

ADDENDUM NO. 3

April 30, 2025

This Addendum contains changes to the requirements of the Contract Documents and Specifications. Such changes are to be incorporated into the Construction Documents and shall apply to the work with the same meaning and force as if they had been included in the original document. Wherever this Addendum modifies a portion of a paragraph of the specifications or a portion of any Drawing, the remainder of the Paragraph or Drawing shall remain in force.

NOTE: Provisions of all Contract Documents apply.

Item 1. BID FORM, Item 9 – Schedule of Values, page BF-7

DELETE page BF-7 in its entirety.

REPLACE with revised Schedule of Values, page BF-7R, attached.

Item 2. Section 01 21 00 3.3 - SCHEDULE OF ALLOWANCES

ADD Allowance No. 3:

Lump Sum Allowance: Include the sum of **\$10,000** for the installation of branding and signage, which includes vinyl applications and mounted signage.

TECHNICAL SPECIFICATIONS

Item 3. Section 08 71 00 FINISH HARDWARE

DELETE Section 08 71 00 dated January 31, 2025, in its entirety.

REPLACE with revised Section 08 71 00 dated April 29, 2025, attached.

Item 4. Section 10 22 19 DEMOUNTABLE PARTITIONS

DELETE Section 10 22 19 dated January 31, 2025, in its entirety.

REPLACE with revise Section 10 22 19 dated April 29, 2025, attached.

Item 5. Section 22 05 53 PLUMBING IDENTIFICATION

DELETE Section 22 05 53 dated January 31, 2025, in its entirety.

REPLACE with revised Section 22 05 53 dated April 29, 2025, attached.

Item 6. Section 22 07 00 INSULATION

DELETE Section 22 07 00 dated January 31, 2025, in its entirety.

REPLACE with revised Section 22 07 00 dated April 29, 2025, attached.

Item 7. Section 22 10 10 PIPING SYSTEMS AND ACCESSORIES

DELETE Section 22 10 10 dated January 31, 2025, in its entirety.

REPLACE with revised Section 22 10 10 dated April 29, 2025, attached.

Item 8. Section 22 40 00 PLUMBING FIXTURES AND TRIM

DELETE Section 22 40 00 dated January 31, 2025, in its entirety.

REPLACE with revised Section 22 40 00 dated April 29, 2025, attached.

Item 9. Section 23 05 04 ELECTRIC WIRING

DELETE Section 23 05 04 dated January 31, 2025, in its entirety.

REPLACE with revised Section 23 05 04 dated April 29, 2025, attached.

Item 10. Section 23 09 23 BUILDING AUTOMATION CONTROL SYSTEM

DELETE Section 23 09 23 dated January 31, 2025, in its entirety.

REPLACE with revised Section 23 09 23 dated April 29, 2025, attached.

Item 11. Section 23 31 00 SHEET METAL AND DUCTWORK ACCESSORIES

DELETE Section 23 31 00 dated January 31, 2025, in its entirety.

REPLACE with revised Section 23 31 00 dated April 29, 2025, attached.

Item 12. Section 23 33 13 FIRE AND SMOKE DAMPERS

DELETE Section 23 33 13 dated January 31, 2025, in its entirety.

REPLACE with revised Section 23 33 13 dated April 29, 2025, attached.

Item 13. Section 23 36 00 VARIABLE VOLUME TERMINAL UNITS

DELETE Section 23 36 00 dated January 31, 2025, in its entirety.

REPLACE with revised Section 23 36 00 dated April 29, 2025, attached.

Item 14. Section 23 37 13 REGISTERS AND DIFFUSERS

DELETE Section 23 37 13 dated January 31, 2025, in its entirety.

REPLACE with revised Section 23 37 13 dated April 29, 2025, attached.

DRAWINGS

Item 15. Drawing A-202

DELETE in its entirety.

REPLACE with revised Drawing A-202R, attached.

Item 16. Drawing A-203

DELETE in its entirety.

REPLACE with revised Drawing A-203R, attached.

Item 17. Drawing A-704

DELETE in its entirety.

REPLACE with revised Drawing A-704R, attached.

Item 18. Drawing A-707

DELETE in its entirety.

REPLACE with revised Drawing A-707R, attached.

Item 19. Drawing A-709

DELETE in its entirety.

REPLACE with revised Drawing A-709R, attached.

Item 20. Drawing A-719

DELETE in its entirety.

REPLACE with revised Drawing A-719R, attached.

Item 21. Drawing A-730

DELETE in its entirety.

REPLACE with revised Drawing A-730R, attached.

Item 22. Drawing S-001

DELETE in its entirety.

REPLACE with revised Drawing S-001R, attached.

Item 23. Drawing S-002

DELETE in its entirety.

REPLACE with revised Drawing S-002R, attached.

Item 24. Drawing M-000

DELETE in its entirety.

REPLACE with revised Drawing M-000R, attached.

Item 25. Drawing DM-201

DELETE in its entirety.

REPLACE with revised Drawing DM-201R, attached.

Item 26. Drawing DM-202

DELETE in its entirety.

REPLACE with revised Drawing DM-202R, attached.

Item 27. Drawing DM-203

DELETE in its entirety.

REPLACE with revised Drawing DM-203R, attached.

Item 28. Drawing DM-204

DELETE in its entirety.

REPLACE with revised Drawing DM-204R, attached.

Item 29. Drawing M-201

DELETE in its entirety.

REPLACE with revised Drawing M-201R, attached.

Item 30. Drawing M-202

DELETE in its entirety.

REPLACE with revised Drawing M-202R, attached.

Item 31. Drawing M-203

DELETE in its entirety.

REPLACE with revised Drawing M-203R, attached.

Item 32. Drawing M-204

DELETE in its entirety.

REPLACE with revised Drawing M-204R, attached.

Item 33. Drawing M-302

DELETE in its entirety.

REPLACE with revised Drawing M-302R, attached.

Item 34. Drawing M-400

DELETE in its entirety.

REPLACE with revised Drawing M-400R, attached.

Item 35. Drawing M-500

DELETE in its entirety.

REPLACE with revised Drawing M-500R, attached.

Item 36. Drawing DP-100

DELETE in its entirety.

REPLACE with revised Drawing DP-100R, attached.

Item 37. Drawing DP-101

DELETE in its entirety.

REPLACE with revised Drawing DP-101R, attached.

Item 38. Drawing DP-102

DELETE in its entirety.

REPLACE with revised Drawing DP-102R, attached.

Item 39. Drawing P-200

DELETE in its entirety.

REPLACE with revised Drawing P-200R, attached.

Item 40. Drawing P-201

DELETE in its entirety.

REPLACE with revised Drawing P-201R, attached.

Item 41. Drawing P-203

DELETE in its entirety.

REPLACE with revised Drawing P-203R, attached.

Item 42. Drawing DFP-101

DELETE in its entirety.

REPLACE with revised Drawing DFP-101R, attached.

Item 43. Drawing FP-201

DELETE in its entirety.

REPLACE with revised Drawing FP-201R, attached.

Item 44. Drawing DE-202

DELETE in its entirety.

REPLACE with revised Drawing DE-202R, attached.

Item 45. Drawing DE-203

DELETE in its entirety.

REPLACE with revised Drawing DE-203R, attached.

Item 46. Drawing E-201

DELETE in its entirety.

REPLACE with revised Drawing E-201R, attached.

Item 47. Drawing E-202

DELETE in its entirety.

REPLACE with revised Drawing E-202R, attached.

Item 48. Drawing E-203

DELETE in its entirety.

REPLACE with revised Drawing E-203R, attached.

Item 49. Drawing E-204

DELETE in its entirety.

REPLACE with revised Drawing E-204R, attached.

Item 50. Drawing E-212

DELETE in its entirety.

REPLACE with revised Drawing E-212R, attached.

Item 51. Drawing E-213

DELETE in its entirety.

REPLACE with revised Drawing E-213R, attached.

Item 52. Drawing E-214

DELETE in its entirety.

REPLACE with revised Drawing E-214R, attached.

Item 53. Drawing E-400

DELETE in its entirety.

REPLACE with revised Drawing E-400R, attached.

Item 54. Drawing TN-201

DELETE in its entirety.

REPLACE with revised Drawing TN-201R, attached.

Item 55. Drawing TN-202

DELETE in its entirety.

REPLACE with revised Drawing TN-202R, attached.

Item 56. RFI Questions and Clarifications

See attached RFI Log (Items 1 – 23)

Attachments: BF-7R

Specification 08 71 00
Specification 10 22 19
Specification 22 05 53
Specification 22 07 00
Specification 22 10 10
Specification 22 40 00

Specification 23 05 04
Specification 23 09 23
Specification 23 31 00
Specification 23 33 13
Specification 23 36 00
Specification 23 37 13

Drawing A-202R
Drawing A-203R
Drawing A-704R
Drawing A-707R
Drawing A-709R
Drawing A-719R
Drawing A-730R
Drawing S-001R
Drawing S-002R
Drawing M-000R
Drawing DM-201R
Drawing DM-202R
Drawing DM-203R
Drawing DM-204R

Drawing M-201R
Drawing M-202R
Drawing M-203R
Drawing M-204R
Drawing M-302R
Drawing M-400R
Drawing M-500R
Drawing DP-100R
Drawing DP-101R
Drawing DP-102R
Drawing P-200R
Drawing P-201R
Drawing P-203R
Drawing DFP-101R

Drawing FP-201R
Drawing DE-202R
Drawing DE-203R
Drawing E-201R
Drawing E-202R
Drawing E-203R
Drawing E-204R
Drawing E-212R
Drawing E-213R
Drawing E-214R
Drawing E-400R
Drawing TN-201R
Drawing TN-202R

RFI Log (1-23)

****END OF ADDENDUM****

9. SCHEDULE OF VALUES *(Revised)*

a. The undersigned agrees, prior to the award of a construction contract and upon the request of the Architect or Owner, to submit a complete, itemized and detailed "Schedule of Values" including Alternates elected, if any, showing the amount allocated to the various trades and subdivisions of the work, aggregating the total Contract Sum.

b. To facilitate the evaluation of Bids, the undersigned has included in each part of his Bid the following values for the trades and/or subdivisions of the work as listed below. Values for work included under Alternate Proposals are excluded. Values relative to General Contractor's costs for General Conditions are excluded.

<u>Spec Section</u>	<u>Trades and/or Subdivision</u>	<u>Value Included in Base Bid</u>
<u>Division 01</u>	<u>General Requirements</u>	
<u>Division 02</u>	<u>Existing Conditions</u>	
<u>Division 03</u>	<u>Concrete</u>	
<u>Division 04</u>	<u>Metals</u>	
<u>Division 06</u>	<u>Wood, Plastics, and Composites</u>	
<u>Division 07</u>	<u>Thermal and Moisture Protection</u>	
<u>Division 08</u>	<u>Openings</u>	
<u>Division 09</u>	<u>Finishes</u>	
<u>Division 10</u>	<u>Specialties</u>	
<u>Division 11</u>	<u>Equipment</u>	
<u>Division 12</u>	<u>Furnishings</u>	
<u>Division 21</u>	<u>Fire Suppression</u>	
<u>Division 22</u>	<u>Plumbing</u>	
<u>Division 23</u>	<u>Heating, Ventilation, and Air Conditioning</u>	
<u>Division 26</u>	<u>Electrical</u>	
<u>Division 27</u>	<u>Communications</u>	
<u>Division 28</u>	<u>Electronic Safety and Security</u>	
	<u>Field Order Allowance No. 1</u>	<u>\$ 250,000</u>
	<u>Allowance No. 2</u>	<u>\$ 10,000</u>
	<u>Allowance No. 3</u>	<u>\$ 10,000</u>
Total Bid		<u>\$</u>

SECTION 087100
FINISH HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

- A. The required hardware items for doors are indicated in hardware sets shown herein. Should any opening be omitted, hardware shall be provided as specified for other doors of similar locations, function, quality and design.

1.02 RELATED SECTIONS

- A. Section 081113: Metal doors and frames.
- B. Section 081416: Wood doors and frames.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with the provisions of the general contract documents.
- B. Product Data: Submit two (2) copies of the manufacturer's data for each item of hardware. Include whatever information may be necessary to show compliance with requirements.
- C. Hardware Schedule: Submit three (3) copies of the hardware schedule. Follow Door and Hardware Institute (DHI) guidelines for scheduling. At the end of the schedule list each door number with appropriate heading number and hardware set number. Furnish initial draft of schedule at the earliest possible date, in order to facilitate the fabrication of other work. Furnish final schedule after samples, manufacturer's data sheets have been approved.
- D. Keying Schedule: A key schedule showing all key numbers and spaces to which each permits entry, shall be provided. Consult with OWNER before submitting final key schedule. After final approval has been received, the schedule along with the key gathering envelopes containing keys for each lock endorsed with lock number and space designation shall be turned over to the OWNERS.
- E. Samples: Prior to submittal of the final hardware schedule and prior to delivery of hardware, submit one (1) sample of each exposed hardware unit. Sample will be reviewed by the ARCHITECT for design, color and texture only. Compliance with other requirements is the exclusive responsibility of the CONTRACTOR. Samples approved by the ARCHITECT shall be turned over to the OWNER to be used as attic stock.

1.04 QUALITY ASSURANCE

- A. Standards: All finish hardware shall conform to one or all the following standards:
 - 1. Testing Laboratories: Underwriters Laboratory (UL) and or Warnock Hersey Fire Laboratories Division: All fire rated doors shall have hardware assemblies approved by one of the listed laboratories.
 - 2. National Fire Protection Association: NFPA 80 and NFPA 101.
 - 3. Builders Hardware Manufacturers Association (BHMA).

4. American National Standards Institute (ANSI).
5. American Disabilities Act (ADA).

- B. Supplier: Finish hardware shall be furnished by those having a minimum of 5 years of builder's hardware experience and shall have in their employ at least one certified Architectural Hardware Consultants (AHC) to correctly interpret the plans, detailed drawings and specifications. It is imperative that all Finish Hardware items be furnished by a factory authorized contract hardware distributor for each of the specified products.

1.05 PRODUCT HANDLING

- A. Handle, store, distribute, protect and install in accordance with the manufactures instructions. Deliver packaged material in original containers with seals unbroken and labels intact. Deliver assemblies completely identified and with adequate protection for storage, handling and installation.
- B. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control the handling and installation of hardware which are not immediately replaceable, so that completion of the work will not be delayed by hardware losses; both before and after installation.

1.06 PROJECT CONDITIONS

- A. Coordinate hardware with other work. Tag each item or package separately, with identification related to the final hardware schedule, and include basic installation instructions in the package. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated and as necessary for proper installation and function. Deliver packaged hardware items to the proper locations for installation.
- B. Furnish hardware templates to each fabricator of doors, frames and other work to be factory prepared for the installation of hardware.

1.07 WARRANTIES

- A. The hardware manufacturers shall provide full replacement warranty as listed below. Replacement warranty shall not include any labor cost.
- | | |
|------------------------|-----------|
| 1. Surface Closers | 10 years. |
| 2. Locksets etc. | 2 years |
| 3. Balance of hardware | 2 years |

PART 2 - PRODUCTS

2.01 MATERIALS AND FABRICATION

- A. Hand of Door: The drawings show the swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of the door swing shown.
- B. Base Metals: Produce hardware units of the basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness but in no case of lesser quality material.
- C. Fasteners: Manufacture hardware to conform to published templates, generally prepared for machine screw installation. Do not provide hardware, which has been prepared for self-tapping sheet metal screws.
- D. Screws: Furnish screws for installation, with each hardware item. Finish exposed screws to match the hardware finish.
- E. Tools for Maintenance: Furnish a complete set of specialized tools as needed, for the OWNERS continued maintenance, removal and replacement of hardware.
- F. Concealed Fasteners: Provide concealed fasteners for hardware units which are exposed when the door is closed except to the extent no standard manufacturer's units are available with concealed fasteners. Use thru bolts only where necessary to adequately fasten hardware to the door.

2.02 HINGES

- A. All hinges shall be full mortise five knuckle ball bearing type, template, with non-rising loose pins. All outswing doors shall be furnished with non-removable pins (NRP).
- B. All hinges for 1-3/4" thick doors shall be 4-1/2" wide in the open position. For other thickness doors, hinges shall be of a width to permit unobstructed swing of the doors.
- C. Size and weight of hinges shall conform to the following:
 - Up to 36" -----4-1/2" heavy weight
 - Over 36" to 44" -----5" heavy weight
 - Over 44" -----continuous hinges
- E. Quantity of hinges shall be provided to conform to the following:
 - Doors up to 60" in heights -----2 hinges
 - Doors 60" to 90" in height -----3 hinges
 - Doors 90" and over -----1 hinge every 30" in height
- F. All hinges shall be the products of one manufacturer.

2.03 LOCKSETS, LATCHSETS ETC.

- A. Unless otherwise noted, all locksets and latchsets shall conform to ANSI A156.13 Series 1000 Grade 1. Furnish wrought steel box strikes (M17) and curved lip strikes (SA114) with proper lip lengths as required.

2.04 KEYS, KEYING, AND CYLINDERS

- A. Keys: shall be nickel silver. Furnish a quantity of keys as follows.
- | | | |
|----|-------------------|---------------------|
| 1. | Grand Master Keys | 5 each per group |
| 1. | Master Keys | 5 each per group |
| 2. | Change Keys | 3 each per cylinder |
| 3. | Control Keys | 5 |
| 4. | Construction Keys | 5 |
- B. Keying: All locks shall be construction keyed and great grand master keyed to the existing keying system. Hardware supplier to meet with the Owner to establish keying requirements.
- C. Cylinders: All cylinders shall be removable core with visual key control. Furnish brass construction cores. Plastic cores will not be accepted.

2.05 DOOR CLOSING DEVICES

- A. All surface closers shall meet ANSI A156.4 Grade 1 requirements, barrier free.
- B. All closers shall be installed so that closer bodies are positioned on room side of doors to and from corridors, i.e., in-swing doors shall be regular arm. Out-swing doors shall have a parallel arm. Regular arm shall be used in connecting doors between rooms.
- C. Furnish all required brackets, filler plates and any others items required to insure proper installation and operation.

2.06 DOOR STOPS

- A. Unless otherwise noted, all door stops shall be Burns 565 wall mounted door stops. Where a wall stop will not function properly, use a Burns 524 floor stop.

PART 3 - EXECUTION

3.01 GENERAL

- A. Approval: As soon as practical after award of Contract and before a hardware schedule is prepared, and before any hardware is ordered or delivered to the project, the CONTRACTOR shall submit to the ARCHITECT for his written approval, copies of sample list, listing each of the different items of builders hardware and catalog cuts of each item.
- B. Templates: As soon as the hardware schedule is approved the hardware supplier shall furnish to the various fabricators, required templates for fabrication purposes. Templates shall be made available not more than (10) days after receipt of the approved hardware schedule.
- C. Packaging and Marking: All hardware shall be shipped with proper fastenings for secure application. Each package of hardware shall be legibly marked indicating the part of the work for which it is intended. Markings shall correspond with the item numbers shown on the approved hardware schedule. Keys shall be tagged within each package set and plainly marked on the face of the envelope with the key control number, door designation and all identification as necessary.

- D. Delivery: Delivery shall be made to the project site to the attention of the GENERAL CONTRACTOR. Where delivery of special hardware is required at any fabricators plant, the hardware supplier shall make such delivery.

3.02 INSTALLATION

- A. Mount hardware units at heights recommended in "Recommended Locations for Builders Hardware" by BHMA, unless otherwise noted or directed by the ARCHITECT.
- B. Install each hardware unit in compliance with the manufacturer's recommendations.

3.03 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer. Replace units that cannot be adjusted.
- B. Wherever hardware installation is made more than one (1) month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance make a final check, and adjust all hardware items in such space or area. Adjust door control devices and compensate for final operation of heating and ventilating equipment.
- C. Instruct OWNERS personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

3.04 HARDWARE SETS

- A. The following is a general listing of hardware requirements and is not intended for use as a final hardware schedule. Any items of hardware required by established standards or practices, or to meet state and local codes or proper door operation shall be furnished specifically called out in the following listed groups.

