN PROFESSIONAL'S KNOWLEDGE, BELIEF, AND PROFESSIONAL JUDGEMENT, THESE PLANS AND/OR SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 UNIFORM CODE.

ENERGY CODE WRITTEN STATEMENT:
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CONTRACT: ELECTRICAL
TITLE: RENOVATE BUILDING 8, 8TH & 9TH FLOORS
LOCATION: STATE OFFICE BUILDING CAMPUS
1220 WASHINGTON AVENUE
ALBANY, NY
CLIENT: NEW YORK STATE OFFICE OF GENERAL SERVICES

MARK	DATE	DESCRIPTION
2	10/18/2024	ADDENDUM 2
A	09/09/2024	FINAL 80 DOCUMENTS

PROJECT NUMBER: 45382 - E
DESIGNED BY: PMR
DRAWN BY: TJD
FIELD CHECK BY:
APPROVED BY:

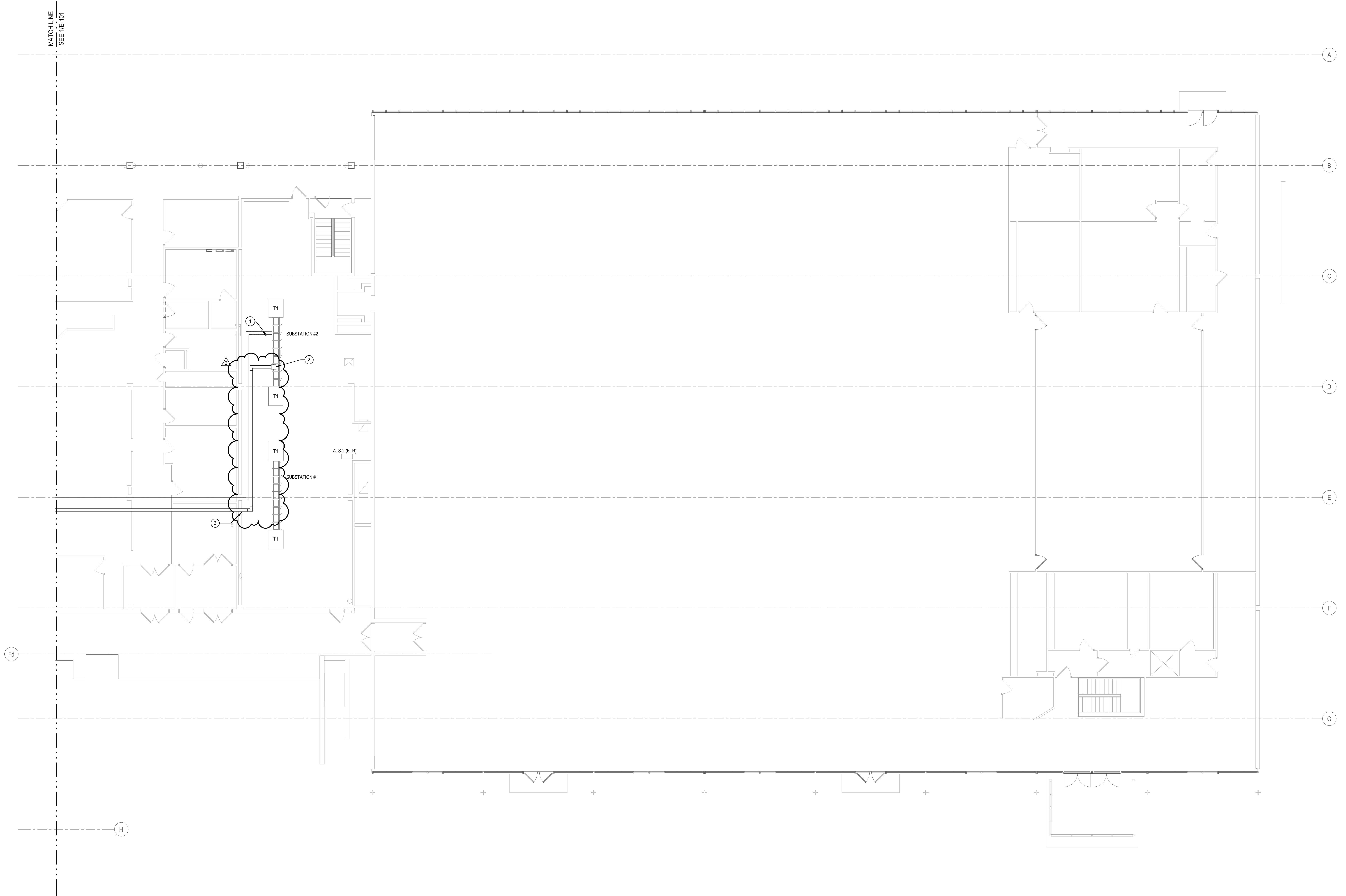
SHEET TITLE: GROUND FLOOR POWER PLAN
DRAWING NUMBER: E-101
SHEET 11 OF 48

1 GROUND FLOOR POWER PLAN
1/8" = 1'-0"

REVISED DRAWING
10/18/2024



- GENERAL ASBESTOS ABATEMENT NOTES:**
- EXISTING CONCRETE FLOORS, METAL CEILING DECKS, PLASTER AND CMU WALLS ARE CONTAMINATED WITH ASBESTOS. ALL ELECTRICAL WORK IMPACTING THESE SURFACES SHALL BE COMPLETED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS, AS WELL AS SECTION 00513 AND THE APPROVED SITE SPECIFIC VARIANCE FILE NO. 23-1078. WORK INCLUDES: PULLING NEW WIRES IN EXISTING BACKBOARDS, FEEDERS, ETC., MOUNTING BACKBOARDS TO EXISTING CMU WALLS, INSTALLING HANGERS TO METAL DECK ON THE 7TH AND 8TH FLOORS ONLY, AND INSTALLING CORES IN THE 7TH AND 8TH FLOOR CEILING/FLOOR DECKS, AND INSTALLING CORES THROUGH EXISTING PLASTER/CMU WALLS.