HARDWARE SET #1

Each to have:

	Set Pivot Hinges	(by Muraflex door manufacturer) x US26D
1	Entry Lock	Sargent 8256 x LNL x US26D
1	Temporary Core	Sargent (to suit) x Brass
1	Permanent Core	Sargent (to suit) x US26D
~~4~~	~~Overhead Stop~~	~~Dorma 710S series x US26D~~
1	Door Stop	Burns (see section 2.06) x 626
~~3~~	~~Silencers~~	~~Trimco 1229A~~
1	Set Seals	(by Muraflex door manufacturer)

HARDWARE SET #2

Each to have:

	Hinges	McKinney (see description) x US26D
1	Storeroom Lock	Sargent 8205 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
~~4~~	~~Wall Stop~~	~~Trimco 1270WV x US32D~~
1	Overhead Stop	Dorma 912S x US26D

3 Silencers Trimco 1229A

HARDWARE SET #2A

Each to have:

	Hinges	McKinney (see description) x US26D
1	Storeroom Lock	Sargent 8205 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
~~1~~	~~Surface Closer w/stop~~	~~Sargent PS351 series x 689~~
1	Door Stop	Burns (see section 2.06) x 626
3	Silencers	Trimco 1229A

HARDWARE SET #2B

Each to have:

	Hinges	McKinney (see description) x US26D
1	Storeroom Lock	Sargent 8205 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Overhead Stop	Dorma 912S x US26D
3	Silencers	Trimco 1229A

~~HARDWARE SET #2C~~

~~Each to have:~~

<del></del>	~~Hinges~~	~~McKinney (see description) x US26D~~
~~1~~	~~Storeroom Lock~~	~~Sargent 8205 x LNL x US26D~~
~~1~~	~~Temporary Core~~	~~Sargent (to suit)~~
~~1~~	~~Permanent Core~~	~~Sargent (to suit) x US26D~~
~~1~~	~~Overhead Stop~~	~~Dorma 702S x US26D~~
~~3~~	~~Silencers~~	~~Trimco 1229A~~

~~HARDWARE SET #2D~~

~~Each to have:~~

<del></del>	~~Hinges~~	~~McKinney (see description) x US26D~~
~~1~~	~~Storeroom Lock~~	~~Sargent 8205 x LNL x US26D~~
~~1~~	~~Temporary Core~~	~~Sargent (to suit)~~
~~1~~	~~Permanent Core~~	~~Sargent (to suit) x US26D~~
~~1~~	~~Surface Closer~~	~~Sargent 351 series x 689~~
~~1~~	~~Overhead Stop~~	~~Dorma 902S x US26D~~
~~3~~	~~Silencers~~	~~Trimco 1229A~~

HARDWARE SET #3

Each to have:

	Hinges	McKinney (see description) x US26D
1	Exit Device	Sargent 12-19-8815 x ETL x US26D
1	Surface Closer w/stop	Sargent PS351 series x 689
1	Set Smoke Seals	Zero 188S-BK @ jambs & head

HARDWARE SET #4

Each to have:

	Hinges	McKinney (see description) x US26D
1	Flush Bolt (top)	Trimco W3917 x US26D
1	Storeroom Lock	Sargent 8205 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
~~1~~	~~Overhead Stop~~	~~Dorma 912S x US26D~~
1	Wall Stop	Trimco 1270WV x US32D
2	Silencers	~~Trimco 1229A~~ Burns 500

HARDWARE SET #4A

Each to have:

	Hinges	McKinney (see description) x US26D
1	Flush Bolt (top)	Trimco W3917 x US26D
1	Storeroom Lock	Sargent 8205 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Sargent PS351 series x 689
2	Silencers	Trimco 1229A

~~HARDWARE SET #4B~~

~~Each to have:~~

<del></del>	~~Hinges~~	~~McKinney (see description) x US26D~~
~~1~~	~~Flush Bolt (top)~~	~~Trimco W3917 x US26D~~
~~1~~	~~Storeroom Lock~~	~~Sargent 8205 x LNL x US26D~~
~~1~~	~~Temporary Core~~	~~Sargent (to suit)~~
~~1~~	~~Permanent Core~~	~~Sargent (to suit) x US26D~~
~~1~~	~~Overhead Stop~~	~~Dorma 912S x US26D~~
~~2~~	~~Silencers~~	~~Trimco 1229A~~

HARDWARE SET #5

Each to have:

<del></del>	~~Hinges~~	~~McKinney (see description) x US26D~~
~~1~~	~~Classroom Lock~~	~~Sargent 8237 x LNL x US26D~~
1	Double Acting Closer	Dorma RTS88 / RTS03 x US26D
1	Dead Lock	Sargent 4877 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D

HARDWARE SET #6

Each to have:

~~2~~	~~Floor Closers~~	~~Dorma BTS75V-BF series x US26D~~
~~2~~	~~Intermediate Pivots~~	~~Dorma 75220 x US26D~~
2	Set Pivot Hinges	Dorma CP440 x LTP 626
2	Exit Devices	Blumcraft H100-F x 630

2	Cylinder Housing	Best (to suit) x 626
2	Temporary Core	Best (to suit) x 626
2	Permanent Core	Best (to suit) x 626
2	Concealed Closers	LCN 6030 series x Alum (custom finish)
2	Stop	Trimco x 630
1	Saddle	Legacy (as detailed)
1	set Weatherstripping	(by door manufacturer)
2	Sets Push & Pull (BTB)	Trimco AP433 x 36"OA x US26D

HARDWARE SET #7

Each to have:

1	Track	Coburn C1-12 (size to suit)
1	Component Pack	Coburn C100-010
1	Bottom Door Guide	Coburn C44-371
1	Set Pull Bars	Trimco AP431 x 36"OA x US26D

HARDWARE SET #8

Each to have:

2	Sets 1-1/2" Offset Pivots	Dorma OP15200 x US26D
2	Roller Latch	Trimco 1559BL x 626
2	Edge Pulls	Trimco APC30-4 x US26D
2	Overhead Stops	Dorma 702S x US26D

HARDWARE SET #9

Each to have:

1	Sets 1-1/2" Offset Pivots	Dorma OP15200 x US26D
1	Roller Latch	Trimco 1559BL x 626
1	Edge Pull	Trimco APC30-4 x US26D
1	Overhead Stop	Dorma 702S x US26D

HARDWARE SET #10

Each to have:

2	Pull Bars (BTB)	Trimco AP431 x 36"OA x US26D
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Note: The balance of the hardware shall be furnished by the door manufacturer.

- A. The following hardware contains electrical hardware and needs to be coordinated with the electrical and security drawings.

HARDWARE SET #E1

Each to have:

	~~Hinges~~	~~McKinney (see description) x US26D~~
	Set Pivot Hinges	(by Muraflex door manufacturer) x US26D
1	Power Transfer	Securiton Electro-Lynx CEPT x US32D
1	Electric Lock	Sargent RX-8271 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D

1	Electric Strike	(by Muraflex door manufacturer)
1	Surface Closer	Sargent 351 series x 689
~~1~~	~~Wall Stop~~	~~Trimco 1270WV x US32D~~
~~3~~	~~Silencers~~	~~Trimco 1229A~~
1	Door Stop	Burns (see section 2.06) x 626
1	Set seals	(by Muraflex door manufacturer)
1	Power Supply	(by security vendor)
1	Door Contact	(by security vendor)
1	Card Access System	(by security vendor)

Note: Card reader unlocks electric lock. Free egress at all times..

~~HARDWARE SET #E1A~~

~~Each to have:~~

~~_____~~	~~Hinges~~	~~McKinney (see description) x US26D~~
~~1~~	~~Power Transfer~~	~~Securiton Electro-Lynx CEPT x US32D~~
~~1~~	~~Electric Lock~~	~~Sargent RX-8271 x LNL x US26D~~
~~1~~	~~Temporary Core~~	~~Sargent (to suit)~~
~~1~~	~~Permanent Core~~	~~Sargent (to suit) x US26D~~
~~1~~	~~Surface Closer~~	~~Sargent 351 series x 689~~
~~1~~	~~Overhead Stop~~	~~Dorma 912S x US26D~~
~~3~~	~~Silencers~~	~~Trimco 1229A~~
~~1~~	~~Power Supply~~	~~(by security vendor)~~
~~2~~	~~Door Contacts~~	~~(by security vendor)~~
~~1~~	~~Card Access System~~	~~(by security vendor)~~

~~Note: Card reader unlocks electric lock. Free egress at all times..~~

HARDWARE SET #E2

Each to have:

	~~Hinges~~	~~McKinney (see description) x US26D~~
	Set Pivot Hinges	(by Muraflex door manufacturer) x US26D
1	Power Transfer	Securiton Electro-Lynx CEPT x US32D
1	Set Automatic Flush Bolts	Trimco (see description) x US26D
1	Dust Proof Strike	Trimco 3910 x US32D
1	Electric Lock	Sargent RX-8271 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Coordinating Closer	Dorma TS9315GSR series x 689
1	Overhead Stop	Dorma 902
~~2~~	~~Silencers~~	~~Trimco 1229A~~
1	Set seals	(by Muraflex door manufacturer)
1	Power Supply	(by security vendor)
2	Door Contacts	(by security vendor)
1	Card Access System	(by security vendor)

Note: Card reader unlocks electric lock. Free egress at all times.

HARDWARE SET #E3

Each to have:

	Hinges	McKinney (see description) x US26D
1	Power Transfer	Securitron Electro-Lynx CEPT x US32D
1	Electric Exit Device	Sargent 12-19-55-8875 x ETL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer	Sargent 351 series x 689
1	Wall Stop	Trimco 1270WV x US32D
3	Silencers	Trimco 1229A
1	Power Supply	Sargent LSP 12-24
2	Door Contacts	(by security vendor)
1	Card Access System	(by security vendor)

Note: Card reader unlocks electric lock. Free egress at all times. When signaled from the fire alarm system or in the event of a loss of power the door unlocks automatically.

HARDWARE SET #E3A

Each to have:

1	Set Pivot Hinges	(by Muraflex door manufacturer) x US26D
1	Power Transfer	(by Muraflex door manufacturer) x US26D
1	Electric Exit Device	Sargent 12-19-55-8375 x ETL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Concealed Closer	(by Muraflex door manufacturer) x US26D
1	Wall Stop	Trimco 1270WV x US32D
3	Silencers	Trimco 1229A
1	Power Supply	Sargent LSP 12-24
2	Door Contacts	(by security vendor)
1	Card Access System	(by security vendor)

Note: Card reader unlocks electric lock. Free egress at all times. When signaled from the fire alarm system or in the event of a loss of power the door unlocks automatically.

HARDWARE SET #E4

Each to have:

	Hinges	McKinney (see to match existing frame prep) x US26D
1	Electric Hinge	McKinney QC* (to match) x US26D
1	Electric Lock	Sargent RX-8271 x LNL x US26D

This is an existing door. Confirm hardware will fit into existing door and frame prep.

HARDWARE SET #E5

Each to have:

2	Sets Pivot Hinges	(by Muraflex door manufacturer) x US26D
2	Concealed Closers	(by Muraflex door manufacturer) x US26D
2	Exit Devices	Blumcraft PA100F x US32D
2	Electric Strike	Folger Adams 310-1 x US32D

Note: Card reader unlocks electric strike. Free egress at all times

HARDWARE SET #E6

Each to have:

1	Set Pivot Hinges	(by Muraflex door manufacturer) x US26D
1	Concealed Closers	(by Muraflex door manufacturer) x US26D
1	Exit Devices	Blumcraft PA100F x US32D
1	Electric Strike	Folger Adams 310-1 x US32D

Note: Card reader unlocks electric strike. Free egress at all times

HARDWARE SET #E7

Each to have:

1	Set Pivot Hinges	(by Muraflex door manufacturer) x US26D
1	Concealed Closers	(by Muraflex door manufacturer) x US26D
1	Set Push & Pull (BTB)	Trimco AP433 x 36"OA x US26D
1	Magnetic Lock	RCI 8310DSS-28
1	Emergency Egress Button	RCI 918N x US32D
1	Motion Sensor	RCI 915AFI
1	card Access System	(by security vendor)

Note: This door is magnetically locked. When signaled from the fire alarm system or in the event of a loss of power the door unlocks automatically. Motion sensor unlocks magnetic lock to allow egress. In the event of the motion sensor failing to open the door, the emergency egress button unlocks door.

HARDWARE SET #E8

Each to have:

	Hinges	McKinney (see description) x US26D
1	Power Transfer	Securitron Electro-Lynx CEPT x US32D
1	Set Manual Flush Bolts	Trimco W39017 x US26D
1	Dust Proof Strike	Trimco 3910 x US32D
1	Electric Lock	Sargent RX-8271 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer	Sargent PS351 series x 689
2	Silencers	Trimco 1229A
1	Power Supply	(by security vendor)
2	Door Contacts	(by security vendor)
1	Card Access System	(by security vendor)

Note: Card reader unlocks electric lock. Free egress at all times..

END OF SECTION

SECTION 102219

DEMOUNTABLE PARTITIONS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment and services necessary to complete the demountable partitions as shown on the drawings and/or specified herein, including but not limited to the following:
 - 1. Partition system.
 - 2. Doors and frames in partition system.
 - 3. Finish hardware for doors.

1.3 RELATED SECTIONS

- A. Wood Doors - Section 081416.
- B. Finish Hardware - Section 087100.
- C. Interior Glass and Glazing - Section 088010.
- D. Architectural Window Film - Section 088720.
- E. Electrical - Division 26.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Provide office partition system manufactured by a single firm specializing in production of this type of work.
- B. Shop Assembly: Preassemble items in shop to greatest extent possible. Disassemble units only to extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Installed partitions shall have a deflection limit of L/240 when subject to a 5 psf uniform lateral load and a concentrated load of 200 lbs.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's detailed materials and fabrication specifications and installation instructions. Include catalog cuts of hardware, fastenings and other data as required.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of partition assemblies which are not fully described by manufacturer's data. Show anchorage and accessory items and finishes.

- C. Samples: Submit samples of each required finish and color. Prepare samples on same materials which will be used in partition assemblies.
- D. Closeout Submittals
 - 1. Maintenance Data: Include Muraflex Maintenance Manual for demountable partitions.
 - 2. As built shop drawings.
 - 3. Manufacturer warranties transferrable to Owner.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver demountable panel partition components cartoned or crated to provide protection during transit and job storage.
- B. Inspect partition components upon delivery for damage. Minor damages may be repaired, provided finish items are equal to new work and acceptable to Architect. Remove and replace damaged items as directed.
- C. Store partition components on raised platforms in vertical positions with blocking between units to allow air circulation. Keep stored material covered and protected from damage.

1.7 SEQUENCING

- A. Install demountable partitions after installation of flooring, walls, and ceiling finishes, including painting.

1.8 WARRANTY

- A. Manufacturer Warranty: Manufacturer's standard warranty agreeing to repair or replace components that fail from defects in material or workmanship under normal use. Damage from misuse, accidents, or normal wear and tear is excluded.
 - 1. Warranty Period: Five years for material and one year for hardware from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PARTITION SYSTEM

- A. Double Glazed Glass Wall System:
 - 1. Aluminum framed double glazed glass wall system with wood or glass doors, as indicated on drawings. Basis of design is Muraflex Mimo, or approved equal by ACME or DIRT. Wall system STC 46; doors STC 46 with overlapping frame stops and seals.
- B. SINGLE GLAZED GLASS WALL System:
 - 1. Aluminum framed demountable partition assembly and components with wood or glass doors, as indicated on drawings. Basis of design is Muraflex Mimo, or approved equal by ACME or DIRT. 3/8" thick laminated glass; STC-36 rating.

2.2 DEMOUNTABLE GLASS WALL PARTITIONS

- A. Aluminum Framing: Aluminum extrusions, 6063-T5 aluminum alloy; Finish: See finish schedule.

1. Frame: Aluminum extrusions made up of ceiling track and top frame sleeve connected with hexagonal standoffs to offer height adjustability. Provide integral acoustic gasketing at door frames.
 - a. Gaskets: Polyvinyl chloride, CAS No. 9002-86-2, to grip glass modules.
 - b. Width: 3"
 - c. Height: 1-9/16"
 - d. Length: As indicated on drawings.
- B. Glass: 3/8" tempered, 2" air space, 1/2" laminated glass.
 1. Fully tempered glass; ASTM C1036, Kind FT, Condition A uncoated, Type I, Quality Q3.
 - a. Base Glass: Low-iron (ultraclear)
 - b. Thickness: 10 mm (nominal 3/8 inch)
 2. Laminated Glass: ASTM C1172.
 - a. Glass Plies: Low-iron (ultraclear)
 - b. Interlayer: Clear
 - c. Thickness : 1/2"
- C. Acoustical:
 1. Minimum Noise Isolation Class shall be as follows:
 - a. Partition with swing door: NIC-30.
 - b. Partition with sliding door: NIC-28.
 2. All doors shall be provided with acoustic upgrades including, at minimum:
 - a. Swing Doors: Compressible gaskets at head and both jambs; mortised automatic drop seal at door bottom.
 - b. Sliding Doors: Brush gaskets at both sides of head track, brush gaskets both sides of receiving channel, compression gasket at inner face of receiving channel; brush seal at bottom of single glazed door, mortised automatic drop seal at bottom of double glazed door. (no sliders currently shown plans)
 3. Acoustical Performance: Where acoustical rating is indicated, provide demountable-partition assembly tested by a qualified testing agency for sound transmission loss performance according to ASTM E 90, calculated according to ASTM E 413, and rated for not less than the STC value indicated.
- D. Anchorage Devices, Clips and Fasteners: Manufacturer's standard type, compatible with materials being secured.
- E. All connection points to mullions and demising partitions are to be properly sealed to prevent loss of acoustic performance across demising conditions.
- F. Doors: Framed Pivot Glass Doors and pocket Sliding Glass Door. Refer to drawings, door schedule and hardware section.
- G. Tempered, Laminated Glass: ASTM C 1172, Condition A (uncoated), Type I (transparent flat glass), Kind LT (laminated tempered), Class 1 (clear), Quality-Q3 with clear, polyvinyl butyral interlayer not less than 0.060" thick.
 1. Glass Thickness: As indicated.

- H. Glazing: Set glass in glazing strips for firm retention and tight seal and to permit easy removal and reinstallation without damage. Loose glazing stops and exposed screws are not acceptable.
1. Glazing Joint: Translucent polycarbonate trim.
- I. Connectors and Accessories: Provide connectors, fasteners, and accessories required for rigid, secure, complete, and finished partition system.
1. Metal Panel Wall Caps: Provide custom aluminum panel wall caps finished to match partition frames.
 2. Provide accommodations for room scheduler panels as scheduled.
 3. Provide solid panels composed of metal finished panels. All cavities to be filled with mineral wool insulation.
 4. Coordinate all hardware provided by the glazed partition manufacturer with the requirements identified for each door in the door and hardware schedule.
- J. Door Hardware: Conform to requirements of Section 087100.
- K. Hardware Schedule for Demountable Partitions:
1. Hardware Set #1
 - a. Framed Pivot Glass Door; Muraflex Pivot Kit
 - b. Lever: MFHDW-028B, lockable
 - c. Door Bottom: Muraflex Standard
 - d. Sound Seals: Muraflex Standard
 - e. Balance of hardware specified in 087100
 2. Hardware Set ~~#E4~~ **#E5, E6, E7**
 - a. Framed Pivot Glass Door; Muraflex Pivot Kit
 - b. ADA Ladder Pull: Round Locking Pulls
 - c. Door Bottom: Muraflex Standard
 - d. Sound Seals: Muraflex Standard
 - e. Balance of hardware specified in 087100
 - f. Power Supply, Door Contact, Card Reader: by security vendor, see Section 087100
 3. Hardware Set ~~#E1 (Room 224)~~ **#E1, E2, E3A**
 - a. Framed Pivot Glass Door; Muraflex Pivot Kit
 - b. Lever: MFHDW-028B, lockable
 - c. Door Bottom: Muraflex Standard
 - d. Sound Seals: Muraflex Standard
 - e. Balance of hardware specified in 087100
 - f. Power Supply Door Contact, Card Reader: by security vendor, see Section 087100
 4. ~~Hardware Set #E2~~
 - a. ~~Framed Pivot Glass Door; Muraflex Pivot Kit~~
 - b. ~~Lever: MFHDW-028B, lockable~~
 - c. ~~Door Bottom: Muraflex Standard~~
 - d. ~~Sound Seals: Muraflex Standard~~
 - e. ~~Balance of hardware specified in 087100~~
 - f. ~~Power Supply Door Contact, Card Reader: by security vendor, see Section 087100~~

- ~~4. Hardware Set #E2~~
 - ~~a. Framed Pivot Glass Door; Muraflex Pivot Kit~~
 - ~~b. Lever: MFHDW-028B, lockable~~
 - ~~c. Door Bottom: Muraflex Standard~~
 - ~~d. Sound Seals: Muraflex Standard~~
 - ~~e. Balance of hardware specified in 087100~~
 - ~~f. Power Supply Door Contact, Card Reader: by security vendor, see Section 087100~~
- ~~5. Hardware Set #E2 (Room 221)~~
 - ~~a. Framed Pivot Glass Door; Muraflex Pivot Kit~~
 - ~~b. Lever: MFHDW-028B, lockable~~
 - ~~c. Door Bottom: Muraflex Standard~~
 - ~~d. Sound Seals: Muraflex Standard~~
 - ~~e. Balance of hardware specified in 087100~~
 - ~~f. Power Supply Door Contact, Card Reader: by security vendor, see Section 087100~~
- ~~6. Hardware Set #E3~~
 - ~~a. Framed Pivot Glass Door; Muraflex Pivot Kit~~
 - ~~b. Lever: MFHDW-028B, lockable~~
 - ~~c. Door Bottom: Muraflex Standard~~
 - ~~d. Sound Seals: Muraflex Standard~~
 - ~~e. Balance of hardware specified in 087100~~
 - ~~f. Power Supply Door Contact, Card Reader: by security vendor, see Section 087100~~
- ~~7. Hardware Set #11~~
- 4. Hardware Set #10**
 - a. FINO Framed Sliding Glass Door: Muraflex Sliding Kit
 - b. ADA Ladder Pull: Round Locking Pulls
 - c. Balance of Hardware specified in 087100.