 - REFER TO SPECIFICATION SECTION 003106 FOR EXISTING HAZARDOUS MATERIALS INFORMATION AND THE PRE-RENOVATION HAZARDOUS MATERIALS SURVEY REPORT APPENDED TO THE PROJECT MANUAL.
 - ALL FLOOR PENETRATIONS PRESENT AT THE BEGINNING OF WORK OR EXPOSED DURING WORK SHALL BE SEALED WATER-TIGHT AND REMAIN SO THROUGHOUT THE ASBESTOS ABATEMENT ACTIVITIES. IT IS CRITICAL THAT THE CONTAINMENT AREAS REMAIN WATER-TIGHT THROUGHOUT THE DURATION OF THE WORK AND THAT NO LEAKS REACH THE OCCUPIED FLOORS BELOW. THE CONTRACTOR SHALL MAKE EVERY EFFORT TO MINIMIZE SEAMS ON THE FLOORS OF CONTAINMENT ENCLOSURES.
- CODED NOTES:**
- PROVIDE (2) #10 AWG (4) CONDUCTOR 2 HOUR FIRE RATED MC CABLE FROM BREAKER IN SUBSTATION TO FIRE PUMP CONTROLLER. SEE DRAWING E-100 FOR CONTINUATION.
 - PROVIDE TRANSITION BOX TO COVER BUSDUCKET TO
 - 4.5" X 7.4" 30A BUSDUCKET FROM SUBSTATION #2 TO PANEL PH-1V3 ON PENTHOUSE LEVEL.



UNIFORM CODE STATEMENT:
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ENERGY CODE WRITTEN STATEMENT:
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CONTRACT: ELECTRICAL

TITLE: RENOVATE BUILDING 8, 8TH & 9TH FLOORS

LOCATION: STATE OFFICE BUILDING CAMPUS
1220 WASHINGTON AVENUE
ALBANY, NY

CLIENT: NEW YORK STATE OFFICE OF GENERAL SERVICES

MARK	DATE	DESCRIPTION
2	10/18/2024	ADDENDUM 2
1	10/07/2024	ADDENDUM 1
A	09/09/2024	FINAL SD DOCUMENTS

PROJECT NUMBER: 45382 - E

DESIGNED BY: PMR

DRAWN BY: TJD

FIELD CHECK BY:

APPROVED BY:

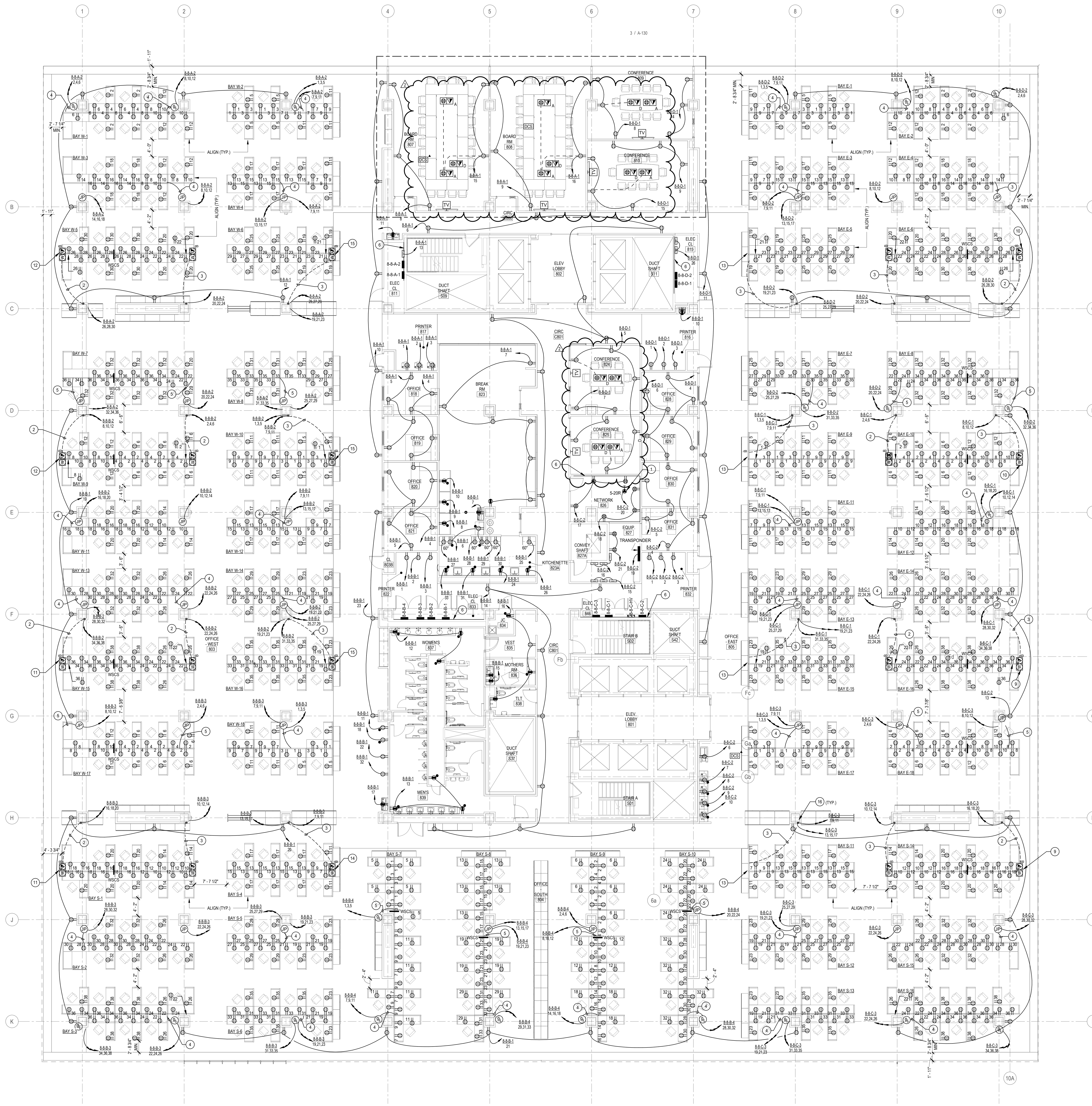
SHEET TITLE: BUILDING 8A - GROUND FLOOR POWER PLAN

DRAWING NUMBER: E-101A

SHEET 12 OF 48

1 BUILDING 8A - GROUND FLOOR POWER PLAN
1/8" = 1'-0"

REVISED DRAWING
10/18/2024



GENERAL ASBESTOS ABATEMENT NOTES:

- EXISTING CONCRETE FLOORS, METAL CEILING DECKS, PLASTER AND CMU WALLS ARE CONTAMINATED WITH ASBESTOS. ALL ELECTRICAL WORK IMPACTING THESE SURFACES SHALL BE COMPLETED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS, AS WELL AS SECTION 00313 AND THE APPROVED SITE SPECIFIC VARIANCE FILE NO. 23-1078 WORK INCLUDES: PULLING NEW WIRES IN EXISTING FRACKERS, FEEDERS, ETC., MOUNTING BACKBOARDS TO EXISTING CMU WALLS, INSTALLING HANGERS INTO METAL DECK ON THE 7TH AND 8TH FLOORS ONLY, AND INSTALLING CORES IN THE 7TH AND 8TH FLOOR CEILING DECKS, AND INSTALLING CORES THROUGH EXISTING PLASTER/CMU WALLS.
- REFER TO SPECIFICATION SECTION 00313 FOR EXISTING HAZARDOUS MATERIALS INFORMATION AND THE RE-ASSESSMENT OF HAZARDOUS MATERIALS SURVEY REPORT APPENDED TO THE PROJECT MANUAL.
- ALL FLOOR PENETRATIONS PRESENT AT THE BEGINNING OF WORK OR EXPOSED DURING WORK SHALL BE SEALED WATER-TIGHT AND REMAIN SO THROUGHOUT THE ASBESTOS ABATEMENT ACTIVITIES. IT IS CRITICAL THAT THE CONTAMINATION AREAS REMAIN WATER-TIGHT THROUGHOUT THE DURATION OF THE WORK AND THAT NO LEAKS REACH THE OCCUPIED FLOORS BELOW. THE CONTRACTOR SHALL MAKE EVERY EFFORT TO MINIMIZE SEAMS ON THE FLOORS OF CONTAMINATION ENCLOSURES.