- L. Provide glazing film as specified in Section 088720 and pattern indicated on drawings

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where demountable partitions are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.
- B. Finished Spaces: Do not deliver or install demountable partitions until finishes in spaces to receive them are complete, including suspended ceilings, floors, carpeting, and painting.

3.2 INSTALLATION

- A. Install partitions before floor coverings and after suspended drywall ceilings have been installed. Coordinate partition work with work of other trades which are affected by partition installation. Avoid damage to installed work.
- B. Repair damaged or defaced work or replace with new work, as acceptable to Architect. Completely refinish defaced partition components with factory finished materials, or replace defaced components.

- C. Furnish, drill for and install anchoring devices required, and secure partitions to floor, ceiling and walls, using concealed fasteners.
- D. Install partitions rigid, level, plumb and in alignment, with components secure together, in accordance with manufacturer's instructions.
- E. Provide through posts to ceiling, or other concealed supports as required to ensure lateral stability of partition runs.
- F. Install continuous and positive seal to prevent light and sound transmission at partition contacts with floor, ceiling, wall and other abutting surfaces.
- G. Adjust hardware and doors and leave in proper operating condition.

END OF SECTION

SECTION 220553

PLUMBING IDENTIFICATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 QUALIFICATIONS

- A. All identification devices shall comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles.

1.3 SUBMITTALS

- A. Submit manufacturer's technical product data and installation instructions for each identification material and device. Submit valve schedule for each piping system typewritten on an 8-1/2 in. x 11 in. paper (minimum), indicating valve number, location and valve function. Submit schedule of pipe, equipment and name identification for review before stenciling or labeling.

1.4 MAKES

- A. Allen Systems, Inc., Brady (W.H.) Co.; Signmark Div., Industrial Safety Supply Co., Inc., Seton Name Plate Corp.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide manufacturer's standard products of categories and types required for each application. In cases where there is more than one type specified for an application, selection is installer's option, but provide single selection for each product category.
- B. All adhesives used for labels in the interior of the building shall comply with the maximum Volatile Organic Compound (VOC) limits as called for in the current version of U.S. Green Building Council LEED Credits EQ 4.1 and EQ 4.2.
- C. For work within an existing building, the mechanical identification shall meet the intent of this section, but match the Owner's existing identification symbology.

2.2 PIPING IDENTIFICATION

A. Identification Types:

1. Pressure Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color coded, pressure sensitive vinyl pipe markers complying with ANSI A13.1. Provide a 360° wrap of flow arrow tape at each end of pipe label.
2. Snap-On Type: Provide manufacturer's standard pre-printed, semi rigid snap-on, color coded pipe markers, complying with ANSI-A13.1.

B. Lettering:

1. Piping labeling shall conform to the following list: **[Edit list as required.]**

PIPE FUNCTION	IDENTIFICATION
Cold Water	DOMESTIC COLD WATER
Hot Water	DOMESTIC HOT WATER
Hot Water Recirculating	DOMESTIC HOT WATER RECIRCULATING
Sanitary Waste	SANITARY WASTE
Indirect Waste	INDIRECT WASTE
Storm	STORM
Vent	VENT
Pump Discharge	PUMP DISCHARGE

2.3 VALVE IDENTIFICATION

A. Valve Tags:

1. Standard brass valve tags, 2 in. diameter with 1/2 in. high black-filled numerals. Attach to valve with brass jack chain and "S" hook. Identify between heating and plumbing services with 1/4 in. letters above the valve number.
2. Acceptable Manufacturers: Seton Style No. M4507, or approved equal.

B. Valve Chart:

1. Provide valve chart for all valves provided as a part of this project. Frame and place under clear glass. Mount in Mechanical Room.

2.4 EQUIPMENT IDENTIFICATION

A. General:

1. Provide engraved vinyl nameplates for each major piece of mechanical equipment provided, 2-1/2 in. x 3/4 in. size.
2. Acceptable Manufacturers: Seton Style No. M4562, or approved equal.

2.5 ABOVE CEILING EQUIPMENT LOCATOR

- A. 3/4 in. diameter adhesive stickers placed on ceiling grid and color-coded.
- B. The color for all plumbing valves shall be BLUE.

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide valve tags for all valves provided on project.
- B. Provide equipment tags for all equipment provided on project.
- C. Provide piping identification with directional flow arrows for all piping on project, maximum intervals of 20'-0". For piping installed through rooms, provide at least one (1) pipe label in each room, for each pipe function.

END OF SECTION

SECTION 220700

INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTAL

- A. Shall include product description, manufacturer's installation instructions, types and recommended thicknesses for each application, and location of materials.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Insulation, jackets, adhesive, and coatings shall comply with the following:
 - 1. Treatment of jackets or facing for flame and smoke safety must be permanent. Water-soluble treatments not permitted.
 - 2. Insulation, including finishes and adhesives on the exterior surfaces of pipes and equipment, shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less.
 - 3. Asbestos or asbestos bearing materials are prohibited.
 - 4. Comply with 2020 New York State Energy Conservation Code.
 - 5. All adhesives and sealants used for insulation in the interior of the building shall comply with the maximum Volatile Organic Compound (VOC) limits as called for in the current version of U.S. Green Building Council LEED Credits EQ E4.1 and EQ E4.2.
 - 6. Provide materials which are the standard products of manufacturers regularly engaged in the manufacture of such products and that essentially duplicate items that have been in satisfactory use for at least two (2) years prior to bid opening. Provide insulation systems in accordance with the approved MICA or NAIMA Insulation Standards.
 - 7. Insulation shall be clearly marked with manufacturer's name, identification of installed thermal resistance (R) value, out-of-package R value, flame spread and smoke developed indexes in accordance with Energy Code requirements.

2.2 ACCEPTABLE MANUFACTURERS

- A. Fiberglass: Knauf, Johns Manville, Owen-Corning, Certainteed
- B. Adhesives: Childers Products, Foster.

2.3 PIPE INSULATION (RIGID FIBERGLASS TYPE)

- A. Product meeting ASTM C 547, ASTM C 585, and ASTM C 795; rigid, molded, noncombustible.
- B. 'K' Value: ASTM C 335, 0.23 at 75°F mean temperature. Maximum Service Temperature: 1000°F.
- C. Vapor Retarder Jacket: ASJ/SSL conforming to ASTM C 1136 Type I, secured with self-sealing longitudinal laps and butt strips.
- D. Field-Applied PVC Fitting Covers with Flexible Fiberglass Insulation: Proto Corporation 25/50 or Indoor/Outdoor, UV-resistant fittings, jacketing and accessories, white or colored. Fitting cover system shall consist of pre-molded, high-impact PVC materials with blanket type fiberglass wrap inserts. Blanket fiberglass wrap inserts shall have a thermal conductivity ('K') of 0.26 at 75°F mean temperature. Closures shall be stainless steel tacks, matching PVC tape, or PVC adhesive per manufacturer's recommendations.
- E. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in pre-forming insulation to cover valves, elbows, tees, and flanges.

2.4 FIELD-APPLIED JACKETS

- A. Piping:
 - 1. PVC Pipe Jacket: High-impact, ultraviolet-resistant PVC; 20 mils thick; roll stock ready for shop or field cutting and forming. Adhesive: As recommended by insulation material manufacturer. PVC Jacket Color: White.

2.5 COATINGS, MASTICS, ADHESIVES AND SEALANTS

- A. Lagging Adhesives: Used in conjunction with canvas or glass lagging cloth to protect equipment/piping indoors. Foster 30-36 Sealfas; Childers CP-50AMV1 Chil Seal, or approved equal.
- B. Fiberglass Adhesive: Used bond low density fibrous insulation to metal surfaces. Shall meet ASTM C916 Type II. Foster 85-60; Childers CP-127, or approved equal.
- C. Insulation Joint Sealant: Used as a vapor sealant on below ambient piping with polyisocyanurate and cellular glass insulation. Foster 95-50; Childers CP-76, or approved equal.

2.6 PIPE SUPPORT INSULATION INSERTS

- A. 20 lbs./cu. ft. molded fiberglass, for -120°F to +450°F service temperature, non-combustible, 0.30 thermal conductivity (k), same thickness as pipe insulation.
- B. Acceptable Manufacturers: Hamfab "H" Block, or approved equal.

2.7 MATERIALS AND SCHEDULES

- A. See Exhibits at the end of this section.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. All materials shall be installed by skilled labor regularly engaged in this type of work. All materials shall be installed in strict accordance with manufacturer's recommendations, building codes, and industry standards.
- B. Locate insulation and cover seams in the least visible location. All surface finishes shall be extended in such a manner as to protect all raw edges, ends and surfaces of insulation. No glass fibers shall be exposed to the air.
- C. All pipe insulation shall be continuous through hangers, sleeves, walls, ceiling, floor, or roof openings, unless not allowed by fire stop system. Refer to Sections 220500, "Basic Plumbing Requirements" and 221010, "Piping Systems and Accessories" for firestop systems.
- D. Provide thermal insulation on clean, dry surfaces and after piping and equipment (as applicable) have been tested. Do not cover pipe joints with insulation until required tests are completed.
- E. All cold surfaces that may "sweat" must be insulated. Vapor barrier must be maintained; insulation shall be applied with a continuous, unbroken moisture and vapor seal. All hangers, supports, anchors, or other projections that are secured to cold surfaces shall be insulated and vapor sealed to prevent condensation. Cover valves, fittings and similar items in each piping system with insulation as applied to adjoining pipe run. Extra care must be taken on piping appurtenances to insure a tight fit to the piping system. For piping systems with fluid temperatures below ambient, all vapor retarder jacket (ASJ) seams must be coated with vapor barrier coating. All associated elbows, fittings, valves, etc. must be coated with vapor barrier coating and reinforcing mesh to prevent moisture ingress. Valve extension stems require Elastomeric insulation that is tight fitting to the adjoining fiberglass system insulation. Pumps, strainers, drain valves, etc. must be totally encapsulated with Elastomeric insulation.
- F. Items such as manholes, handholds, clean-outs, plugged connections, pet cocks, air vents, ASME stamp, and manufacturers' nameplates, may be left un-insulated unless omitting insulation would cause a condensation problem. When such is the case, appropriate tagging shall be provided to identify the presence of these items. Provide neatly beveled edges at interruptions of insulation.

- G. Provide protective insulation as required to prevent personal injury.
- H. All pipes shall be individually insulated.
- I. If any insulation material becomes wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site.
- J. All exposed surfaces shall be white, unless noted otherwise.

3.2 PIPE INSULATION

- A. Insulate piping systems including fittings, valves, flanges, unions, strainers, and other attachments installed in piping system, whether exposed or concealed.
- B. Insulation installed on piping operating below ambient temperatures must have a continuous vapor retarder. All joints, seams and fittings must be sealed. Insulation shall be continuous through hangers on all water piping and storm water piping.
- C. Hanger Shields: Refer to Section 221010 "Piping Systems and Accessories".
- D. Hanger shields shall be installed between hangers or supports and the piping insulation. Rigid insulation inserts shall be installed as required between the pipe and the insulation shields. Inserts shall be of equal thickness to the adjacent insulation and shall be vapor sealed as required.
 - 1. Pre-Insulated Type: Butt insulation to hanger shields and apply a wet coat of vapor barrier cement to the joints and seal with 3 in. wide vapor barrier tape.
 - 2. Field Insulated Type: Provide Hamfab Co. "H" blocks per manufacturers recommended spacing between pipe and shield.
 - 3. Tape shields to insulation.
- E. Joints in section pipe covering made as follows:
 - 1. All ends must be firmly butted and secured with appropriate butt-strip material. On high-temperature piping, double layering with staggered joints may be appropriate. When double layering, the inner layer should not be jacketed.
 - 2. Standard: Longitudinal laps and butt joint sealing strips cemented with white vapor barrier coating, or factory supplied pressure sensitive adhesive lap seal.
 - 3. Vapor Barrier: For cold services, Longitudinal laps and 4 in. vapor barrier strip at butt joints shall be sealed with white vapor barrier coating. Seal ends of pipe insulation at valves, flanges, and fittings with white vapor barrier coating.

- F. Fittings, Valves and Flanges:
 - 1. Domestic Hot and Cold Water: Premolded fitting insulation of the same material and thickness as the adjacent pipe insulation.
 - 2. White PVC jacketing, with continuous solvent weld of all seams. Tape all fittings.
- G. Apply PVC jacket where indicated, with 1 in. overlap at longitudinal seams and end joints. Seal with manufacturers recommended adhesive.
- H. Apply PVC jacketing to exposed insulated pipe, valves, fittings, and specialties, at an elevation of 8 feet or less above finished floor in mechanical/electrical rooms, penthouses, and services aisles/pipe chases. Fittings of aluminum-jacketed piping may be either aluminum or standard PVC fitting covers. Jacketing for piping in existing areas shall match existing jacketing.
- I. Piping in exterior walls, spaces, overhangs, attics, or where subject to freezing: Insulate pipe with double the thickness called for. Piping in wall chases: In addition to the above, pack chase with loose glass fiber insulation.
- J. Provide insulation on exposed hot and cold plumbing piping to within 18 in. of fixture or equipment connection.
- K. Insulate exposed domestic water and waste piping for plumbing fixtures designated for use by the handicapped.

3.3 EXISTING INSULATION

- A. Patch existing insulation damaged during the course of the work.
- B. Insulate existing piping and equipment as called for.
- C. Jacketing for piping in existing areas shall match existing jacketing.
- D. Reinsulate piping that was abated.

EXHIBIT "I" - PIPE INSULATION MATERIALS

<u>SERVICE</u>	<u>INSULATION MATERIAL</u>	<u>THICKNESS</u>	<u>REMARKS</u>
Domestic cold water	Glass fiber	1-1/2 in. and larger: 1 in. 1-1/4 in. and smaller: 1 in.	
Domestic hot, tempered and circulation water (105°F - 140°F)	Glass fiber	1-1/2 in. and larger: 1-1/2 in. 1-1/4 in. and smaller: 1 in.	
AC unit drains, overflows and indirect waste piping associated with any HVAC equipment	Glass fiber	All sizes: 1/2 in.	

END OF SECTION

SECTION 221010

PIPING SYSTEMS AND ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

- A. Provide a schedule of pipe materials, fittings and connections.
- B. Provide a detailed matrix listing the specific UL approved firestop system assembly to be used for each type of piping provided and each type of construction to be penetrated along with all associated UL assembly details.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Pipe and fittings shall be new, marked with manufacturer's name and comply with applicable ASTM and ANSI Standards.
- B. All items here-in used to convey water for potable use shall be lead free in accordance with NSF, Standard 61, Section 9 - Standard for Drinking Water and Lavatory Faucets and NSF Standard 372 - Maximum Lead Requirements. Compliance shall be via third party testing and certification.

2.2 STEEL PIPING AND FITTINGS

- A. Pipe: ASTM A53, or ASTM A106 seamless, Schedule 40 or Schedule 80 weight; black or galvanized finish as called for; ends chamfered for welding or grooved for grooved mechanical connections.
- B. Fittings: Same material and pressure class as adjoining pipe.
 - 1. Welded fittings: Factory forged, seamless construction, butt weld type chamfered ends. Where branch connections are two or more sizes smaller than main size, use of "Weldolets", "Thredolets" or "Sockolets" acceptable. Mitered elbows, "shaped" nipples, and job fabricated reductions not acceptable unless specifically called for. Socket weld type, 2000 psi wp, where called for.
 - 2. Threaded fittings: Cast or malleable iron, black or galvanized, as called for; drainage type where called for; UL listed and FM approved for fire protection systems. Street type 45° and 90° elbows are not acceptable.

C. Flanges, Unions, and Couplings:

1. Threaded Connections:

- a. Flanges: Cast iron companion type; for sizes 2-1/2 in. and larger.
- b. Unions: Malleable iron, bronze to iron seat, 300 lb. wwp; for sizes 2 in. and smaller.
- c. Couplings: Malleable iron. Steel thread protectors are not acceptable as couplings.

2. Welded Connections:

- a. Flanges: Welding neck type. Slip-on type not allowed unless noted and shall not be installed in conjunction with butterfly valves.

D. Gauge and Instrument Connections: Nipples and plugs for adapting gauges and instruments to piping system shall be IPS brass.

2.3 COPPER TUBE AND FITTINGS

- A. Pipe: ASTM B88; Type K or L, hard temper. Soft temper only as called for. Plans show copper tube sizes.
- B. Fittings: Wrought copper and copper alloy, ASME B16.22 or cast copper alloy, ASME B16.18; solder end connections.
- C. Joints: Comply with the requirements of ASTM B828.
- D. Unions and Flanges: 2 in. and smaller use unions, solder type, cast bronze, ground joint, 150 lb. swp; 2-1/2 in. and over use flanges, cast bronze, companion type, ASME drilled, solder connection, 150 lb. swp.
- E. Flux Materials: Flux shall comply with ASTM B813 and the provisions of the New York State Plumbing Code.
- F. Solder Materials: No-lead solder, using alloys made from tin, copper, silver and nickel. Harris, Inc., "Stay-Safe 50" and "Bright", Engelhard "Silvabright 100", Canfield "Watersafe" or approved equal.
- G. Brazing Materials: Class BcuP-5 for brazing copper to brass, bronze to copper. Harris, Inc. "Stay-Silv 15" or approved equal.

2.4 COPPER DRAINAGE TUBE AND FITTINGS

- A. Pipe: ASTM B306, Type DWV, hard temper.
 - 1. Copper not allowed for urinal waste.

- B. Fittings: Wrought copper, ANSI B16.29 or cast bronze, ANSI B16.23; solder end connections.
- C. Flux Materials: Flux shall comply with ASTM B813 and the provisions of the New York State Plumbing Code.
- D. Solder Materials: No lead solder, using alloys made from tin, copper, silver and nickel.
- E. Acceptable Manufacturers: Harris, Inc., "Stay-Safe 50" and "Bright", Engelhard "Silvabright 100", Canfield "Watersafe", or approved equal.

2.5 NO-HUB CAST IRON SOIL PIPE AND FITTINGS

- A. Pipe: ASTM A888, CISPI Standard 301, no-hub cast iron, bitumen coated.
 - 1. For above grade only.
- B. Fittings: Cast iron, no-hub drainage pattern, bitumen coated.
- C. Couplings:
 - 1. 1-1/2 in. to 2 in.: CISPI standard 310 with 300 series stainless steel corrugated shield and clamp assembly with ASTM C564 neoprene sealing sleeve (or) same as specified for 3 in. and larger.
 - 2. 3 in. and Larger: 24 gauge, Type 304 stainless steel housing clamp assembly with ASTM C564 neoprene sealing sleeve, 60 in. lbs. minimum torque rating, shall meet requirements of pipe manufacturer and shall be compatible with specified pipe. Acceptable Manufacturers: Clamp-All Coupling System, Tyler "Wide Body", Husky "Series 2000", Mission "Heavy Weight" or approved equal.
- D. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

2.6 SPECIAL FITTINGS

- A. Cast Iron to Lead Pipe: Red brass ferrules and wiped joints. Caulk ferrule into cast iron hub.
- B. Copper to Cast Iron: Cast bronze, cast iron to sweat adapter.
- C. Copper to Steel Piping:
 - 1. Cast bronze copper to iron male or female adapter with shoulder for drainage piping only.
 - 2. Dielectric pipefittings.
- D. Steel to Cast Iron: Cast iron soil pipe connector with spigot and IPS male thread end (Manhoff fittings).

- E. No-Hub, Cast Iron, Glass, Polypropylene or High Silicon Cast Iron: Proper adapter to piping being connected.
- F. Cast Iron and PVC Solvent: Aerators and deaerators as manufactured by Conine Manufacturing Co., Inc.

2.7 DIELECTRIC PIPE FITTINGS

- A. Description: Assembly or fitting having insulating material isolating joined dissimilar metals to prevent galvanic action and stop corrosion.
- B. Nipples: Factory fabricated, for 250 psi minimum working pressure at 180°F, threaded ends, insulating material suitable for system fluid, pressure and temperature.
- C. Flanges: Factory-fabricated, companion-flange assembly, for 150 or 300 psig minimum pressure to suit system fluid pressures and temperatures with flange insulation kits and bolt sleeves.
- D. Acceptable Manufacturers: EPCO, Capitol Manufacturing, Watts or approved equal.

2.8 HANGERS, INSERTS AND SUPPORTS

- A. Hangers, Inserts, Clamps: B-Line, Grinnell, Michigan Hanger, PHD Manufacturing.
- B. Hangers:
 - 1. Adjustable, wrought malleable iron or steel with electroplated zinc or cadmium finish. PVC coated where in contact with copper piping.
 - 2. Adjustable ring type where piping is installed directly on hanger for piping 3 in. and smaller.
 - 3. Adjustable steel clevis type for piping 4 in. and larger.
 - 4. Nuts, washers and rods with electroplated zinc or cadmium finish.
 - 5. Provide hot dipped galvanized finish for hangers and accessories installed in exterior locations and interior areas with moist environment conditions such as pools, pool filter rooms, areaways, garages and similar areas.
- C. Spacing Schedule:

Pipe Size	Steel	Copper	Plastic	Cast Iron	Rod Size
3/4 in. to 1 in.	8 ft.	6 ft.	3 ft.	Each Horizontal Joint 5 ft. Maximum O.C.	3/8 in.
1-1/4 in. to 2 in.	10 ft.	6 ft.	3 ft.		3/8 in.
2-1/2 in. to 4 in.	12 ft.	10 ft.	4 ft.		1/2 in.
5 in. and over	12 ft.	10 ft.	4 ft.		5/8 in.
8 in.	12 ft.	10 ft.	4 ft.		3/4 in.
Over 8 in.	To suit loading conditions.				

D. Cast Iron No-Hub Supports:

1. In accordance with manufacturer's recommendations.
2. Vertical piping supported at each stack base, at each floor and 15 ft. on center, maximum. Freestanding vertical pipe should be adequately staked or braced during construction to maintain alignment. Bases of stacks shall be supported on concrete, brick laid in cement mortar, metal brackets attached to the building construction or by other methods approved by the Owner's Representative.
3. Horizontal piping supported within 24 in. each side of the coupling joint at 10 ft. intervals for 10 ft. pipe lengths and at 5 ft. intervals for 5 ft. pipe lengths. Supports or hangers placed to maintain alignment and grade with provision made to prevent shear. Greater than 3 in. diameter pipe braced at changes of direction to prevent horizontal movement.

E. Beam Attachments:

1. C-Clamp style, locknut, restraining strap, electroplated finish, UL listed, FM approved for pipe sizes 2 in. and smaller.
2. Center loaded style with clamp attachments that engage both edges of beam, electroplated finish, UL listed, FM approved, for pipe sizes larger than 2 in., refer to "Supports" for additional requirements.
3. Inserts: Carbon steel body and square insert nut, galvanized finish, maximum loading 1300 lbs., for 3/8 in. to 3/4 in. rod sizes, reinforcing rods on both sides, MSS-SP-69 Type 19 or approved equal.

F. Supports:

1. Provide intermediate structural steel members where required for hanger attachment. Members shall span across the bar joists at panel points of joists. Secure member to structure. Select size of members based on a minimum factor of safety of four.
2. For Weights Under 1000 lbs.: "Drill-In" inserts, "U" shaped Channel, beam clamps or other structurally reviewed support. The factor of safety shall be at least four. Follow manufacturer's recommendations.
3. For Metal Decks: Drill hole through for hanger rods and imbed a welded plate in concrete or use devices designed for this application, with a safety factor of four.
4. Acceptable Manufacturers: Hilti, ITW Ramset, Phillips "Red Head" or approved equal.

G. Trapeze Hangers:

1. For plumbing systems only.

2. Hangers shall be supported with rod sized with a safety factor of four.
3. May be manufactured type "U" shaped channel, or suitable angle iron or channel. Round off all sharp edges.
4. Securely fasten piping to trapeze with "U" bolt or pipe clamps, dissimilar metals shall not touch, use isolation gaskets, similar to HoldRite strut-mounted cushion clamps. Fasten piping to trapeze at every third support, except uninsulated piping which shall be fastened at every support using strut-mounted cushion clamps.
5. Acceptable Manufacturers: B-Line, HoldRite, Kindorf, Unistrut or approved equal.

H. Cabinet Pipe Space Supports:

1. Piping below casework countertops within space behind cabinet shall be supported using continuous slot metal channels with pipe clamps.
2. Acceptable Manufacturers: B-Line, Kindorf, Unistrut or approved equal.

I. Hanger Insulation Shields:

1. Hanger insulation shields shall be provided for all water and storm water piping. Hangers shall attach directly to pipe for all remaining services.
2. Piping 2 in. and Smaller: Pipe insulated with glass fiber insulation shall be protected at point of support by a sheet metal shield. Shield shall be #18 gauge, galvanized steel, minimum 120 degree arc, formed to fit insulation thickness and 12 in. long. Tape shields to pipe insulation.
3. Piping 3 in. and Larger: Pipe insulated with glass fiber insulation shall be protected at point of support by a sheet metal shield and pipe support insulation insert(s) between pipe and hanger. Shield shall be #18 gauge, galvanized steel, minimum 120 degree arc, formed to fit insulation thickness and 12 in. long. Tape shields to pipe insulation. Provide temporary blocking to maintain proper spacing for insulation.

- J. Piping systems with material not listed above shall be supported and protected in accordance with manufacturer's recommendations.

2.9 PIPING ACCESSORIES

- A. Escutcheon Plates: Steel or cast brass, split hinge type with setscrew, high plates where required for extended sleeves. Chrome plated in finished areas and at plumbing fixtures.
- B. All cleanout plugs, bushings and nipples, required for instruments and gauges shall be brass.

2.10 SLEEVES

A. Standard Type:

1. Schedule 40 black steel pipe sleeves for structural surfaces, two pipe sizes larger than the pipe, and as recommended by the sealing element manufacturer. Provide full circle water stop collar for sleeves located within below grade walls, wet wells and waterproofed surfaces. The collar shall be fabricated from steel plate and welded to the sleeve around its entire circumference.

2.11 SEALING ELEMENTS

A. Expanding neoprene link type, watertight seal consisting of interlocking links with zinc plated bolts.

1. Acceptable Manufacturers: Thunderline "Link-Seal" Series 200, 300 or 400, Pyropac, Calipco.

2.12 FIRESTOP SYSTEM FOR OPENINGS THROUGH FIRE RATED WALL AND FLOOR ASSEMBLIES

- A. Materials for firestopping seals shall be listed by an approved independent testing laboratory for "Through-Penetration Firestop Systems". The system shall meet the standard fire test for Through-Penetration Firestop Systems designated ASTM E814. Firestop system seals shall be provided at locations where piping pass through fire rated wall, floor/ceiling, or ceiling/roof assembly. Minimum required fire resistant ratings of the assembly shall be maintained by the Firestop System. Installation shall conform with the manufacturer's recommendations and other requirements necessary to meet the testing laboratory's listing for the specific installation.

2.13 STACK SLEEVE

- A. Cast iron body with caulking recess, flashing clamp and under deck clamp.

- B. Acceptable Manufacturers: Jay R. Smith Series 1720, Zurn, Wade.

2.14 PIPING MATERIALS AND SCHEDULE

- A. See Exhibit "A", "Schedule of Piping Materials" at end of this Section for (Plumbing) piping.
- B. See Exhibit "B", "Testing" at end of this Section.

PART 3 - EXECUTION

3.1 EQUIPMENT AND SYSTEMS

- A. Install equipment and systems in accordance with provisions of each applicable Section of these Specifications, and Local/State Codes/Regulations having jurisdiction. Accurately establish grade and elevation of piping before setting sleeves.

Install piping without springing or forcing, except where specifically called for, making

proper allowance for expansion and anchoring. Changes in sizes shall be made with reducing fittings. Reducing couplings are not acceptable. Arrange piping at equipment with necessary offsets, unions, flanges, and valves, to allow for easy part removal and maintenance. Offset piping and change elevation as required to coordinate with other work. Avoid contact with other mechanical or electrical systems. Provide adequate means of draining and venting units, risers, circuits and systems. Conceal piping unless otherwise called for. Copper tubing shall be cut with a wheeled tubing cutter or other approved copper tubing cutter tool. The tubing must be cut square to permit proper joining with the fittings. Ream pipes after cutting and clean before installing. Cap or plug equipment and pipe openings during construction. Install piping parallel with lines of building, properly spaced to provide clearance for insulation. Make changes in direction and branch connections with fittings. Do not install valves, unions and flanges in inaccessible locations. Materials within a system and between systems shall be consistent. If this is not possible, install dielectric fittings.

3.2 PIPING OVER ELECTRICAL EQUIPMENT

- A. Contractor shall route piping to avoid installation directly over electric equipment, including, but not limited to panels, transformers, disconnects, starters, motor control center, adjustable speed drives and fused switches.
- B. Piping shall not be installed in the dedicated electric and working space as defined by NEC 110. Dedicated electrical space is generally equal to the depth and width of electrical equipment, and extends 6 ft. above the electrical equipment, or to a structural ceiling. Dedicated working space is a minimum of 30 in. wide or the width of equipment (whichever is larger) a minimum of 6 ft.-6 in. tall, with a depth of 3ft. to 9 ft. depending on the voltage.

3.3 HANGERS, INSERTS AND SUPPORTS

- A. Piping shall not be supported by wires, band iron, chains, from other piping, or by vertical expansion bolts. Support piping with individual hangers from concrete inserts, wood construction, welded supports, or beams clamps of proper configuration and loading design requirements for each location; replace if not suitable. Follow manufacturer's safe loading recommendations. Suspend with rods of sufficient length for swing and of size called for, using four (4) nuts per rod. Provide additional structural steel members, having one coat rustproof paint, where required for proper support. Provide oversized hangers where insulation/supports must pass between pipe and hanger. Provide continuous support or extra supports for plastic piping per manufacturer's requirements. Hangers, when attached to joists, shall only be placed at the top or bottom chord panel point. Only concentric type hangers are permissible on piping larger than 2-1/2 in.; "C" types are permitted for piping 2 in. and smaller on joists. Provide riser clamps for each riser at each floor. Use trapeze hangers where a group of piping can be installed.
- B. Provide a pipe hanger within 12 inches of pipe unions and piping connections to equipment, in order to facilitate disconnections of piping without pipe sagging.

3.4 PIPE CONNECTIONS

- A. No-Lead Solder Connections: Nonacid flux and clean off excess flux and solder.
- B. Brazed Connections: Make joints with silver brazing alloy in accordance with manufacturer's instructions. Remove working parts of valves before applying heat.
- C. Threaded Connections: Clean out tapering threads, made up with pipe dope; screwed until tight connection. Pipe dope must be specifically selected for each application.
- D. Flanged Joints: Select appropriate gasket material, size, type and thickness for service applications. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- E. Dielectric Pipe Fittings: Provide dielectric nipples at ALL equipment connections where dissimilar metals meet. In addition, provide dielectric unions in all open type piping systems (condensing water, domestic water, etc.) where dissimilar metals are to be joined.
 - 1. Dielectric Unions are not be to used.

3.5 SLEEVES

- A. Provide for pipes passing through floors, walls or ceilings. Not required for floors that are core-drilled, except where floor is waterproofed.
- B. Extend 1/8 in. above finished floor in finished areas. In above grade Mechanical Rooms and other areas with floor drains, use steel pipe sleeves 2 in. above floor.
- C. Use steel pipe sleeves in bearing wall, structural slabs, beams and other structural surfaces, and where called for.
- D. Sleeves shall be as small as practical, consistent with insulation, so as to preserve fire rating.
- E. Fill abandoned sleeves with concrete.
- F. Provide rubber grommet seals for pipes passing through ducts or air chambers or built-up housings.

3.6 SLEEVE PACKING

- A. Seal void space at sleeves as follows:
 - 1. Interior Locations: Firmly pack with fiberglass and caulk.
 - 2. Exterior Walls and Below Grade Cored Holes: Use sealing element.
 - 3. Cored Holes: Use sealing element.
 - 4. Fire Rated, Partitions and Floor Slabs: Use fire rated sealing elements, materials and methods. Provide per manufacturer's instructions to maintain firestop.

5. Waterproofed Walls/Floors: Use waterproof sealing element, device or compound.

3.7 ESCUTCHEON PLATES

- A. Provide polished chrome setscrew type escutcheon plates for all exposed piping passing through floors, walls or ceilings, in all rooms except in Boiler, Fan and Mechanical Rooms.

3.8 TESTS

- A. Refer to Exhibit "B" at the end of this section for testing of Plumbing Systems.
- B. Provide all necessary items to complete proper testing of work. Perform all testing in accordance with governing Codes, local utilities and other agencies having jurisdiction and as specified. Pay all costs to perform tests. Perform all testing in a safe manner. Isolate existing systems.
- C. Domestic Water:
 1. Do not cover joints with insulation until required tests are completed and the Owner's Representative accepts the system.
 2. Make leaks tight; no caulking permitted. Replace defective fittings, pipe or connections. Piping shall be tight and show no loss of pressure.
 3. Air test not acceptable as final test.
 4. Confirm in writing that tests and flushing have been conducted and successfully completed. Submit copy of the test report to Owner's Representative.
- D. Sanitary and Storm:
 1. There shall be no loss of water when testing interior piping.
 2. Air test not acceptable as final test.
 3. Should any leaks, defective joints or defective construction be detected in sewers and/or floors or walls of appurtenant structures, they shall be permanently stopped. Should any defective pipes, fittings or accessories be discovered they shall be removed and replaced at the Contractor's expense.
 4. Confirm in writing that tests have been conducted and successfully completed. Submit copy of the test report to Owner's Representative.

3.9 DOMESTIC WATER PIPING CLEANING AND DISINFECTION

- A. Cleaning and disinfecting shall be in accordance with requirements of New York State Department of Health and authority having jurisdiction. Prior to disinfecting, flush piping to remove any sediment and debris.

- B. Clean and disinfect water distribution piping systems and parts of existing potable water systems that have been altered, extended or repaired.
- C. After disinfection procedures, submit water samples in sterile bottles to an approved Department of Health Laboratory. Samples shall be proven equal to the water quality served to the public from the existing water supply system and acceptable to the Department of Health. Flush and disinfect all sections of pipe that fail the laboratory tests. Submit test results indicating water is potable.

3.10 CONNECTIONS TO SPECIAL EQUIPMENT

- A. Kitchen Equipment:
 - 1. Kitchen Equipment shall be furnished by others and set in place by others.
 - 2. Provide all piping, stops, valves, traps and fittings.
 - 3. Where exposed, provide chrome plated brass piping, valves, hangers, brackets and accessories.
 - 4. Pipe relief valves to floor. Size and arrangement of pipe, traps, valves and fittings, as recommended by manufacturer of equipment.

3.11 PIPE LINE SIZING

- A. Pipe sizes called for are to be maintained. Pipe size changes made only as reviewed by Owner's Representative. Where discrepancy in size occurs, the larger size shall be provided.

EXHIBIT "A" - PIPING MATERIALS (PLUMBING)
(Notes at end of Exhibit "A")

<u>SERVICE</u>	<u>PIPE MATERIALS</u>	<u>FITTINGS</u>	<u>CONNECTIONS</u>
Domestic water interior/hot, cold and circulating 3 in. and smaller	Type L copper	Wrought or cast copper	No-lead solder
Sanitary, sanitary vent, grease waste and storm (buried)	SEE "UNDERGROUND PIPING AND ACCESSORIES" SECTION 221020		
Sanitary, sanitary vent and grease waste	Service weight cast iron soil pipe	No hub	No hub neoprene gasket and stainless steel clamp assembly
	Type DWV copper	Wrought copper	No-lead solder (SEE NOTE 3)
Storm	Service weight cast iron soil pipe	Cast iron hub and spigot	Neoprene compression type gasket
	Service weight cast iron soil pipe	No hub	No hub neoprene gasket and stainless steel clamp assembly
	Schedule 40 galvanized steel	Galvanized ductile iron	Roll grooved mechanical type couplings
	Type DWV copper	Wrought copper	No-lead solder
Indirect waste 1" and Smaller	Type M copper	Wrought copper	No-lead solder
Indirect waste 1 ¼" and larger	Type DWV copper	Wrought copper	No-lead solder
Pump discharge	Schedule 40 galvanized steel	Galvanized cast iron drainage	Threaded
	Type L Copper	Wrought copper	No-lead solder

NOTES FOR EXHIBIT A:

NOTE 1: All uninsulated piping supported by trapeze hangers shall be securely fastened to each hanger using strut-mounted cushion clamps.

EXHIBIT "B" - TESTING

SERVICE

TEST REQUIREMENTS

Domestic water	Test hydrostatically at 150 PSI for two (2) hours or at 1.5 times the working pressure when working pressure exceeds 100 PSI
Sanitary, sanitary vent, storm	Maintain 10 ft. head of water for two (2) hours.
Indirect waste	Maintain 10 ft. head of water for two (2) hours.
Pump discharge	Hydrostatically test at 5 PSI greater than the pump rating for two (2) hours.

END OF SECTION

SECTION 224000

PLUMBING FIXTURES AND TRIM

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

- A. Submit manufacturer's data in accordance with Basic Mechanical/Electrical Requirements. Obtain approval prior to ordering material.
- B. Provide submittals for all items specified under Part 2 - Products of this section.

1.3 DESCRIPTION OF FIXTURES

- A. Fixtures and trim shall be of those manufacturers listed, unless otherwise indicated. Fixtures for this project shall be of same manufacturer.
 - 1. Fixtures: American Standard, Kohler, Mansfield, Sloan, Toto, Watts or Zurn.
 - 2. Faucets: Chicago Faucets, Delta, Moen, Symmons, T&S Brass or Zurn. All faucets shall be lead-free in accordance with NSF 61 and NSF 372.
 - 3. Lab Faucets: Watersaver, Chicago Faucets
 - 4. Flushometers: Sloan "Regal XL" or Zurn.
 - 5. Closet Seats: Bemis, Beneke, Church or Olsonite.
 - 6. Fixture Carriers: Jay R. Smith, Watts, Wade, Josam or Zurn.
 - 7. Sinks: Elkay, Just or Kohler.
 - 8. Water Coolers: Elkay, Haws, Murdock or Oasis.
 - 9. Supplies, Stops and Traps: Brasscraft, EBC, McGuire or Sanitary Dash.
- B. Exposed parts of trim shall have polished chrome plated finish.
- C. Tubular drainage products ("P" traps, nipples, etc.) shall be 17 gauge brass.

1.4 QUALITY ASSURANCE

- A. Comply with requirements of the Plumbing Fixture Law of the New York State Department of Environmental Conservation.

- B. Comply with the American Disabilities Act Guidelines and ANSI A117.1 "Accessible and Usable Buildings and Facilities".
- C. All items here-in used to convey water for potable use shall be lead free in accordance with NSF Standard 61, Section 9 Standard for Drinking Water and Lavatory Faucets and NSF Standard 372 - Maximum Lead Requirements. Compliance shall be via third-party testing and certification.
- D. All fixture trim used to convey water for potable use shall be lead free.

PART 2 - PRODUCTS

2.1 SINKS

A. SK-A (HDCP):

1. Elkay Lustertone ELUHAD141855PD, 16 1/2 in. x 20 1/2 in. x 5 3/8 in. deep, nickel type 304 stainless steel single bowl sink, ADA compliant, 18 gauge, undermount installation, fitted with the following:
 - a. Chicago #201-GN2AE3-317XKAB two handle concealed mount sink faucet, 11-5/8 in. high, 5 3/8 in. reach swing spout, pressure compensating aerator, deck mounted, 8 in. centers, lead-free, ADA compliant and fitted with the following:
 - 1) 1.5 GPM aerator.
 - 2) #317, 4 in. wrist blade handles
 - 3) ADA complaint.
 - b. Elkay #LKAD18 stamped brass drain outlet with 3 in. perforated grid strainer and LKADOS 1-1/2 in. O.D. offset tailpiece.
 - c. McGuire #8912 semi-cast brass adjustable "P" trap, 1-1/2 in. x 1-1/2 in., with cleanout plug and cast brass escutcheon with set screw.
 - d. McGuire #LF2167LKF, lead-free, 1/2 in. copper sweat supplies with 1/2 in. OD flexible risers, loose key stops and cast brass escutcheons with set screws.

2.2 MOP BASINS

A. MB-A:

1. Fiat Model TSB, terrazzo, 36 in. x 24 in. x 12 in. deep, stainless steel flat strainer, 3 in. outlet, stainless steel cap on all sides, color as selected by the Architect, with the following:
 - a. T&S Brass #B-0665-BSTP, lead-free, exposed wall mounted faucet with integral stops, rough chrome finish, lever handles, top-brace spout with bucket hook, hose end and vacuum breaker.
 - b. Fiat # 832AA Hose and Hose Bracket.
 - c. Fiat #889CC Mop Hanger.
 - d. Fiat # E77AA Vinyl Bumper guard on exposed sides.
 - e. Fiat #MSG 36 Stainless Steel Wall Guard.
 - f. Provide silicone sealant between wall, floor and mop basin.

2.3 ELECTRIC WATER COOLER

A. EWC-A:

1. Elkay EZWS-ERPBM28K recessed two level wheelchair access model with bottle filler, ADA compliant, lead-free construction, type 304 stainless steel vandal resistant cabinet and front panel grille, one piece stainless steel basins, flexible bubbler, self-closing front push bar control with in-line stream regulator, adjustable temperature control, permanently sealed and lubricated fan motor, hermetically sealed compressor and control, 370 watts, 120V, capacity of 7.5 GPH at 80°F inlet water, 50°F outlet water with room temperature of 90°F, fitted with the following:
 - a. McGuire #LF165LKE, lead-free, 3/8 in. lavatory wall supply with loose key angle stop, 3/8 in. flexible tube riser, and cast brass escutcheons with set screws.
 - b. McGuire #8902, 1-1/4 in. x 1-1/2 in. semi-cast brass "P" trap with cleanout and cast brass escutcheon with set screw.
 - c. Jay R. Smith floor mounted carrier with rectangular uprights.
 - d. Acceptable Manufacturers: Elkay, Halsey Taylor.