GENERAL NOTES:

- RECEPTACLES SHOWN IN WORKSTATIONS ARE FOR DIAGNOSTIC PURPOSES ONLY AND ARE PROVIDED BY FURNITURE VENDOR.
- PRIOR TO INSTALLATION OF POKE THRU DEVICES, COORDINATE WITH APPROVED FURNITURE LAYOUT FOR EXACT LOCATION.
- SEE FURNITURE WIRING DIAGRAM ON DWG E-702 FOR CONDUCTOR QUANTITIES AND CONNECTIONS TO THE FURNITURE POWER WIRING SYSTEM. ALL NEUTRAL CONDUCTORS SHALL BE SIZED #10. CONTROLLED RECEPTACLES SHALL BE PROVIDED WITH DEDICATED GROUND AND NEUTRAL.
- SEE TYPICAL LIGHTING CONTROL WIRING DIAGRAM ON DWG E-702. COORDINATE POINTS OF CONNECTION AND OPTIMUM DEVICE LOCATIONS WITH THE CONTROL EQUIPMENT VENDOR.

CODED NOTES:

- PROVIDE NEMA 5-20R RECEPTACLE IN ELECTRONIC EQUIPMENT RACK FOR CCTV SYSTEM UPS. SEE CCTV RACK DIAGRAM ON DWG E-608 FOR ADDITIONAL INFORMATION.
- PROVIDE 3/4" CONDUIT WITH (12) CONDUCTORS FROM POWER PANEL AND CIRCUIT INDICATED ABOVE. SUSPEND CEILING DOWN COLUMN TO FLOOR BELOW THEN UP THROUGH POKE THRU BOX TO 3/4" FLEXIBLE CONDUIT TO FURNITURE BASEBOARD WIRING SYSTEM. TO BE PERFORMED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR UNDER THIS CONTRACT.
- PROVIDE 1" CONDUIT WITH (10) CONDUCTORS FROM POWER PANEL AND CIRCUIT INDICATED ABOVE. SUSPEND CEILING DOWN COLUMN TO FLOOR BELOW THEN UP THROUGH POKE THRU BOX TO 1" FLEXIBLE CONDUIT TO FURNITURE BASEBOARD WIRING SYSTEM. TO BE PERFORMED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR UNDER THIS CONTRACT.
- PROVIDE 3/4" FLEXIBLE CONDUIT WITH (12) CONDUCTORS FROM FXX" JUNCTION BOX TO FURNITURE BASEBOARD WIRING SYSTEM.
- PROVIDE 3/4" FLEXIBLE CONDUIT WITH (12) CONDUCTORS FROM FXX" JUNCTION BOX TO FURNITURE BASEBOARD WIRING SYSTEM.
- PROVIDE 3/4" THICK 4X8 SHEETS OF PLYWOOD AS REQUIRED TO COVER ALL WALLS IN ELECTRICAL ROOMS AND NETWORK ROOM. PLYWOOD SHALL BE FR-5 TYPE TO ACHIEVE FLAME-RATED RATING OF 50 OR LESS. PROVIDE UL MARK ON ALL PIECES INDICATING COMPLIANCE. PAINTING BY GENERAL CONTRACTOR TO BE PERFORMED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR UNDER THIS CONTRACT.
- INSTALL PER DETAIL 8 ON DRAWING E-701.
- INSTALL PER DETAIL 14 ON DRAWING E-701.
- INSTALL POKE THRU(S) PER DETAIL 4 ON DRAWING E-703.
- INSTALL POKE THRU(S) PER DETAIL 5 ON DRAWING E-703.
- INSTALL POKE THRU(S) PER DETAIL 6 ON DRAWING E-703.
- INSTALL POKE THRU(S) PER DETAIL 7 ON DRAWING E-703.
- INSTALL POKE THRU PER DETAIL 8 ON DRAWING E-703.
- INSTALL POKE THRU PER DETAIL 9 ON DRAWING E-703.
- INSTALL POKE THRU PER DETAIL 10 ON DRAWING E-703.
- CORE DRILL THROUGH COLUMN TO BE PERFORMED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR UNDER THIS CONTRACT.