PART 3 - EXECUTION

3.1 FIXTURES, EQUIPMENT AND SYSTEMS

- A. Install fixtures, equipment and systems as shown on Drawings or specified herein in accordance with provisions of each applicable Specification Section and all local and state codes having jurisdiction.

3.2 INSTALLATION OF PLUMBING FIXTURES

- A. Install plumbing fixtures level and plumb, in accordance with fixture manufacturers written installation instructions.
- B. Carefully drill holes for through bolts to avoid chipping blocks or plaster.
- C. Except where carriers are specified, attach hangers or brackets to walls as follows:
 - 1. Masonry Construction: Secure fixture hangers to partition by thru-bolts extending through a steel plate on opposite side of partition. Obtain Owner's Representative's approval prior to work.
 - 2. Metal Stud Construction: Anchor backing for fixtures or equipment to 1/8 in. x 12 in. steel plate bolted or riveted to at least three studs. Obtain Owner's Representative's approval prior to work.
- D. Anchor carriers to concrete floor with 1/2 in. x 3 in. anchor or thru-bolts and washers. Provide for drilling of floor and installation of expansion shields.
- E. Seal fixtures in contact with walls, floors and counters using a sanitary-type, one-part, mildew-resistant, silicone caulk. Match color to fixture color.
- F. Set self-rimming lavatories and sinks in a bed of silicone caulk.
- G. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified and to building wall construction where no support is indicated.
- H. Fasten counter-mounting-type plumbing fixtures to casework.
- I. Immediately after installation, provide protective covering over fixtures and trim.

3.3 MOUNTING HEIGHT AND LOCATION

- A. Mount fixtures at height and location as indicated on Architectural plans and elevations.
- B. Mount accessible fixtures in conformance with the requirements of ANSI A117.1.

3.4 CONNECTIONS

- A. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other sections of Division 22.

3.5 ADJUSTING AND CLEANING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings and controls.
- B. Adjust water pressure at electric water coolers, faucets and flush valves to provide proper flow and stream.
- C. Replace washers of leaking and dripping faucets and stops.
- D. Clean fixtures, fittings, spout and drain strainers with manufacturers' recommended cleaning methods and materials.
- E. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning fixtures and components and retest. Repeat procedure until all units operate properly.

END OF SECTION

SECTION 230504

ELECTRIC WIRING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services for the complete installation of motor control wiring and temperature control wiring as required in Contract Documents. Provide wiring and conduit, required to connect devices furnished as part of or adjunctive to the automatic temperature control system and for motor control regardless of the source of supply. Control wiring includes 120 volt, lower voltage wiring and data network system for control signals directing equipment operation. Control circuits shall be 120 volt maximum. Provide wiring in accordance with requirements specified in Division 26 "Electrical" and the National Electrical Code. Provide devices required for proper system operation, including special electrical switches, transformers, disconnect switches, relays, and circuit breaker protection.
- B. Coordinate all work with Division 26 "Electrical".
- C. Coordinate all work with Division 27, "Communications".

1.2 WORK NOT INCLUDED

- A. Power wiring for motors, motor starters and associated starting and control equipment, as well as the motor starters (except in the case of equipment specified to have packaged control/starters), are included in Division 26 "Electrical", unless otherwise called for.

1.3 QUALIFICATIONS

- A. Wiring shall be installed in compliance with all requirements of Division 26 "Electrical".
- B. Wiring shall be installed in compliance with all requirements of Division 27, "Communications".

1.4 SUBMITTALS

- A. Provide complete wiring diagrams for equipment systems. Deliver wiring diagrams to proper trades in time for roughing of conduit, equipment connections, and avoid delay in construction schedule. Wiring diagrams and roughing information to be wired as part of the Work of Division 26 & 27, "Electrical" & "Communications", shall be clearly indicated.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Control Wiring:

1. Refer to Division 26 specifications for required wiring materials.
2. Unless specifically required otherwise by the BACS equipment manufacturer, all I/O wiring shall be twisted shielded cable.

B. Conduit:

1. Refer to Division 26 specifications for type of conduit to be used in specific applications.
2. All conduit containing control wiring shall be green.

PART 3 - EXECUTION

3.1 GENERAL

- #### A.
- Check electrical wiring pertaining to equipment for completeness and correctness of connections. Correct any misapplied motor and/or motor starter, improper thermal overload device, or device which fails to function and resultant damage, whether due to incorrect connections or improper information on wiring diagrams.

3.2 WIRING FOR CONTROL SYSTEMS

- #### A.
- Provide motor control and temperature control wiring for equipment. All wiring shall be in conduit, unless otherwise noted below, supported on 5ft. centers.
1. Provide 18 in. length flexible conduit at motors and devices subject to vibration.
 2. Do not attach directly to hot surfaces, piping, or ductwork.
 3. Control wiring shall be in separate conduit and raceway from all other wiring.
 4. Control wiring shall be un-spliced from the controller to the sensor or device and shall be labeled at all points of termination.
 5. For sensors with twisted shielded pair cable, the shield shall be ground at the panel and taped back at the sensor.
 6. All control wiring shall be run in conduit within the following locations:
 - a. Mechanical rooms or other spaces in which it is readily accessible.

- b. Interstitial spaces
 - 1) Control wiring can be run in either conduit, cable tray or raceway.
 - c. Vertical chases.
 - d. Above non-accessible ceilings.
 - e. Accessible ceilings within laboratories.
 - f. Air Handling Units.
- 7. Where allowable by Code and contract documents, temperature control wiring may be installed without conduit. Installation and wire insulation types shall be as described by NEC, Article 725. All low voltage wiring circuits 50 volt and under shall:
 - a. Have the proper insulation and meet the requirements of NEC Article 300-22 when installed above accessible ceiling spaces.
 - b. Be adequately supported using bridle rings spaced a maximum of 3 ft. on centers or other approved method when installed horizontally above accessible ceilings or run exposed in unfinished areas.
 - c. Be run in wall cavity or surface metal raceway where no access is available to wall cavity, in finished areas.
 - d. Be installed in conduit in all cases not specifically covered by the above cases, or where subject to physical damage.
- B. Provide pushbutton stations, pilot lights, selector switches, auxiliary starter contacts, and other devices required to provide specified functions.
 - 1. Provide green grounding wire circuited from starter, and run ground wire through conduit to each remote auxiliary relay, pushbutton station, remote panel heating device, thermostat, or device with potentials in excess of 50 volts. Size ground wire as required by NEC.

3.3 EQUIPMENT WIRING

- A. Provide power and control wiring between sections of electrical radiation units, between shipping splits, and between remote panels, thermostats, disconnect switches, and their respective units. Provide control wiring from the package control system, to each respective electric heat coil, reheat coil or motor. Properly mount control package. Power wiring to and including disconnect switch shall be by Division 26, "Electrical".

3.4 FIELD WIRING IN STARTERS, CONTROLLERS AND PANELS

- A. Wiring within starters, controllers, and temperature control panels, shall be routed neatly in gutter space, away from moving and/or heat producing parts. Provide suitably rated terminal blocks. Do not place more than two wire connections on pilot device or relay terminal. Where more than two circuit connections are required, use terminal blocks. Provide nylon insulated, ring spade terminal for all control wires. Cables and wires shall be neatly bundled and lashed with nylon cable straps.

END OF SECTION

SECTION 230923

BUILDING AUTOMATION CONTROL SYSTEM

PART 1 - GENERAL

1.1 INTRODUCTION

- A. The Building Automation Control System (BACS) is configured as a network with control functions at multiple levels, and with multiple points of operator control and supervision. The BACS includes web-based access, the Energy Management and Controls System (EMCS), data transmission systems, field panels and controllers, necessary interfacing controls, sensors and actuators. The controllers contain microprocessors and other supporting electronics that perform local control functions and execute application programs without requiring communications with the centralized head-end computers or workstations.

1.2 DESCRIPTION

- A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Drawings. Extend existing Building Automation Control System (BACS), to perform the functions described in this Section. All new equipment shall be compatible with the existing system. Provide wiring and conduit required to connect devices furnished as a part of, or accessory to, this automatic control system. Control wiring is defined as wiring up to and including 120 volts. Install wiring in accordance with requirements of "Electrical Wiring" in Section 230504, and the National Electrical Code. Provide all required devices for proper system operation, including special electrical switches, transformers, relays, pushbutton stations, etc.
 - 1. All Actuation of valves and dampers shall be electric unless specifically called out elsewhere in the specifications or drawings.
- B. The BACS shall have the following capabilities as described in these specifications:
 - 1. The network controllers shall be connected directly to the Owner's Ethernet Network. The network controller shall also contain SNMP for integration to the Owner's Network Controllers System.
 - 2. The system shall be capable of sending both emails and text messages and phone numbers for alarms. Coordinate with the Owner for email addresses, phone numbers and alarms.
 - 3. Logging of historical data shall be provided for every BACS input and output in the system.
- C. The BACS shall consist microcomputer controllers of modular design providing distributed processing capability, and allowing future expansion of both input/output points and processing/control functions.

- D. The system shall consist of the following components:
1. Provide Ethernet-based network controllers as described in this specification. Controllers shall connect directly to the Operator Workstation over Ethernet, provide communication to the Standalone Digital Control Units and/or other Input/Output Modules and serve as a gateway to equipment furnished by others.
 2. Provide the necessary quantity and types of standalone controllers to meet the requirements of the project for mechanical equipment control including air handlers, central plant control, and terminal unit control. Each standalone controller shall operate completely standalone, containing all of the I/O and programs to control its associated equipment.
 3. A high speed Ethernet connection to the site shall be used for offsite access to the site. Coordinate with the Owner's IT professionals for high speed system access and shall comply with Owner's requirements to maintain the level of security required by the Owner. Coordinate with Owner and provide VPN (Virtual Private Network) as required, to comply with the Owner's IT professionals requirements.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 230504 – Electric Wiring
- B. Section 230901 – Building Automation Control System Communications

1.4 QUALITY ASSURANCE

- A. The complete automatic temperature control system shall be comprised of electric control devices with a microprocessor based Direct Digital Control System. All work shall be installed only by skilled mechanics employed by the BACS Contractor or Subcontractor.
- B. The BACS Contractor/Subcontractor shall have a minimum of five (5) years experience in systems of similar size, type and complexity installed within a 100 mile radius.
- C. The BACS Contractor/Subcontractor shall have a local service department (within a 50 mile radius) and have available a minimum of three (3) factory trained technicians within a 24 hour period.
- D. All components shall be fully tested and documented to operate as a complete system.
- E. Supplier must guarantee that all replacement parts will be carried in stock for a period of ten (10) years minimum from the date that the system is commissioned.
- F. Electrical standards: Provide electrical products that comply with the following agency approvals:
1. UL 916; Energy Management Systems for Temperature Control components and ancillary equipment.

2. UL 873; Temperature Indication and Regulating Equipment.
 3. FCC, Part 15, Subpart J, Class A Computing Devices.
- G. All products shall be labeled with the appropriate approval markings. System installation shall comply with NFPA, NEMA, Local and National codes.

1.5 ACCEPTABLE MAKES

- A. The complete Building Management System is designed and based on that manufactured by Automated Logic Corporation. Acceptable Make: Automated Logic Corporation.

1.6 SUBMITTALS

- A. Floor Plans: Floor plans shall include all controllers/control panels, sensors, interface devices, remote pressure transmitters, smoke detectors, control valves, control dampers, flow meters, UPS's, etc., and all network components (repeaters, routers, etc.). Network wiring shall be shown and identified on the floor plan drawings. The relationship between controlled variable / equipment with the device / sensor shall be indicated using dotted lines. Zoning shall be clearly indicated.
- B. Control System Architecture Diagram: System architecture one-line diagrams shall indicate schematic location of all controllers, LAN switches and interface devices, gateways, etc. Indicate address and type for each control unit; as well as physical media, protocol, communication speed, and type of each LAN.
- C. Control Schematic Drawings: Control schematics shall be generated to graphically indicate each functional system, show the schematic configuration of the systems and location of control devices, define the point names and addresses (as applicable), and define the setpoints for control elements. The following information shall be included in the control schematics at a minimum:
1. BACS legend and abbreviations.
 2. BACS one-line Architecture diagram.
 3. Point names and types.
 4. Normal position of output devices.
 5. Setpoints.
 6. Point addresses and device ranges.
 7. Complete bill of materials listing all devices and manufacturer numbers.

- D. List of all points, including alarms and trends: A listing of all input/output (I/O) points shall include all physical and virtual points, organized by system/sub-system; names, descriptors, and point types; as well as the following:
1. Hardware & Software point type and addresses.
 2. Specific input points that must be able to be put in test mode to facilitate commissioning.
 3. Listing of any associated alarms, as well as annunciation location (BACS, EMCS, etc). Control loops shall include an adjustable deviation from setpoint alarm based upon error and time. The alarm parameters shall be the state the point is in to cause a particular alarm, including whether the source system is also enabled.
 4. Listing, for each point, of its trending and scheduling requirements.
 5. Listing of whether the point is to be included on the BACS graphics.
- E. Detailed written sequences of operation.
- F. Submit a valve schedule showing manufacturer and model number, system / zone served, valve body size, type, CV rating and pipe connection size, actuator, model number and fail position, flow and pressure drop at maximum flow and location. Provide apparatus Bulletins and data sheets for all control system components.
- G. Submit a damper schedule showing manufacturer and model number, system / zone served, size and type, actuator, model number, pilot, mounting position and fail position, design flow and pressure drop, leakage class and location. Provide apparatus Bulletins and data sheets for all control system components.
- H. Product Data: The BACS vendor shall submit manufacturer's technical product data for each control device, panel, controller, and accessory furnished indicating dimensions, capacities, performance and electrical characteristics, and material finishes. Also include installation, start-up, calibration, and maintenance instructions as well as all cable and tubing requirements.
- I. Wiring Diagrams: The BACS vendor shall include detailed wiring. Indicate all required electrical wiring. Wiring diagrams shall include both ladder logic type diagrams for motor starter, control, and safety circuits and detailed digital interface panel point termination diagrams with all wire numbers and terminal block numbers identified. Provide panel termination drawings on separate drawings. Ladder diagrams shall appear on the system schematic. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed. All wiring of related components that make up a system shall be grouped together in one diagram (e.g., all wiring diagrams for the components and devices on a particular AHU shall be shown on one drawing. The supply fan components and devices shall not be shown separate from return fan components and devices, etc.).

- J. Record Documents: Record documents shall be prepared reflecting the final installed condition of the BACS. These as-built documents shall be kept up to date throughout the construction and warranty period. Provide the following information for approval prior to project closeout:
1. Maintenance instructions and spare parts list for each type of control device, control unit, and accessory.
 2. BACS User's Guides (Operating Manuals) for each controller type.
 3. BACS Programming Manuals for each controller type.
 4. All information provided during the submittal phase; updated with as-built information. As-built panel drawings shall also be included as part of the O&M manual process. The drawings that are located in each panel shall incorporate all the systems controlled from that particular panel. The drawings shall include the system schematic and detailed panel wiring diagram. The specific locations of any remote devices such as remote static pressure sensors and differential pressure sensors shall be noted on the plans.
 5. Each control panel on the project shall include an as-built hard copy of all drawings and documentation associated with that panel and its field devices. This documentation shall be provided in a plastic protective pocket mounted inside the panel door.
 6. As-Built Program: Databases with logic, graphics, trends, setpoints, and tuning parameters.

1.7 SCOPE OF WORK

- A. Except as otherwise noted, the control system shall consist of all Ethernet Network Controllers, Standalone Digital Control Units, software, sensors, transducers, relays, valves, dampers, damper operators and other accessory equipment, along with a complete system of electrical interlocking wiring as required to fill the intent of the specification and provide for a complete and operable system.
- B. The BACS Contractor/Subcontractor shall review and study all HVAC drawings and the entire specification to familiarize themselves with the equipment and system operation and to verify the quantities and types of dampers, operators, alarms, etc. to be provided.
- C. All interlocking, wiring and installation of control devices associated with the equipment shall be provided under this Contract. The BACS Contractor/Subcontractor shall demonstrate the operation of the system to the Owner and prove that it complies with the intent of the drawings and specifications.

- D. Provide services and manpower necessary for commissioning of system in coordination with the HVAC Contractor, Balancing Contractor and Owner's representative. Commissioning reports showing the testing of each BACS point on the system shall be submitted to the Engineer for review and approval upon completion of the commissioning process. Refer to the "General Commissioning Requirements" in Section 019110.

1.8 WORK INCIDENTAL TO BACS CONTRACTOR

- A. The BACS Contractor/Subcontractor shall furnish the following materials, installation by the HVAC Contractor:
 - 1. For piping work:
 - a. Control valves in piping.
 - b. Immersion sensing wells in piping systems.
 - c. Valved pressure taps.
 - 2. For sheet metal work:
 - a. All automatic dampers, the BACS Contractor/Subcontractor shall assemble multiple section dampers with required interconnecting linkages and extend required number of shafts through duct for external mounting of damper and motors.
 - b. The HVAC Contractor shall provide access doors or other means of access through ducts or ceilings and walls for service and adjustment of controllers, valves, and dampers.
- B. Control manufacturer shall furnish written details, instructions and supervision for the above trades to ensure proper installation size, and location of any equipment furnished for installation by others.
- C. The BACS Contractor/Subcontractor is responsible for providing 120 volt dedicated power to all BACS panels and for providing 120 volt dedicated power emergency power with surge protection to all BACS panels, where noted.
- D. Electrical trade to provide occupancy sensors unless noted otherwise. Refer to responsibility matrices in Part 3.
- E. The BACS to provide 120 volt dedicated power and control transformers at all microprocessor based VAV terminal unit controllers. As an option, provide control transformers sized to serve multiple VAV terminal unit controllers and laboratory air valve controllers. The Electrical Contractor is responsible for providing a junction box or boxes to obtain power, on a per floor/area basis. See electrical plans for locations. BACS contractor to extend from junction boxes as required.

- F. BACS Contractor/Subcontractor is responsible for providing Ethernet data drops at main building controller and IP controllers.

1.9 SYSTEM ADJUSTMENT AND CALIBRATION

- A. When the Work has been completed, completely adjust and calibrate the control system. Review the operation of each system input and output, control loops and/or software routings, timing functions, operator entered constants and facilities management functions and observe that they perform their intended functions. Provide a complete values and points log, printed every hour, for one week to demonstrate control functions and programming. Provide one point log for summer operation and one winter. Points to be trended shall be selected by the engineer. When above procedure has been completed and the control system is operating satisfactorily, submit a letter with one copy of completed values and points log to the Owner's Representative advising them that the control system is 100% complete and operates in accordance with the Contract Documents.
- B. After review and approval of points log by the Engineer, the BACS Contractor shall schedule a technician on site for field review of system components, operation and graphics as part of final system appearance.

1.10 WARRANTY

- A. Except as otherwise specified, the Contractor shall warrant and guarantee all work against defects in materials, equipment, and workmanship for a period of one (1) year from the date of acceptance of the work as evidenced by a resolution to that effect by the Owner, and for that period of time noted in special or extended warranties.
 - 1. Maintain temperatures within 1°F above and below setting.
 - 2. Humidity devices shall maintain relative humidity conditions within 3% of span 0-100% RH.
- B. The period of one (1) year shall be extended with respect to portions of the work first performed after substantial completion by the period of time between substantial completion and actual performance of the work.
- C. The Contractor shall provide all recommended preventative maintenance of the materials, equipment, and workmanship as necessary and as described in the operating and maintenance manuals during the warranty period. In addition, the Contractor shall provide two (2) semi-annual service visits (i.e., one visit during the peak cooling season and one visit during the peak heating season) to test and evaluate the performance of the equipment. The Contractor shall provide a written report of the test and evaluation results. The service visits shall include, but not be limited to:
 - 1. Checking and, if necessary, correcting the calibration of the sensors, transducers, and transmitters for air flow, liquid flow, pressure, temperature, and humidity.
 - 2. Checking and, if necessary, correcting the operation of the dampers and damper actuators.

3. Checking and, if necessary, correcting the operation (i.e., monitoring and command) of the system points.
- D. Software and Hardware Updates - At the end of the first six months, and during the subsequent six months, the BACS Contractor shall update the equipment and any controllers, servers, workstations, and HMI Web servers with the latest modifications and improvements in software, firmware, and hardware that the manufacturer may have incorporated in the furnished equipment.

PART 2 - PRODUCTS

2.1 SENSORS

A. Temperature Sensors / Transmitters:

1. Temperature sensors / Transmitters shall comply with the following as a minimum:
 - a. Resolution: When matched with A/D converter of the controller, sensor range shall provide a resolution of no less than 0.4°F (unless noted otherwise) over a range of -30 to 230°F.
 - b. Accuracy: +/- 0.4°F accuracy at calibration point. When used in combination with a humidity and/or CO₂ sensor, +/- 0.5°F is acceptable.
 - c. Element: Thermistor.
 - 1) For applications requiring high accuracy measurement, such as outside air (OA) temperature and liquid immersion sensors, use of integrated circuit is acceptable.
2. Room Temperature Sensor:
 - a. These shall be an element contained within a ventilated cover, suitable for wall mounting on a standard electrical box. Provide an insulated base. Provide in white, unless noted otherwise.
 - b. Setpoint Adjustment: Provide set point adjustment where indicated. The setpoint adjustment shall be a warmer/cooler indication that shall be scalable via the BACS. Programmable scale shall have the capability to be limited via the BACS. Public spaces shall not have setpoint adjustment.
 - c. Occupancy Override: Where spaces do not have occupancy/vacancy sensors, provide a button on the room sensor enclosure where indicated. This shall be a momentary contact closure. Public spaces shall not have occupancy overrides.
 - d. Display: Alphanumeric.

3. Single Point Duct Temperature Sensor:
 - a. These shall consist of a sensing element, junction box for wiring connections, and a gasket to prevent air leakage or vibration noise. The sensor probe shall be stainless steel.
 4. Averaging Duct Temperature Sensor:
 - a. These shall consist of an averaging element, junction box for wiring connections and gasket to prevent air leakage. Provide sensor lengths and quantities to result in one foot of sensing element for each, two square feet of coil/duct face area. The averaging sensor tube shall contain at least four thermistor sensors.
 5. Liquid Immersion Temperature Sensor:
 - a. These shall include thermowell, sensor and connection head for wiring connections. Thermowell shall be brass or stainless steel for non-corrosive fluids below 250°F and 300 series stainless steel for all other applications.
 6. Outside Air Temperature Sensor:
 - a. These shall consist of a sensor, sun shield, utility box, and watertight gasket to prevent water seepage. Materials shall be non-corroding and resistant to UV exposure.
- B. Humidity Sensors:
1. Sensors shall comply with the following as a minimum:
 - a. Input Range: 10 to 100% RH.
 - b. Operating Range: As required by the application.
 - c. Long Term Stability: Less than 1% drift per year.
 - d. Accuracy:
 - 1) General Duty, monitoring: +/- 3% RH between 20-90% RH at 77 °F, including hysteresis, linearity, and repeatability.
 - 2) High Accuracy control, enthalpy calculation, dewpoint calculation, humidification and dehumidification control: +/- 2% RH between 20-90% RH at 77 °F, including hysteresis, linearity, and repeatability.
 2. Device shall be suitable for duct, wall, or outdoor mounting. Device can be combined into one device with temperature and CO2 sensors, where applicable.

Sensors shall be two-wire transmitters utilizing bulk polymer resistance change or thin film capacitance change. Units shall produce linear continuous output of 4-20 mA for % RH. Duct sensors and outdoor air humidity sensors shall be suitable for ambient temperature conditions of -40 to 212°F.

C. Carbon Dioxide (CO₂) Sensors:

1. CO₂ measurement shall be accomplished with Non-Dispersive Infrared (NDIR) technology. Sensors shall comply with the following as a minimum:
 - a. Uncertainty: Shall be no greater than ± 75 ppm (or $\pm 7\%$ of Reading < 500 ppm and $\pm 7.5\%$ for 800 – 1,200 ppm) at 77° F (25° C) for a CO₂ measurement range of at least 400 – 2,000 ppm.
 - b. Stability: Less than 2% FS, over the expected 15 year life of the typical sensor.
2. Each CO₂ sensor node shall be factory calibrated, shall automatically self-calibrate during operation and shall not require routine recalibration throughout its normal service life.
3. Device shall be combined into one device with temperature and humidity sensors, where applicable.

D. Pressure Sensors / Transmitters:

1. Air Differential Pressure Sensor / Transmitters:
 - a. Provide zero and span adjustments, measuring probes and display.
 - b. Sensors / Transmitters shall comply with the following as a minimum:
 - 1) Accuracy: $\pm 1\%$ of full scale.
 - 2) Range: Smallest range feasible for the application, but no more than two times the working differential pressure of the system to allow the highest resolution possible.
 - c. Acceptable Manufacturers: BAPI, Dwyer, Mamac, Setra, Veris Industries.
2. Liquid Differential Pressure Sensors:
 - a. Three-valve manifold for venting, draining, and calibration; pressure/temperature test ports in lieu of pressure gauges. Wetted parts shall be stainless steel with a silicone fluid-filled diaphragm. Provide external span and zero adjustments.

- b. Sensors / Transmitters shall comply with the following as a minimum:
 - 1) Signal: Linear 4 to 20 mA or 0-10 VDC signal.
 - 2) Span: No greater than 2 times the working differential pressure of the system to allow the highest possible resolution.
 - 3) Rating: 150 psig, static.
 - 4) Accuracy: 1% accuracy over the entire span.
 - 5) Repeatability: +/- 0.5% at maximum span.
- c. Design Make: Veris Industries PWL / PWL2.
- d. Acceptable Manufacturers: Mamac, Setra, Veris Industries.
- 3. Air Differential and Static Pressure Switches:
 - a. Span shall be no greater than 2 times the measured value to allow the highest possible resolution.
- 4. Liquid Differential Pressure Switches:
 - a. Do not use liquid differential pressure switches for run status on pumps. Provide liquid differential pressure switches when pressure sensing is required to determine status.
 - b. Acceptable Manufacturers and Model Numbers: Barksdale EPD1HAA40, Penn P74.
- E. Air Flow Sensors/Transmitters:
 - 1. Air flow sensors shall be Pitot-tube averaging grid or Vortex Shedding type.
 - a. Fan inlet grids shall be used where possible to measure fan flow. Fan inlet grids shall be provided by the fan vendor.
 - b. The use of “golf ball” type airflow probes is not acceptable.
 - c. The use of combination control damper/flow measurement devices is not acceptable.
 - 2. Duct Mounted Air Flow Sensing Element:
 - a. Rectangular: 16 gauge galvanized casing, 8 in. deep, with formed 1-1/2 in. integral 90° connecting flanges.
 - b. Oval: 18 gauge galvanized casing, 8 in. long between beads with 1 in. connecting sleeve on each end (10 in. overall length). Actual O.D. dimensions are 1/4 in. less than specified duct I.D. dimensions.

- c. Accuracy: Within 2% throughout the velocity range of 600 FPM and over, when installed in accordance with published recommendations.
 - d. Temperature: 350°F continuous operation, 400°F intermittent operation.
 - e. Humidity: 0-100% continuous operation.
 - f. Corrosion Resistance: Good salt air, excellent solvent and aromatic hydrocarbon resistance.
 - g. Element Material: 6063-T5 anodized aluminum.
 - h. Connection Fittings: 1/4 in. compression, suitable for use with thermoplastic or copper tube.
 - i. Air flow sensing element subject to corrosive fumes or humidity shall be constructed of stainless steel for the casing and element materials.
 - j. Acceptable Manufacturers: Accutrol Vortek, Air Monitor, Paragon
3. Fan Inlet Air Flow Sensing Element:
- a. Material: 6063-T5 anodized aluminum, galvanized mounting brackets.
 - b. Accuracy: Within 2% throughout the velocity range of 600 FPM and over, when installed in accordance with published recommendations.
 - c. Temperature: 350°F continuous operation; 400°F intermittent operation.
 - d. Humidity: 0-100% continuous operation.
 - e. Connection Fittings: 1/4 in. compression, suitable for use with thermoplastic or copper tube.
 - f. Corrosion Resistance: Good salt air and mild acid resistance, excellent solvent and aromatic hydrocarbon resistance.
 - g. Air flow sensing element subject to corrosive fumes or humidity shall be constructed of stainless steel for the element and materials.
 - h. Design Equipment: Paragon Controls FE-1050.
 - i. Acceptable Manufacturers: Accutrol Vortek, Air Monitor, Paragon

4. Air Volume/Velocity Transducers for Duct, Outside Air and Fan Inlet Airflow Stations:

- a. The transducer shall be a combination differential pressure transmitter, square root extractor, scaling multiplier, and output filter with process indication, complete in a single package. Transducer shall comply with the following as a minimum:
 - 1) Accuracy: $\pm 0.25\%$.
 - 2) Stability: $\pm 0.5\%$ of full scale per year or less.
 - 3) Span: No greater than 2 times the working differential pressure of the system to allow the highest possible resolution.
 - 4) Material: Compatible with the environment.
 - 5) Auto-zero capability by venting ports to atmosphere.
- b. The measured air volume shall be locally indicated on a door mounted LED display meter scaled in CFM.
- c. The transducer package shall be a factory calibrated for the flow-measuring element being served.
- d. A transducer shall be provided for each individual airflow station.
- e. An output signal of 0-10 VDC or 4-20 mA shall be generated for monitoring by the BACS system.
- f. Acceptable Manufacturers: Accutrol Vortek, Air Monitor, Paragon.

F. Current Switches (CS):

- a. For constant speed motors, switch shall indicate loss of status when current falls below an adjustable trip point.
- b. CS shall include LED indication of status.
- c. Acceptable Manufacturer: Veris Industries.

G. Occupancy/Vacancy Sensors:

- 1. For spaces with standalone lighting controls, the sensors are to be provided by the electrical trade to control both HVAC and lighting; The BACS contractor shall provide a single gang box with face plate at the sensor. Refer to the Standalone Lighting Controls Responsibility Matrix in Part 3.

H. Condensate Sensors:

1. Condensate Sensors for moisture sensing on chilled water supply systems to terminal chilled beam and radiant cooling devices.
2. Acceptable Manufacturers and Model Numbers:
 - a. Siemens QXA 2000.
 - b. Sauter EGH 102.
 - c. Honeywell H7018A1003.

A. Safety/Status Devices:

1. Low Limit Detector: Electric type, with 20 ft. long serpentine element, with manual reset and auxiliary contacts to the BACS, set for 37°F for "freeze" protection and 55°F for fan discharge application. Provide a 20 ft. long element for every 25 sq. ft. of coil face area.
2. High Limit Detector: High limit thermostats shall be located as directed, and shall be manual reset type set at 120°F in the return and 180°F in the discharge. Thermostats shall be double pole so as to provide input capability for alarm at the temperature control system.
3. Pump status shall be provided through adjustable range current sensing element on pump motor.
4. Fan status shall be provided through adjustable range current sensing element on the fan motor.

B. Miscellaneous Devices:

1. Provide necessary, relays, transformers, required for a complete and operable system.

2.2 CONTROL VALVES

A. General:

1. Sized by BMS Contractor/Subcontractor and guaranteed to meet the heating and cooling requirements. Pressure drop for valves shall be submitted for review, including all CV values. Valves shall be selected such that they are not oversized.
2. Valves shall be suitable for the rated pressure and temperature service. Close off pressures must be determined in concert with the actuators and valves shall be provided to close off against extreme anticipated conditions.

3. Modulating valves shall be carefully selected to control in a smooth and stable fashion across the range of anticipated conditions. Split ranging of heating and cooling valves controlled by the BACS is not acceptable. A separate output from the BACS shall be provided for all control valves. Electric Input shall be 4-20 mA or 0-10 VDC.
 4. Pressure independent control valves shall not be used.
- B. Electrical Operators:
1. Provide 24 VAC control operators which are 0-10 VDC input proportional with fail positions as noted below and as needed by control sequence. Operator shall be synchronous motor driven with sufficient reserve torque to provide smooth modulating action.
 2. Actuators shall be electric, one motor only.
 3. Acceptable Manufacturer: Belimo
- C. Coil Valves, Water:
1. Type: Two-way, V-port valve with characterizing disc, 1/4 turn.
 2. Packing: EPDM O-rings, lubricated.
 3. Ball & Stem: Stainless steel.
 4. Seat: Fiberglass reinforced teflon.
 5. Flow characteristics: Equal percentage
 6. Modulating water valves will generally be ball valves with an equal percentage characteristic. Modulating water valves shall typically be sized for 50-100% of the typical controlled circuit pressure drop at 70% wide open CV. The minimum design CV shall be no less than 1.9.
 7. Water and glycol control valves shall be rated to remain closed (zero leakage) against 120% of the full shutoff head of the pumps, when the control signal is set to "fully closed".
 8. Fail positions shall generally be as follows:
 - a. Terminal Hot Water Radiation: Fail last.
 - b. Duct Mounted Re-heat Coils Serving Offices: Fail last.
 9. Acceptable Manufacturers: Belimo, Valve Solutions, Inc.

2.3 CONTROL DAMPERS

A. Electrical Operators:

1. Provide 24 VAC control operators which are 0-10 VDC input proportional or two position with spring return as needed by control sequence and designed to operate the control dampers. Operator shall be synchronous motor driven with sufficient reserve torque to provide smooth modulating action or two position action and adequate close off rating.
2. Actuators shall be electric, one motor only. Stacking of actuators is unacceptable. Design for a minimum of 60,000 full cycles at full torque and listed to UL 873. Provide stroke indicator. Actuators shall have a positive positioning circuit and selectable inputs. Full stroke shall be within 90 seconds. Where fail positions are required, provide spring return on the actuator with adequate close off force.
3. Acceptable Manufacturer: Belimo

B. General Duty, Control Dampers:

1. Provide control dampers as shown on the drawings and diagrams, to meet the following minimum construction standards. Control dampers shall be galvanized construction, unless otherwise noted. Dampers subject to corrosive fumes or humidity shall be constructed of stainless steel. Dampers shall have external crankshafts to allow the connection of the damper actuator outside of the air stream.
2. Where damper sizes are not specifically indicated, they shall be sized by the BACS Contractor. Maximum velocity shall be 1500 fpm and maximum pressure drop 0.1 in. w.g. Modulating dampers shall be carefully selected to control in a smooth and stable fashion across the range of anticipated conditions. Size limitation for dampers connected to a single jackshaft shall be based on the manufacturer's recommendations.
3. Leakage: Class 1, 4 CFM/sq. ft. at 1 in. W.C., tested per AMCA Standard 500-D-98 and AMCA Standard 511 and bearing AMCA's Certified Ratings for both air performance and air leakage.
4. Frame: Structural hat channel with reinforced corners. Material to match damper material of construction and shall be either 0.081 in., 6063-T5 extruded aluminum, 16 gauge, galvanized steel reinforced to meet 13 gauge criteria, or 16 gauge, 304 stainless steel.
5. Blades: Air foil type for low pressure drop and low noise generation. Blades shall be opposed, except where size dictates a single blade. Material to match damper material of construction and shall be either heavy duty 6063-T5 extruded aluminum, 14 gauge galvanized steel or 18 gauge, 304 stainless steel.
6. Blade Seals: Ruskiprene, suitable for -72°F to +275°F mechanically locked into the blade edge.

7. Jamb Seals: Flexible metal, compression type.
8. Blade Axles: 1/2 in. diameter plated steel, hexagonal, mechanically attached to damper blade. Stainless steel dampers shall be 304 stainless steel axels. Linkage conceded out of the air stream.
9. Bearings: Corrosion resistant, permanently lubricated stainless steel sleeve.
10. Dampers over 48 in. length and height shall be made in multiple sections.
11. Where shown or required for proof of closure or open position, provide factory installed damper positioning switch package.
12. Design Make: Ruskin CD50 (aluminum), Ruskin CD60 (galvanized), Ruskin CD60SS (stainless steel).
13. Acceptable Manufacturers: Greenheck, Ruskin and Tamco.

C. High Performance Thermally Broken and Insulated Control (Motorized) Dampers:

1. Provide high performance thermally broken and insulated control dampers at outdoor air intake and exhaust louvers to meet the following minimum construction standards. Dampers shall have external crankshafts to allow the connection of the damper actuator outside of the air stream.
2. Where damper sizes are not specifically indicated, they shall be sized by the BACS Contractor. Maximum velocity shall be 1500 fpm and maximum pressure drop 0.1 in. w.g. Modulating dampers shall be carefully selected to control in a smooth and stable fashion across the range of anticipated conditions. Size limitation for dampers connected to a single jackshaft shall be based on the manufacturer's recommendations.
3. Leakage: Shall not exceed 4 CFM/sq. ft. at 1in. W.C. (Leakage Class 1), tested per AMCA Standard 500-D-98 and AMCA Standard 511 and bearing AMCA's Certified Ratings for both air performance and air leakage. Holding torque shall not exceed 5 in. lbs./sq. ft. on opposed blade dampers, and 7 in. lbs./sq. ft. on parallel blades with a minimum torque of 40 in. lbs.
4. Frame: 0.125 in. extruded aluminum structural hat channel with tabbed corners for reinforcement.
5. Blade Seals: Ruskiprene II, suitable for -40°F and with locked into the blade edge extruded silicone, down to -70°F.
6. Jamb Seals: Flexible polycarbonate type.
7. Blade Axles: 1/2 in. plated steel hexagonal positively locked into the damper blade. Linkage conceded out of the air stream.
8. Bearings: Corrosion resistant, permanently lubricated molded synthetic.

9. Dampers over 48 in. length and height shall be made in multiple sections.
10. Where shown or required for proof of closure or open position, provide factory installed damper positioning switch package.
11. Design Make: Ruskin TED50.
12. Acceptable Manufacturers: Greenheck, Ruskin and Tamco.

2.4 LIGHTING CONTROL DEVICES

A. BACS Lighting Control:

1. Certain zone types require that the BACS perform the lighting controls. Refer to the BACS Lighting Controls Responsibility Matrix in Part 3 for the responsibilities of this contractor with regard to BACS lighting controls.
2. Lighting control equipment shall be compatible with the Building Management System.
3. Acceptable Manufacturers: Legrand, Wattstopper, Leviton, Lutron.

B. Power Pack Relay:

1. Design Make: Leviton OPS20-RDH.

C. Occupancy Sensor:

1. Vacancy/occupancy sensors shall comply with the following as a minimum:
 - a. Zero crossing switching operation (switch on/off only where sine wave is at zero volts) suitable for linear, non-linear loads indicated. Where the load to be controlled exceeds the sensor load rating provide a separate relay of adequate rating.
 - b. Failure of the unit shall be to the on/closed position or manual operation.
 - c. Motion sensitivity adjustment (dip switch or dial) and time delay adjustment (5 to 30 minutes minimum, dip switch or dial).
 - d. Line voltage input and switching. Field selectable for 120 or 277 VAC, 60 Hz.
 - e. UL listed and have a five (5) year manufacturer full replacement warranty.
 - f. Test mode feature to override the set time delay to allow adjusting of the sensitivity.

- g. Sensor locations shall be adjusted during construction and at occupancy as recommended by the manufacturer for optimal sensing and operation.
 - h. Operation shall be field selectable with vacancy sensor being manual "on" with close switch/contact upon motion sensing and open after the set amount of time delay without motion or occupancy sensor being automatic on upon motion sensing. Original settings shall be as occupancy.
 - i. Adjustable controls/settings shall only be accessible when the front cover is removed or from the back of the unit.
 - j. Unit color shall match the project devices except for the ceiling-mounted units which shall match the ceiling color. All color selections shall be by the Architect.
 - k. Provide components as needed for the indicated control.
 - l. A factory-authorized representative shall coordinate and instruct the startup services of the sensors providing placement recommendations, connection guidance and startup supervision and adjustment.
2. Ceiling Mounted - PIR Technology (No Subscript):
- a. Unit shall mount to standard octagonal box, have auxiliary contact (Form C, 0.5A at 24 VDC), and utilize PIR technology motion sensing.
 - b. Shall have self-contained rated contacts or control a separate switch pack. If a self-contained unit, then the ratings and function shall meet or exceed the switch pack specifications.
 - c. Sensing shall be 360 degrees with a minimum operating area of:
 - 1) Major Motion (Walking/Arm Wave): 50 ft. x 30 ft.
 - 2) Minor Motion (Small Motion at Desk): 40 ft. x 20 ft.
 - d. Units shall be suitable for overlap of motion detection areas without reduction in spacing and false operation.
 - e. Sensing shall be suitable for a ceiling/mounting height of up to 12 ft. minimum.
 - f. Ambient light level sensing (adjustable 20-300 fc) to prevent "On" operation when the ambient light level is greater than the setpoint level.
 - g. The maximum depth shall be 1.5 in. below the ceiling/box.
 - h. Design Make: Legrand Wattstopper CI-24.

3. Switch Pack:

- a. Provide a minimum of one (1) switch pack for each ceiling-mounted vacancy/occupancy sensor. Provide additional units for multiple circuits (quantity to match the quantity of circuits).
- b. Unit shall be plenum rated with line voltage side into a metallic box.
- c. Low voltage power shall be suitable for a minimum of three (3) sensors. Multiple sensors shall be able to control a single switch pack.
- d. Minimum switching capacity shall be 20A (all types of loads) at 120/277 VAC.
- e. Shall have enough spare contacts provided at each sensor for HVAC system connection.