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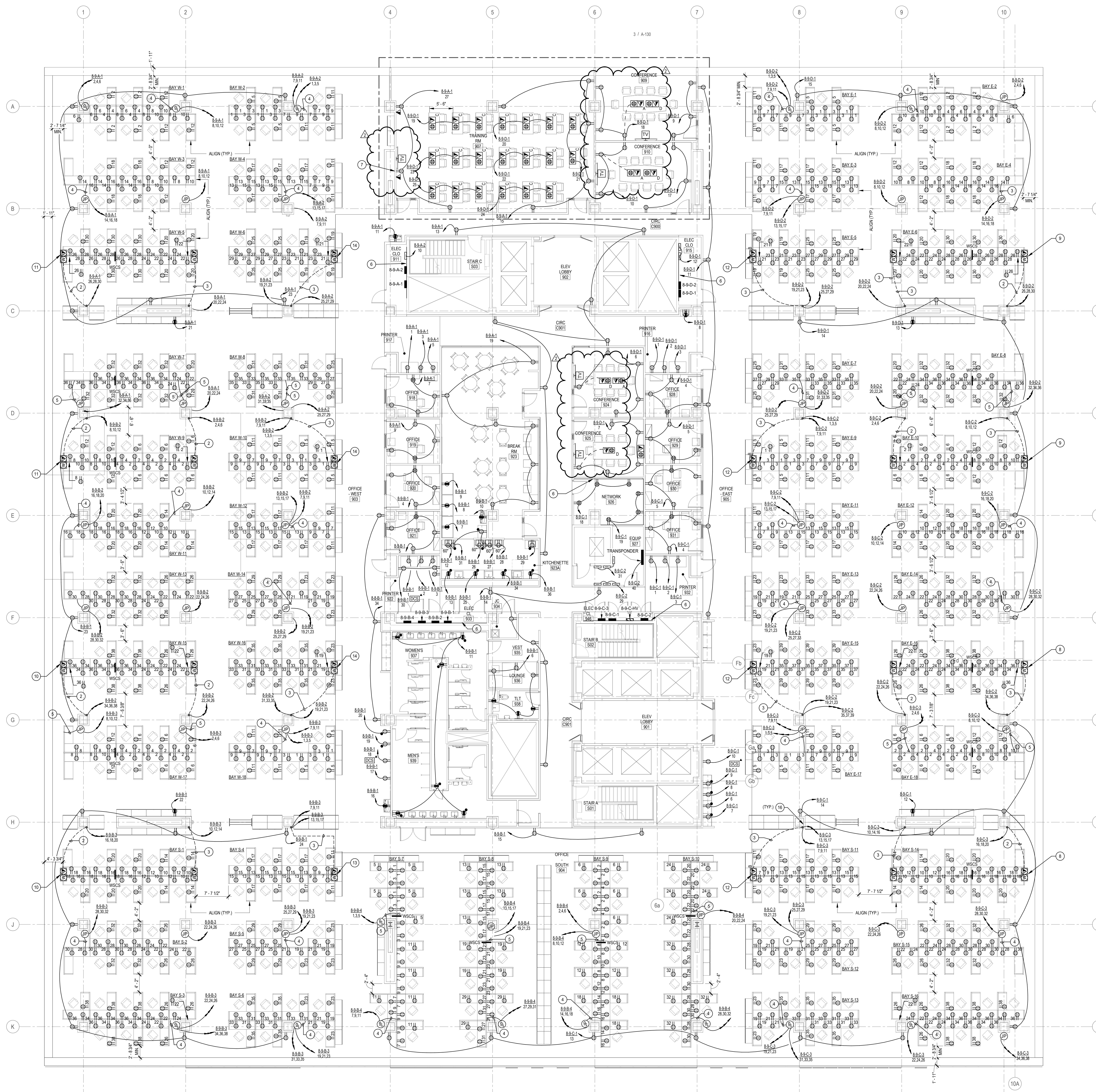


CONTRACT: ELECTRICAL
TITLE: RENOVATE BUILDING 8, 8TH & 9TH FLOORS
LOCATION: STATE OFFICE BUILDING CAMPUS 1220 WASHINGTON AVENUE ALBANY, NY
CLIENT: NEW YORK STATE OFFICE OF GENERAL SERVICES

MARK	DATE	DESCRIPTION
2	10/18/2024	ADDENDUM 2
4	09/09/2024	FINAL 80 DOCUMENTS
PROJECT NUMBER:	45382 - E	
DESIGNED BY:	PMR	
DRAWN BY:	TJD	
FIELD CHECK BY:		
APPROVED BY:		
SHEET TITLE:	8TH FLOOR POWER PLAN	

1 8TH FLOOR POWER PLAN
1/8" = 1'-0"