D. Dimming Control Relay:

1. Design Make: ACI PAM-1.

2.5 CONTROL PANELS

A. Enclosures:

1. BACS control panels shall be fully enclosed cabinet, baked enamel, steel, aluminum or composite material construction. Enclosures located in mechanical rooms shall be NEMA 4 and Enclosures located in labs and other relatively dust free and dry spaces may be NEMA 1. Enclosures shall have removable back plates and keyed, hinged covers. Enclosures shall be either free-standing or wall-mounted. Provide support steel framing.
2. The Contractor shall size the panel such that no more than 80% of the surface of the enclosure back plate is used.
3. Network level boards shall be installed inside a protective enclosure.
4. Plastic wire way (e.g., Panduit) shall be used to organize all wiring in the panel. Sufficient wire way shall be provided in the panel such that it is filled no more than 80% capacity.
5. Cover exposed electrical connections. Each component on front panel shall have an appropriate engraved label describing its function. Components inside the panel shall be appropriately labeled for ease of identification. Stick-on labels are not acceptable.

B. Low Voltage Power Supplies:

1. The Contractor shall provide a regulated, protected low voltage power supply as required with the ability to produce at least 33% more current than required by the transmitters and controls being installed. Output regulation shall be less than 0.5mV. There shall be no overshoot on turn on or off. Operating temperature shall be -20 to +70°C.
2. Class II transformers shall be used.

C. Line Voltage Power Source:

1. Careful consideration must be given to the propagation of information across controllers as they wake up from a power interruption. This may require certain critical controllers to be powered from uninterruptible power source (UPS) to ensure rapid propagation of the emergency status.

2.6 CONTROL WIRING AND INSTRUMENTATION TUBING

- A. All control wiring shall comply with requirements of "Electrical Wiring" in Section 230504.
- B. All instrumentation tubing in mechanical rooms shall be hard drawn type L copper.

2.7 CONTROLLERS

- A. The control system shall consist of a network of controllers. It is intended to allow cost-effective application of manufacturers' standard products while maintaining the integrity and reliability of the control functions commensurate with their application. The controllers provided shall meet the performance requirements for throughput, response time, point capacity, trend log capacity, etc., as stated in this section and Section 230901. While specification 230901 contains several constraints on the controller system architecture, it is recognized that a variety of configurations may be equally acceptable. For example, it may be possible to meet the project requirements with a single large controller or several smaller ones. Therefore, this specification does not generally prescribe controllers' system architecture or controllers' detailed characteristics, such as processor speed, amount of memory, amount of I/O, power supply details, etc.
- B. Controllers shall be provided with a real-time operating system resident in ROM. It shall support all specified functions. It shall provide a command prioritization scheme to allow functional override of control functions. At a minimum, the following shall be provided:
 1. Real-time operating system software.
 2. Real-time clock/calendar and network time synchronization (with the exception field-level controllers).
 3. Controller diagnostic software.
 4. BACS software.

5. Alarm processing and buffering software.
 6. Energy management software.
 7. Data trending, reporting, and buffering software.
 8. I/O (physical and virtual) database. Inputs and outputs shall have the capability to be overridden for emergency modes and testing. If the design documentation does not specifically indicate for which points this is required, control vendor shall request in writing a list of such points. If this has not been requested, the vendor shall reprogram or reconfigure the systems as required during testing.
- C. Building and system level controllers (for example, air handling units, hydronic systems, laboratory zones) shall be capable of operating independently, in stand-alone fashion, with no communication to other devices on the network while performing their monitoring and control routines using programs and operating parameters stored in the controllers' memory. All points and functions that make up a functional system shall be included in one controller to qualify for this stand-alone functionality. Refer to control schematics for function point groups. Examples of required functional point groupings, by owner, are as follows:
1. Air Systems: All points and functions required to control an air handler with all directly associated supply fans, return fans, exhaust fans, airflows, heat recovery, coils and downstream static pressure sensors. This excludes the terminals that may be associated with that air handler.
 2. Hydronic Systems: All points and functions associated with the supply side of a hydronic system such as pumps, flow meters, temperature sensors, differential pressure sensors, proof indications, valves etc. This excludes the terminals on that hydronic system.
 3. Terminals: All points and functions required to control one terminal system including variable airflow devices, control dampers, valves, temperature and humidity sensors, etc. This does not include the scheduling period or any outside air that may be necessary for control.
- D. Where control sequences depend on global variables such as outside air temperature, the controller shall have the capability of either using the last value or a default value.
- E. Values that may be received across the network are as follows:
1. Air Systems: Outside air temperature and humidity, emergency power source indications, terminal based reset parameters, VAV box commands, smoke modes.
 2. Hydronic Systems: Outside air temperature and humidity, emergency power source indication, and terminal based reset parameters, control valve commands.

- F. Controllers must include sufficient memory for all required operation and all required trending, when trending is buffered in the controller. Where control system operation is hindered by the shortage of memory, contractor shall, at no cost to the Owner, either upgrade the memory or provide multiple controllers. The mix of points for multiple controllers shall not violate the stand-alone requirements.
- G. Controllers storing their configuration in volatile memory shall not be used. Software stored in non-volatile memory will not have to be downloaded from the central server after an interruption of power occurs.
- H. Controllers used for time-scheduled operations must be equipped with a battery backed internal real-time clock function to provide a time base for implementing time-dependent programs. Provision shall be made for the automatic updating, such as a Network Time Protocol (NTP) server or Precise Time Protocol (PTP) server, of the controllers' clocks via a time master.
- I. Resumption of power after an outage shall cause the controllers to automatically restart and establish communications as needed by their applications. Controller shutdown based on a self-diagnosed failure in the power supply, hardware, or software must set each piece of controlled equipment to a predetermined failure mode.
- J. Controllers shall be powered from the most reliable source that powers any of the systems it serves. In the situation where a controller will be required to continuously collect data, or where it monitors critical recovery information such as the presence of emergency power, it may be necessary to provide a UPS for the controller as well as any critical sensors. Where panels are provided with a UPS, the panel shall be provided with a means of monitoring the power source status to the controlled equipment to enable special emergency power logic. This can be a dedicated power monitor or a value coming from transfer switch contacts.

PART 3 – EXECUTION

3.1 GENERAL SYSTEM REQUIREMENTS

- A. This section defines the requirements for configuration and installation of the BACS.
- B. Vendors providing controls for Cornell University shall maintain site-wide configuration documentation. Whenever the BACS is extended, the documentation required in this section shall be provided/updated per configuration management requirements to reflect the entire installation on the campus. Device naming and addressing must conform to Cornell's specific conventions as detailed in Cornell's specific convention as detailed in Specification 230901. No device will be connected to a Cornell network until these conventions have been understood and met.
- C. Devices (i.e., sensors, meters, instruments, etc.) that are resettable must be installed in a readily accessible location (e.g., the device must be accessible at floor level without the use of a ladder). No device shall require shutting down a building system for calibration.

- D. Devices that are installed in an exposed location (i.e., not mounted within a cabinet) must be suitable for such installations (e.g., do not install a device that is intended to be installed in a cabinet in an exposed location).
- E. All existing BACS controllers and sensors removed from the project shall be turned over the Owner in good condition.
- F. This contract shall be responsible for decommissioning of the BACS being removed and modifications to existing system graphics and software programming.

3.2 SENSORS

- A. Room Sensors shall be mounted symmetrical with adjacent items such as light switches (nominally 44 inch to the center of the device and in accordance with ADA requirements). Verify exact room location to avoid doors, fixed and portable equipment. Install to minimize damage. Do not install adjacent to lighting dimmers or other heat generating equipment.
- B. All sensors and transmitters shall be located in accessible locations that do not require system shutdown for calibration. Locate all remote transmitters in control panels 5 foot above finished floor.
- C. One outside air (OA) temperature / humidity sensor with a global networked point provided for each building. Generally, these shall be located on a north wall of the building and installed with stand-offs. On each 100% OA system, locate sensor with dewpoint calculations in outside air intake plenum.
- D. Refer to drawings for installation requirements for liquid differential pressure sensors.
- E. All pressure switches shall be mounted in accessible and, to the extent possible, vibration-free locations. Switches shall be installed in accordance with the manufacturer's installation instructions.
- F. Do not use liquid differential pressure switches for run status on pumps. Current switches shall be used on constant volume pumps and drive contacts shall be used for pumps with ASDs.
- G. Flow sensors shall be carefully placed to ensure flow profiles that are required for accurate flow sensing. Installed in accordance with the manufacturer's installation instructions for minimum length of duct or pipe unobstructed upstream and downstream from the sensor.

3.3 CONTROL VALVES

- A. Union or flanged connected. Locate close to apparatus controlled with pipe reducers and increasers located closest to valve. Locate, arrange, and pipe per installation diagram.

3.4 CONTROL DAMPERS

- A. Dampers and Damper Operators: Tag dampers for proper location. Install per manufacturer's printed instruction as to motor size and quantity, linkage arrangement, drive connection point. Adjust to close tightly. Allow for conduit sleeve or blank space for roof fan dampers. Where ducts are insulated, set damper operators at least 2 in. away from side of duct to allow for insulation.

3.5 CONTROL PANELS

- A. The control panels and enclosures housing the controllers shall be coordinated to the extent possible, to share vertical and horizontal wire-ways to facilitate and minimize the cost of home-runs to terminal equipment.
- B. Cornell must have quick, direct access to all control panels to maintain building integrity similar to that provided for fire emergencies without going through user spaces. Panels shall be located outside of user areas where practical. If field panels must be located in user areas, they shall be in areas with easy access. Protection and separation for user activities will be provided.
- C. Enclosures:
 - 1. All BACS mechanical room control panels shall be installed in metal enclosures containing the controller, I/O modules, power supplies, termination strips, battery (if not integral to the controller or I/O module) and a spare AC outlet.
 - 2. Control panels shall be located in equipment rooms, where practicable, and in locations such that the ambient conditions are between 50 and 90°F and 10 to 85% relative humidity. Control panels located in areas where conditions are outside of these ranges shall have enclosures outfitted with heating or cooling devices to provide the proper environmental conditions.
 - 3. All terminal controllers shall be installed in a protective sheetmetal enclosure. Coordinate with the terminal unit vendor.
 - 4. All penetrations of the BACS or outboard gear panels in mechanical rooms shall be from the bottom of the enclosure with wireway and conduit stubs from the wireway up to the panel.
 - 5. Panel layout and construction shall be neat and professional.
 - 6. All controllers, wiring, and components in the panels shall be labeled. All labeling shall match the reference numbers on the cabinet drawings that shall be provided for each panel.
 - 7. All transformers and power supplies shall be mounted outside of the central panel.

D. Low Voltage Power Supplies:

1. The BACS Contactor shall certify, in writing, at the time of shop drawing submittal that the BACS equipment provided will not cause, as a result of its operation, either directly or indirectly, electrical interference to be induced into the building's electrical power systems.

E. Live Voltage Power Source:

1. Controllers shall be powered from emergency power sources whenever the controlled equipment is connected to emergency power source.
2. An un-interruptible power source (UPS) shall be provided on Ethernet network gateways (headends) and switches.
3. Line voltage power sources to controls shall be labelled with its source panel and circuit number.

3.6 CONTROL WIRING AND INSTRUMENTATION TUBING

- A. All control wiring shall comply with requirements of "Electrical Wiring" in Section 230504.

3.7 CONTROLLERS

- A. The controllers and system architecture shall be configured and programmed to carry out the sequences of operation contained in the project documents.
- B. Since these guidelines with respect to controllers are performance oriented, rather than prescriptive, they will generally refer simply to "controllers" meaning computers capable of direct digital control. In those cases where distinguishing between controllers with differing capabilities is needed, the following nomenclature will be used:
1. Building-level controller: These are controllers that are connected to the campus backbone network and communicate over Ethernet using BACnet/IP. They will typically be used to control and monitor one or more large systems or be applied to other building-wide functions. They shall, at a minimum, meet the requirements of a BACnet Building Controller (B-BC).
 2. System-level controller: These controllers will also be BACnet/IP connected to the campus backbone network. They will typically be dedicated to the control of a single large piece of equipment such as an air handler or chiller, and a lab environment with fume hoods. They shall, at a minimum, meet the requirements of a BACnet Advanced Application Controller (B-AAC).

3. Field-level controller: These controllers are typically used for control of “unitary” devices such as VAV boxes, fan coil units, etc. These controllers will be BACnet/IP connected to the campus backbone network or in special spaces may be on a lower performance BACnet LAN such as MS/TP or ARCNET. They shall, at a minimum, meet the requirements of a BACnet Application Specific Controller (B-ASC).
- C. Programming: The programming shall be logically segmented, documented, and titled, and expand on the specified sequence of operations. Each segment shall contain control logic for a specific controlled component of a system. This is to improve the ability of the end user to understand and interpret the logic easily.
 - D. Trending: To support commissioning and building data mining, the BACS shall be capable of trending and archiving all points on building-level and system-level controllers at a minimum of 15 minute intervals. The BACS shall also have the capability of trending at least five points on each field-level controller at an interval of 15 minutes. The trend data shall be uploaded to a central database as needed to prevent buffer overflow in the controller. Controller memory capability, network architecture, and communications bandwidth shall be designed to account for this trending. The BACS vendor shall provide control trends during start up and prior to functional performance testing of the systems. Reports shall be scheduled to output the data to a common format such as comma separated text, Microsoft formats such as Excel and Access, and portable database format. Trended data will be archived in an Owner-accessible SQL database for a minimum period of 2-years.
 - E. Trend Graphs: Web-based software shall provide for displaying graphic plots of the trended values. The software shall support multiple scales, points and point types simultaneously. Control vendor shall configure these graphs in a logical manner for each system. Consult with the commissioning team members and project manager for required configuration. Provide a trend for every analog control loop that includes the setpoint, process variable, and control output.
 - F. Real-time Plotting: Software shall be provided for real time plotting/graphing of multiple values in user-defined time intervals. These graphs will typically be used in commissioning to observe loop responses and system reactions. Control vendor shall configure these graphs in a logical manner for each system. Consult with the commissioning team members and project manager for required configuration.
 - G. Web-based Graphic: The following screens shall be provided:
 1. Floor Plan Screens:
 - a. Provide floor plan screens for each floor and/or section of the building. Indicate the location of all equipment that is not located on the equipment room screens. Indicate the location of temperature sensors and the device associated with each temperature-controlled zone (i.e., reheat coils, VAV terminals, fan-coils, single-zone AHU’s etc.) on the floor plan screens. Each floor plan screen shall show thermographic space temperatures and lighting on/off status.

- b. Display the space temperature point adjacent to each temperature sensor symbol. Indicate room numbers as provided by Cornell University. Provide a graphic link from each zone and/or equipment symbol shown on the graphic floor plan screens to each corresponding equipment schematic graphic screen.
 - c. Provide floor plan screens for each mechanical equipment room and, if mechanical equipment is situated there, the roof. Indicate the location of each item of mechanical equipment. Provide a link from each equipment symbol shown on the plan view screen to each corresponding mechanical system schematic graphic.
 - d. If multiple floor plans are necessary to show all areas, provide a graphic building key plan. Use elevation views and/or plan views as necessary to graphically indicate the location of all of the larger scale floor plans. Link the graphic building key plan to larger scale partial floor plans. Provide links from each larger scale floor plan graphic to the building key plan and to each of the other graphic floor plan screens.
 - e. Provide a graphic site plan with links to and from each building graphic.
 - f. Locate central system static and differential pressure sensors, linkable from the floor plan drawings.
2. System Schematic Screens:
- a. Provide graphics for each air handling system. Indicate OA temperature and enthalpy, and mode of operation as applicable (i.e., occupied, unoccupied, warm-up, cool-down, etc.). Link screens for air handlers to the heating system and cooling system graphics. Link screens for supply and exhaust systems, if they are not available in a single graphic.
 - b. Each I/O point in the project shall appear in at least one graphic. System graphics shall include flow diagrams with status, setpoints, current analog input and output values, operator commands, etc., as applicable. General layout of the system shall be schematically correct. I/O devices shall be shown in their schematically correct locations. Include appropriate engineering units for each displayed point value. Verbose names (English language descriptors) shall be included for each point on all graphics; this may be accomplished by the use of a pop-up window accessed by selecting the displayed point with the cursor. Indicate all adjustable setpoints on the applicable system schematic graphic or, if space does not allow, on a supplemental linked setpoint screen. All outputs shall be represented in terms of percent open and include a pop-up link to the control logic.
 - c. Provide a system schematic graphic for each HVAC subsystem controlled.
 - d. Provide a graphic for each hydronic system.

- e. Link screens for heating and cooling system graphics to utility history reports showing current and monthly energy usage, demands, peak values, etc.
 - f. Link screens to all schedules and setpoints.
 - 3. Zone Schematic Screens, HVAC:
 - a. Provide a graphic for each zone, including all terminal units such as fan coil units, chilled beams and VAVs shown on the graphic even if provided with different terminal level controllers.
 - b. In addition to points associated with the unit, indicate mode of operation as applicable (i.e., normal occupied, unoccupied, warm-up, maximum heating, maximum cooling, etc.). Provide links between the applicable floor plan screen and this screen.
 - c. Provide links to the graphics representing the parent systems.
 - 4. Zone Schematic Screens, BACS Lighting Controls:
 - a. In addition to points associated with the unit, indicate mode of operation as applicable. Provide links between the applicable floor plan screen and this screen.
- H. Alarm Programming: Alarms shall be intelligent based upon the algorithm in this section
 - 1. Alarm programming related to BACS controlled equipment shall reside at the controller level along with the functional programming for equipment control.
 - a. Intrinsic alarming associated with AI, AV, BI or BV objects (or any of the other BACnet objects that support intrinsic alarming) shall only be used where the alarm is valid regardless of the state of the associated equipment or where there is a ready means for automatically suppressing alarm generation when the associated equipment is operationally secured.
 - b. Alarm points shall be separate BACnet objects actuated by associated alarm programming.
 - c. Alarm objects shall have descriptive BACnet object names. BACnet alarm object names shall end in "Alarm". For detailed information on proper point naming conventions, see Section 230901 Building Automation and Control System Communications.
 - d. If it is necessary for the alarm to have latching functionality, the user shall be provided easy unlatching capability from within the BACS system if appropriate, taking into account equipment safety concerns. This is in addition to any local alarm reset.

- e. Alarms designated for monitoring by EMCS shall be set up in the BACS system to report to the EMCS alarm server.
 - f. Only central system alarms shall be annunciated at EMCS.
- 2. Analog Deviation Alarms: Analog deviation alarms shall be based upon the comparison between the controlled variable and the controlled variable setpoint (whether calculated or fixed).
 - a. When controlled variable deviates from setpoint above or below user adjustable high or low alarm thresholds, the alarm shall be activated.
 - b. High and low alarm threshold values shall have associated adjustable deadbands (hysteresis values) for alarm clearing conditions as the controlled variable falls below the high alarm threshold or rises above the low alarm threshold.
 - c. Alarm programming shall include user adjustable alarm delays for active equipment operation.
 - d. Alarm programming shall include startup delays to prevent nuisance alarms during equipment startup.
 - e. Analog deviation alarms shall be disabled if the associated equipment is operationally secured.
- 3. Analog High Limit Alarms: Analog high limit alarms shall be based upon the comparison between the controlled variable and a user adjustable high limit alarm value.
 - a. When controlled variable rises above the user adjustable high limit, the alarm shall be activated.
 - b. High alarm limit value shall have associated adjustable deadband (hysteresis value) for alarm clearing condition as the controlled variable falls below the high alarm limit.
 - c. Alarm programming shall include user adjustable alarm delays.
 - d. High limit alarms shall be disabled if the associated equipment is operationally secured, unless needed due to equipment safety considerations.
- 4. Analog Low Limit Alarms: Analog low limit alarms shall be based upon the comparison between the controlled variable and a user adjustable low limit alarm value.
 - a. When controlled variable falls below the user adjustable low limit, the alarm shall be activated.

- b. Low alarm limit value shall have associated adjustable deadband (hysteresis value) for alarm clearing condition as the controlled variable rises above the low alarm limit.
 - c. Alarm programming shall include user adjustable alarm delays.
 - d. Low limit alarms shall be disabled if the associated equipment is operationally secured, unless needed due to equipment safety considerations.
- 5. Binary Run Status Alarms: Status alarms shall be based upon the comparison between run status and equipment command where applicable.
 - a. Alarm Status programming shall include user adjustable alarm delays.
- 6. Binary Alarming: Alarms shall be triggered upon associated BI changing state to the non-normal or alarm state.
 - a. Alarm Status programming shall include user adjustable alarm delays.
 - b. Binary alarms shall be disabled if the associated equipment is operationally secured, unless needed due to equipment safety considerations.

3.8 OPERATOR INTERFACES

- A. All interface to the BACS shall be web-based.
- B. During construction, the BACS shall be hosted on a construction server and transferred to the owner's central server at the earliest convenience.
- C. The project shall be responsible for upgrading the campus central server location.

3.9 LOW AND HIGH LIMIT SAFETY FUNCTIONS

- A. Provide for where noted on drawings. Wiring to be directly to the motor starter. High limit controller (firestat) shall be located in the unit discharge. Low limit shall be strung on the upstream face of cooling coils.