REVISED DRAWING
10/18/2024



- GENERAL ASBESTOS ABATEMENT NOTES:**
- EXISTING CONCRETE FLOORS, METAL CEILING DECKS, PLASTER AND CMU WALLS ARE CONTAMINATED WITH ASBESTOS. ALL ELECTRICAL WORK IMPACTING THESE SURFACES SHALL BE COMPLETED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS AS WELL AS SECTION 08213 AND THE APPROVED SITE SPECIFIC VARIANCE FILE NO. 23-1078. WORK INCLUDES: PULLING NEW WIRES IN EXISTING FRANKERS, FEEDERS, ETC., MOUNTING BACKBOARDS TO EXISTING CMU WALLS, INSTALLING HANGERS INTO METAL DECK ON THE 7TH AND 8TH FLOORS ONLY, AND INSTALLING CORES IN THE 7TH AND 8TH FLOOR CEILING DECK DECKS, AND INSTALLING CORES THROUGH EXISTING PLASTER/CMU WALLS.
 - REFER TO SPECIFICATION SECTION 03126 FOR EXISTING HAZARDOUS MATERIALS INFORMATION AND THE RENOVATE HAZARDOUS MATERIALS SURVEY REPORT APPENDED TO THE PROJECT MANUAL.
 - ALL FLOOR PENETRATIONS PRESENT AT THE BEGINNING OF WORK OR EXPOSED DURING WORK SHALL BE SEALED WATER-TIGHT AND REMAIN WATER-TIGHT THROUGHOUT THE ASBESTOS ABATEMENT ACTIVITIES. IT IS CRITICAL THAT THE CONTAMINATION AREAS REMAIN WATER-TIGHT THROUGHOUT THE DURATION OF THE WORK AND THAT NO LEAKS REACH THE OCCUPIED FLOORS BELOW. THE CONTRACTOR SHALL MAKE EVERY EFFORT TO MINIMIZE SEAMS ON THE FLOORS OF CONTAMINATION ENCLOSURES.
- GENERAL NOTES:**
- RECEPTACLES SHOWN IN WORKSTATIONS ARE FOR DIAGNOSTIC PURPOSES ONLY AND ARE PROVIDED BY FURNITURE VENDOR.
 - PRIOR TO INSTALLATION OF POKE THRU DEVICES, COORDINATE WITH APPROVED FURNITURE LAYOUT FOR EXACT LOCATION.
 - SEE FURNITURE WIRING DIAGRAM ON DWG E-703 FOR CONDUCTOR QUANTITIES AND CONNECTIONS TO THE FURNITURE POWER WIRING SYSTEM. ALL NEUTRAL CONDUCTORS SHALL BE SIZED #10. CONTROLLED RECEPTACLES SHALL BE PROVIDED WITH DEDICATED GROUND AND NEUTRAL.
 - SEE TYPICAL LIGHTING CONTROL WIRING DIAGRAMS ON DWG E-702. COORDINATE POINTS OF CONNECTION AND OPTIMUM DEVICE LOCATIONS WITH THE CONTROL EQUIPMENT VENDOR.
 - IMPACTS TO THE 8TH FLOOR CEILING ARE NOT ABATEMENT.
- CODED NOTES:**
- PROVIDE NEMA 5-20R RECEPTACLE IN ELECTRONIC EQUIPMENT BACK FOR CCTV SYSTEM UPS. SEE CCTV RISER DIAGRAM ON DWG E-608 FOR ADDITIONAL INFORMATION.
 - PROVIDE 3/4" CONDUIT WITH (12) CONDUCTORS FROM POWER PANEL AND CIRCUIT INDICATED ABOVE. SUSPEND CEILING DOWN COLUMN TO FLOOR BELOW THEN UP THROUGH POKE THRU BOX TO 3/4" FLEXIBLE CONDUIT TO FURNITURE BASEBOARD WIRING SYSTEM TO BE PERFORMED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR UNDER THIS CONTRACT.
 - PROVIDE 1" CONDUIT WITH (10) CONDUCTORS FROM POWER PANEL AND CIRCUIT INDICATED ABOVE. SUSPEND CEILING DOWN COLUMN TO FLOOR BELOW THEN UP THROUGH POKE THRU BOX TO 1" FLEXIBLE CONDUIT TO FURNITURE BASEBOARD WIRING SYSTEM.
 - PROVIDE 1" FLEXIBLE CONDUIT WITH (10) CONDUCTORS FROM 4"x4" JUNCTION BOX TO FURNITURE BASEBOARD WIRING SYSTEM.
 - PROVIDE 3/4" FLEXIBLE CONDUIT WITH (12) CONDUCTORS FROM 4"x4" JUNCTION BOX TO FURNITURE BASEBOARD WIRING SYSTEM.
 - PROVIDE 3/4" THICK 4'x8' SHEETS OF PLYWOOD AS REQUIRED TO COVER ALL WALLS IN ELECTRICAL ROOMS AND NETWORK ROOM. PLYWOOD SHALL BE F-5 TYPE TO ACHIEVE FLAME-Spread Rating of 25 OR LESS. PROVIDE UL MARK ON ALL PIECES INDICATING COMPLIANCE. PAINTING BY GENERAL CONTRACTOR TO BE PERFORMED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR UNDER THIS CONTRACT.
 - INSTALL PER DETAIL 14 ON SHEET E-701.
 - INSTALL POKE THRU(S) PER DETAIL 4 ON DRAWING E-703.
 - INSTALL POKE THRU(S) PER DETAIL 5 ON DRAWING E-703.
 - INSTALL POKE THRU(S) PER DETAIL 6 ON DRAWING E-703.
 - INSTALL POKE THRU(S) PER DETAIL 7 ON DRAWING E-703.
 - INSTALL POKE THRU PER DETAIL 8 ON DRAWING E-703.
 - INSTALL POKE THRU PER DETAIL 8 ON DRAWING E-703.
 - INSTALL POKE THRU PER DETAIL 10 ON DRAWING E-703.
 - CORE DRILL THROUGH COLUMN TO BE PERFORMED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR UNDER THIS CONTRACT.

UNIFORM CODE STATEMENT:
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ENERGY CODE WRITTEN STATEMENT:
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CONTRACT: ELECTRICAL
TITLE: RENOVATE BUILDING 8, 8TH & 9TH FLOORS
LOCATION: STATE OFFICE BUILDING CAMPUS 1220 WASHINGTON AVENUE ALBANY, NY
CLIENT: NEW YORK STATE OFFICE OF GENERAL SERVICES

MARK	DATE	DESCRIPTION
2	10/18/2024	ADDENDUM 2
4	09/09/2024	FINAL 80 DOCUMENTS

PROJECT NUMBER: 45382 - E
DESIGNED BY: PMR
DRAWN BY: TJD
FIELD CHECK BY:
APPROVED BY:
SHEET TITLE:

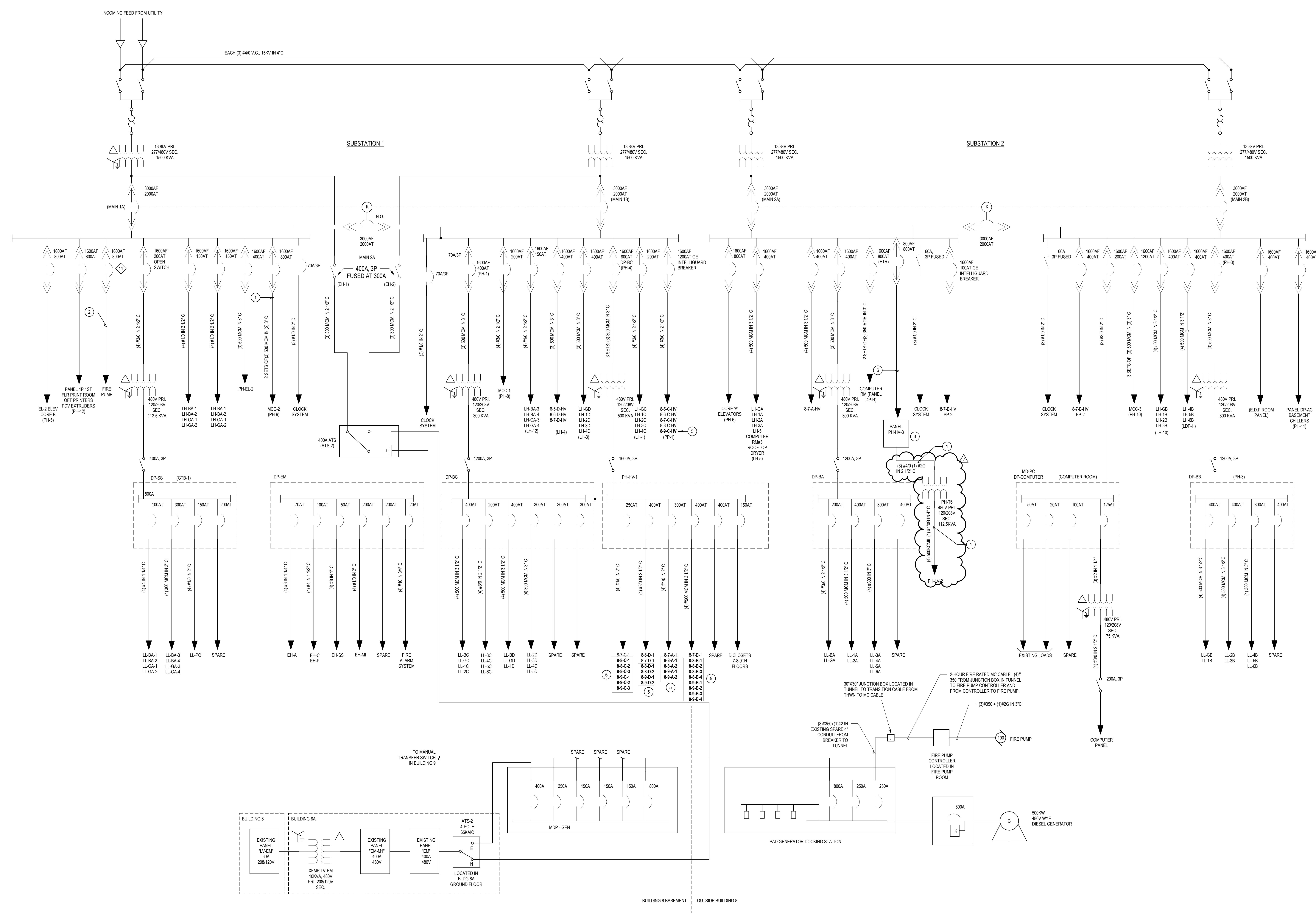
REVISED DRAWING
10/18/2024

9TH FLOOR POWER PLAN

1 9TH FLOOR POWER PLAN
1/8" = 1'-0"



- GENERAL NOTES:
1. DESCRIPTIONS IN PARENTHESIS REPRESENT THE DESCRIPTION INDICATED ON THE BLACK LAMINATED LABEL ON THE SUBSTATIONS.
 2. TEXT IN "Y" PARENTHESIS INDICATE ONE OF THE LABELS FOUND IN SUBSTATIONS. OTHER DESCRIPTIONS WERE ALSO FOUND ON SWITCHGEARD ON MASHING TAPE. BOTH ARE LISTED FOR CLARITY.
- CODED NOTES: (1)
1. VERIFY EXISTING BREAKER SIZE, CONDUIT SIZE & CONDUCTORS TRIP SETTING. CIRCUIT TRACE TO CONDUIT LOAD.
 2. PROVIDE BREAKER COMPATIBLE WITH GE SUBSTATION AS MANUFACTURED BY ABB. PROVIDE FRAME AND TRIP SETTING AS INDICATED.
 3. PROVIDE 800A RATED, 480V, 3-PHASE, 4-WIRE LINE POWER PANEL.
 4. NOT USED.
 5. POWER PANELS SHOWN IN BOLD TEXT ARE EXISTING POWER PANELS BEING REPLACED WITH ONES IN PARENTHESIS. ALL PANELS SHALL BE 120" WIDE BY 72" DEEP.
 6. 800A BUSDUCT. PROVIDE TRANSITION BOX AND ALL FITTINGS NECESSARY TO CONNECT TO SUBSTATION BREAKER AS WELL AS LINE POWER PANEL PHHV.3



1 BUILDING 8 & 8A SINGLE LINE DIAGRAM
NOT TO SCALE

REVISED DRAWING
10/18/2024

UNIFORM CODE STATEMENT:
TO THE BEST OF THE REGISTERED DESIGN PROFESSIONAL'S KNOWLEDGE, BELIEF, AND PROFESSIONAL JUDGEMENT, THESE PLANS AND/OR SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 UNIFORM CODE.

ENERGY CODE WRITTEN STATEMENT:
TO THE BEST OF THE REGISTERED DESIGN PROFESSIONAL'S KNOWLEDGE, BELIEF, AND PROFESSIONAL JUDGEMENT, THESE PLANS AND/OR SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 ENERGY CODE.

WARNING:
THE ALTERATION OF THIS MATERIAL IN ANY WAY, UNLESS DONE UNDER THE DIRECTION OF A COMPARABLE PROFESSIONAL, L.L. ARCHITECT FOR AN ARCHITECT, ENGINEER FOR AN ENGINEER OR LANDSCAPE ARCHITECT FOR A LANDSCAPE ARCHITECT, IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW AND/OR REGULATIONS AND IS A CLASS "A" MISDEMEANOR.

CONTRACT: ELECTRICAL
TITLE: RENOVATE BUILDING 8, 8TH & 9TH FLOORS
LOCATION: STATE OFFICE BUILDING CAMPUS 1220 WASHINGTON AVENUE ALBANY, NY
CLIENT: NEW YORK STATE OFFICE OF GENERAL SERVICES

MARK	DATE	DESCRIPTION
2	10/18/2024	ADDENDUM 2
1	10/07/2024	ADDENDUM 1
A	09/09/2024	FINAL 800 DOCUMENTS

PROJECT NUMBER: 45382 - E
DESIGNED BY: PMR
DRAWN BY: TJD
FIELD CHECK BY:
APPROVED BY:

SHEET TITLE:
BUILDING 8 & 8A SINGLE LINE DIAGRAM - PLANS