3.10 SMOKE DAMPERS AND FIRE/FAN SHUT DOWN

- A. Provide control for smoke dampers as required. Division 26 "Electric" to provide signal wiring to close all smoke partition smoke dampers associated with a particular air handling unit upon alarm at any duct smoke detector in that particular system. Coordinate the voltage of the EP switch with Division 26 "Electric".
- B. Division 26 "Electric" to provide a signal to stop air handling unit fans and close air handling unit smoke dampers upon activation of the fire alarm system. Wiring to be directly to the motor starter.

- C. The BACS Contractor shall provide control wiring for a digital input point for an end switch that shall prevent the operation of the air handling unit fans until its corresponding smoke dampers are proven fully open.
- D. Division 26 "Electric" shall also provide a signal to the BACS control system that the fire alarm system is activated.
- E. Installed Smoke Detection Devices and Smoke Dampers:
 - 1. Smoke dampers are installed at each duct/smoke barrier penetration.
 - 2. Every smoke damper has a local duct smoke detector.
 - 3. Every smoke damper has a local remote test station.
 - 4. Every duct smoke detector is addressable and is connected to the building fire alarm system.
 - 5. The building project area is provided with addressable area smoke detectors.
- F. Fire Alarm Activation of Smoke Dampers:
 - 1. Duct Smoke Detectors:
 - a. Upon activation of any duct smoke detector, an addressable signal is sent to the building fire alarm system and the smoke damper associated with duct smoke detector is closed.
 - b. Upon receipt of the addressable duct smoke detector signal, the building fire alarm system shuts down both the supply and return fans or the exhaust fan, associated with the duct system that experienced the detector activation.
 - c. Upon receipt of the associated fan system drives being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
- G. Non-Fire Alarm System Activation of Smoke Dampers (These activations do not cause for a building fire condition to be annunciated):
 - 1. Safety Device Activation:
 - a. Upon activation of either the low-limit switch (freeze-stat) or the supply duct high static pressure switch, both the supply and return fans are de-energized via hardwiring of the low limit switch in the fan starter circuits.

- b. The building fire alarm system point addressable module that is installed at the adjustable speed drive of the supply and return fans then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.
 - c. Upon receipt of the associated fan system drives being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
- 2. BACS Component Fault:
 - a. Upon activation of any of the following BACS component faults, the supply and return fans, or exhaust fan are de-energized via BACS.
 - (a) Supply fan ASD fault.
 - (b) Return fan ASD fault.
 - (c) Exhaust fan ASD fault.
 - (d) Exhaust fan current sensor fault.
 - (e) Outside air damper end switch fault.
 - (f) Return air damper end switch fault.
 - (g) Exhaust air damper end switch fault.
 - b. The building fire alarm system point addressable module that is installed at the adjustable speed drive, or motor starter current sensor, of both the supply and return fans or exhaust fan, then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.
 - c. Upon receipt of the associated fan system drive/starter being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
- 3. EMCS Operator Activation:
 - a. When the EMCS system operator overrides the operational status of the air handling system and shuts down the supply, return, or exhaust fans.
 - b. The shutdown of the supply, return or exhaust fans shall be interlocked through BACS programming. If the supply fan is shutdown, the return fan shall also be shut down automatically. If the return fan is shutdown, the supply fan shall be shut down automatically.

- c. The building fire alarm system point addressable module that is installed at the adjustable speed drive, or motor starter current sensor, of both the supply and return fans or exhaust fan, then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.
 - d. Upon receipt of the associated supply, return or exhaust fan system drive/starter being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
- 4. Maintenance Operator Activation:
 - a. When a building maintenance staff member manually shuts off the supply, return or exhaust fan at the starter disconnect switch, the supply, return or exhaust fans are shutdown.
 - b. The shutdown of the supply, return or exhaust fans shall be interlocked through BACS programming. If the supply fan is shutdown, the return fan shall also be shut down automatically. If the return fan is shutdown, the supply fan shall be shut down automatically.
 - c. The building fire alarm system point addressable module that is installed at the adjustable speed drive, or motor starter current sensor, of both the supply and return fans or exhaust fan, then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.
 - d. Upon receipt of the associated supply, return or exhaust fan system drive/starter being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
- H. Smoke Damper Testing - M/E Engineering offers the following suggestions for a smoke damper testing protocol. The actual final protocol needs to be authored and approved by all Cornell parties and agencies of interest.
 - 1. Duct Smoke Detector (Fire Alarm Condition):
 - a. Under controlled conditions and with proper notification to the Building Manager and Cornell Fire and Safety, apply smoke to any duct smoke detector in the ductwork of any air handling systems which serve the project area.
 - b. Upon receipt of the addressable duct smoke detector signal, the building fire alarm system shuts down both the supply and return, or exhaust fans associated with the duct system that experienced the detector activation.

- c. The building fire alarm system point addressable module that is installed at the adjustable speed drive, or motor starter current sensor, of both the supply and return fans or exhaust fan, then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.
 - d. Upon receipt of the associated supply, return or exhaust fan system drive/starter being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
 - e. Confirm damper closure at the local smoke damper access door.
2. Safety Device Activation (Non-Fire Alarm Condition):
- a. Under controlled conditions and with proper notification to the Building Manager, manually trip the low limit switch (freeze-stat) associated with any air handling system in the project area.
 - b. The building fire alarm system point addressable module that is installed at the adjustable speed drive, or motor starter current sensor, of both the supply and return fans or exhaust fan, then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.
 - c. Upon receipt of the associated supply, return or exhaust fan system drive/starter being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
 - d. Confirm damper closure at the local smoke damper access door.
3. BACS Component Interlock or Fault:
- a. Under controlled conditions and with proper notification to the Building Manager, manually cause for a fault condition to occur in any of the following BACS components:
 - (a) Supply fan ASD fault.
 - (b) Return fan ASD fault.
 - (c) Exhaust fan ASD fault.
 - (d) Exhaust fan current sensor fault.
 - (e) Outside air damper end switch fault.
 - (f) Return air damper end switch fault.

- (g) Exhaust air damper end switch fault.
 - b. The building fire alarm system point addressable module that is installed at the adjustable speed drive, or motor starter current sensor, of both the supply and return fans or exhaust fan, then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.
 - c. Upon receipt of the associated supply, return or exhaust fan system drive/starter being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
 - d. Confirm damper closure at the local smoke damper access door
4. EMCS Operator Activation (Non-Fire Alarm Condition):
- a. Under controlled conditions and with proper notification to the Building Manager, manually override the operational status of any air handling system via laptop, PC or remote access to EMCS Webcontrol and shutdown the associated air handling system.
 - b. The shutdown of the supply, return or exhaust fans shall be interlocked through BACS programming. If the supply fan is shutdown, the return fan shall also be shut down automatically. If return fan is shutdown, the supply fan shall be shut down automatically.
 - c. The building fire alarm system point addressable module that is installed at the adjustable speed drive, or motor starter current sensor, of both the supply and return fans or exhaust fan, then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.
 - d. Upon receipt of the associated supply, return or exhaust fan system drive/starter being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
 - e. Confirm damper closure at the local smoke damper access door.
5. Maintenance Operator Activation (Non-Fire Alarm Condition):
- a. Under controlled conditions and with proper notification to the Building Manager, manually shut off any air handling system within the project area.
 - b. The shutdown of the supply, return or exhaust fans shall be interlocked through BACS programming. If the supply fan is shutdown, the return fan shall also be shut down automatically. If the return fan is shutdown, the supply fan shall be shut down automatically.

- c. The building fire alarm system point addressable module that is installed at the adjustable speed drive, or motor starter current sensor, of both the supply and return fans or exhaust fan, then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.
- d. Upon receipt of the associated supply, return or exhaust fan system drive/starter being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
- e. Confirm damper closure at the local smoke damper access door.

3.11 EXISTING CONTROL DEVICES

- A. The bid for the control work shall be based on the premise that existing control devices are operational and are not in need of repair and replacement, unless otherwise noted.
- B. This contractor shall notify the Owner's Representative of existing control devices that need to be replaced or repaired that may be noticed in the process of installation of new work.

3.12 COMMISSIONING

- A. All new BACS installations and expansions of existing systems shall be fully commissioned. All acceptance testing, documentation and training shall be required.
- B. Refer to the "General Commissioning Requirements" in Section 019110 for the BACS Trade's responsibilities for commissioning in addition to the following:
 - 1. Provide all logic, graphics, and trends for review prior to the start of field commissioning activities.
 - 2. Provide a complete calibration and operational check for each individual point and function contained within the BACS.
 - 3. Conduct the checkout with the use of point/function log sheets to be prepared by the contractor. The Owner shall approve the log sheet format.
 - 4. Submit log sheets to the Owner prior to the commencement of any final acceptance testing.
 - 5. Certify, in writing, to the Owner prior to the commencement of final acceptance testing that all components of the BACS are functioning as per the requirements of the contract documents.
 - 6. Provide to the Owner as-built drawings and documentation at least four (4) weeks prior to the commencement of any final BACS acceptance testing. Ensure all trends and graphics are completed and approved by Cornell.

7. The BACS contractor shall issue a report upon project completion stating that the system is complete, has been adjusted, and has had all hardware and software functions verified, that all analog control loops are tuned, and is operating in accordance with the specifications. Any deviations from specified settings or operations necessitated during system adjustment shall be specifically noted.
8. The Contractor shall check out the installation with a representative from Cornell's Energy Conservation Control Team. The checkout shall consist of verifying the ability of the BACS to communicate with the central EMCS system, verifying the calibration of each sensor and/or transmitter, and verifying the operation of each control point.
9. All software processes shall be thoroughly demonstrated to the Owner's representative. Alarm conditions shall be simulated for conformance. Analog control points shall be exercised through their entire range. All control interlocks and sequences shall be completely verified. The checkout shall be a thorough and exhaustive review of the installation to assure proper operation of the total system.

3.13 TRAINING

- A. Upon completion of the work and acceptance by the Owner, factory representatives of the control manufacturer shall provide instruction to the Owner's operating personnel who have responsibility for the mechanical systems and controls installed by the contractor. The contractor shall provide 8 hours of training.

3.14 CONTROL SEQUENCE

- A. Refer to plan for control diagrams, sequence of operation and points lists.

3.15 LIGHTING CONTROLS RESPONSIBILITY MATRIX

- A. The following chart outlines the BACS / Division 26 Responsibilities with regard to the standalone lighting controls:

STANDALONE LIGHTING CONTROLS RESPONSIBILITY MATRIX

<u>LIGHTING CONTROL DEVICE</u>	<u>BACS</u>	<u>DIV 26</u>
Emergency Switched 277/120 VAC Power		X
120 VAC Power		X
Emergency Lighting Control Unit		X
Emergency Lighting Transfer Switch		X
Emergency Light Fixture		X
Emergency Lighting Dimming Override		X
Normal Power Light Fixture		X
Controller		X
24 VAC Power		X
Transformer		X

Primary Power Pack Relay		X
Secondary Power Pack Relay		X
HVAC OCC/UNOCC COMMAND	X	
Dimming Wall Switches		X
Dimming Control Relay		X
Occupancy Sensors		X
OCCUPANCY	X	
Daylight Sensors		X

- B. Certain zone types require that the BACS perform the lighting controls. The following chart outlines the BACS / Division 26 Responsibilities with regard to the BACS provided lighting controls:

BACS LIGHTING CONTROLS RESPONSIBILITY MATRIX

<u>LIGHTING CONTROL DEVICE</u>	<u>BACS</u>	<u>DIV 26</u>
Emergency Switched 277/120 VAC Power		X
120 VAC Power		X
Emergency Lighting Control Unit		X
Emergency Lighting Transfer Switch		X
Emergency Light Fixture		X
Emergency Lighting Dimming Override		X
Normal Power Light Fixture		X
Controller	X	
24 VAC Power	X	
Transformer	X	
Primary Power Pack Relay	X	
LIGHT ENABLE COMMAND	X	
LIGHT STATUS	X	
Secondary Power Pack Relay	X	
HVAC OCC/UNOCC COMMAND	X	
Dimming Wall Switches		X
Dimming Control Relay	X	
DIMMING COMMAND	X	
DIMMING ENABLE COMMAND	X	
Occupancy Sensors	X	
OCCUPANCY	X	
Daylight Sensors	X	
LIGHT LEVEL	X	

END OF SECTION

SECTION 233100

SHEET METAL AND DUCTWORK ACCESSORIES CONSTRUCTION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services required for the complete installation designed in Contract Documents.

1.2 QUALITY ASSURANCE

- A. Ductwork shall be fabricated and installed in compliance with latest edition of the following standards and with the edition of the Codes in effect at the time the building permit is obtained.
 - 1. SMACNA Duct Construction Standards - Metal and Flexible Ductwork.
 - 2. SMACNA Duct Liner Application Standard.
 - 3. SMACNA HVAC Air Duct Leakage Test Manual.
 - 4. Mechanical Code of New York State.
 - 5. Energy Conservation Construction Code of New York State.
 - 6. Plans and Specifications which exceed the requirements in any of the referenced standards.
- B. All sheet metal shall be fabricated and installed by an experienced Contractor specializing in this type of work.
- C. All ductwork and fittings shall have a computer generated label affixed to the exterior surface of each section, detailing all applicable information including the duct dimensions, gauge, reinforcement type/class and connection type by systems manufacturer. Galvanizing thickness shall be clearly stenciled on each duct section.
- D. All ductwork on the project shall meet the SMACNA Duct Cleanliness For New Construction Guidelines, "Advanced Level" of duct cleanliness for production, delivery, storage and installation of ductwork.

1.3 SUBMITTALS

- A. Submit a complete shop standard manual including miscellaneous materials, and construction details for all shop fabricated materials including, but not limited to, volume dampers, turning vanes, duct sealant, equipment flexible connections, access doors, flexible duct, acoustical duct lining, etc.

B. Ductwork Shop Drawings

1. Prepare minimum 1/4 in. scale drawings:
 - a. Detailed ductwork shop drawings shall include size, layouts and pressure classifications. Any ductwork installed without benefit of review by the Engineer of Record may be subject to replacement at the expense of the Contractor.
 - b. Constructed from actual field inspections and measurements so as to assure a complete job.
 - c. Incorporate dimensions of actual equipment proposed for use on the project.
 - d. Showing adequate sections, elevations, and plan views and indicating the bottom of ductwork elevations from the finished floor.
 - e. Indicating all volume dampers, fire dampers, smoke dampers, damper access doors and other accessories required for a completed project.
 - f. Indicate roof, wall and floor opening dimensions and locations shown on shop drawings.
 - g. Indicate the location of the duct smoke detectors, increase duct size, ensure the minimum straight ductwork upstream or/and downstream at smoke detectors, where required for proper installation, per smoke detector manufacturer's recommendations. Coordinate minimum duct size required with 28 "Electronic Safety and Security".
2. Call to the attention of the Engineer immediately, any major deviations from the Contract Drawings, which must be made. All deviations shall be documented in writing. Resubmit with corrections for final Engineer review.
3. Submit prints to each Sub-Contractor of the other trades for review for interferences and coordination with their work.

- C. Prepare a duct pressure testing report similar to that suggested by SMACNA and submit for review. Duct testing shall be conducted in the presence of the Owner's Representative. Provide test reports indicating pressure tests performed. Include date, a ductwork approved shop drawings sheet with the section tested highlighted, test pressure and leakage rate.

1.4 GENERAL

- A. All adhesives, sealants, primers and paint used for ductwork in the interior of the building shall comply with the maximum Volatile Organic Compound (VOC) limits called for in the current version of U.S. Green Building Council LEED Credits EQ 4.1 and EQ 4.2.

1.5 DUCTWORK CLASSIFICATION

- A. Duct systems are to be classified and constructed per the SMACNA Velocity-Pressure classification system as follows:
1. All ductwork shall be constructed for a minimum pressure class of 2 in. w.g. (unless stated otherwise) for the following systems, as applicable:
 - a. Supply duct downstream of terminal units.
 - b. Typical low pressure supply ductwork.
 - c. Typical return ductwork.
 - d. Typical low pressure exhaust ductwork.
 2. Supply duct upstream of terminal units shall be constructed for a minimum pressure class of 3 in. w.g. unless otherwise stated or required as per below.
 3. Pressure classes above 3 in. w.g. shall be provided as follows, based upon the external static pressure as scheduled for each specific fan.

<u>Scheduled External Static Pressure</u>	<u>Pressure Class</u>
Over 3 in. up to 4 in. w.g.	4 in. w.g.
Over 4 in. up to 6 in. w.g.	6 in. w.g.
Over 6 in. up to 10 in. w.g.	10 in. w.g.

PART 2 - PRODUCTS

2.1 DUCTWORK MATERIALS

- A. See Exhibit at the end of this section for where sheet metal materials shall be applied, and remarks.
1. Galvanized Sheet Steel: Comply with ASTM A653 and A924, with G90/Z275 coating.
 2. Stainless Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in Exhibit "I"; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D or No. 3 as indicated in Exhibit "I".
 3. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M) Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
 4. Gauges per SMACNA HVAC Duct Construction Standards, Metal and Flexible.
- B. Make: Semco, United Sheet Metal, unless noted otherwise, or approved equal.

2.2 SQUARE AND RECTANGULAR DUCTWORK

- A. Transverse and longitudinal duct seams reinforcement shall conform to appropriate tables and figures per SMACNA Velocity-Pressure Classification for duct construction.
 - 1. Transverse joints shall be sealed with duct joint sealant. "Ductmate" or "Nexus" 4-bolt connection systems may be used in lieu of standard construction.
 - 2. Field assembled longitudinal seams shall be sealed with duct sealant. Factory or shop fabricated rolled or machine pressed longitudinal seams does not require sealant.
- B. Corner closures shall be required as described and illustrated by SMACNA Duct Construction Standards.
- C. Throat radius on all elbows shall not be less than the dimension of the duct plane of radius. Where this cannot be maintained, use shorter radius with internal guide vanes, or square elbow with turning vanes.
- D. Bracing and hanging of ductwork shall be per SMACNA Standards for size and system class of ductwork being used.
- E. Any transformations shall not reduce the ductwork cross-sectional area. Maximum angle in straight duct, 20° for diverging flow and 30° for contraction flow. Transformation from square to round seams welded or brazed.

2.3 ROUND DUCTWORK

- A. Standard Round Ductwork:
 - 1. All spiral ducts shall have locked seams so made as to eliminate leakage under pressure for which this system has been designed. Longitudinal seams duct shall have fusion-welded butt seams.
 - 2. No stovepipe will be allowed.
 - 3. Round Ductwork Fittings:
 - a. All fittings fabricated per SMACNA Standards for round ductwork, material to match straight pieces of ductwork.
 - b. Fittings shall have continuous, welded seams.
 - c. 90° tees shall be conical type. 90° tees and 45° laterals up to and including 12 in. diameter tap size shall have a radiused entrance into the tap, produced by machine or press forming. The entrance shall be free of any restrictions.
 - d. Round taps off the bottom of rectangular ducts down to diffusers shall be made with a 45° square to round shoe-tap.

4. Elbows:
 - a. Diameters 3 in. through 8 in.: Two-section stamped and continuously welded elbows, material to match straight pieces of ductwork.
 - b. Over 8 in.: Gored construction with standing seam construction and internally sealed or continuously welded. Less than 35° - two gores, 36° to 71° - three gores, over 71° - five gores.
 - c. Fabricated to a centerline radius of 1.5 times the cross-section diameter.
 - d. Adjustable elbows are not allowed.
5. Joints:
 - a. For duct construction pressure 3 in. w.g. or greater:
 - 1) Round Joints:
 - a) Unexposed Duct 3 in. - 30 in. Diameter: Connect round duct with a one piece interior slip coupling, at least two gauges heavier than duct wall, beaded at center and fastener to duct with screws. Seal joint with an approved sealant applied continuously around both end of coupler prior to assembling and after fastening.
 - b) All Exposed Duct and Unexposed Duct 30 in. - 72 in. Diameter: Install using a three piece, gasket flanged-joint consisting of two internal flanges, with integral mastic sealant, and one external closure band, which compress the gasket between the internal flanges.
 - (1) Acceptable Manufacturer: Ductmate Industries "Spiralmate" system or approved equal.
 - c) Above 72 in. Diameter: Install using companion angle flanged joints as defined in Figure 3-1 of the 2005 SMACNA Manual, "HVAC Duct Construction Standards, Metal and Flexible" Third Edition. Refer to manual for proper sizing and construction details.
 - d) Dust collection systems and exposed duct 3 in. - 14 in. use a one piece, polyethylene lined gasket connector with integrated bolt for the closure system.
 - (1) Acceptable Manufacturer: Ductmate Industries "Quicksleeve" or approved equal.
 - b. Pipe-to-pipe joints in diameters up to 60 in. shall be by the use of sleeve couplings, reinforced by rolled beads.

- c. Pipe-to-fitting joints in diameters up to 60 in. shall be by slip-fit of projecting collar of the fitting into the pipe.
- d. Insertion length of sleeve coupling and fitting collar shall be 2 in. up to 36 in. diameter and 4 in. above 36 in. diameter.
- e. Pipe-to-pipe and pipe-to-fitting connections in ductwork above 60 in. in diameter shall be made by angle ring flanges. The flange on the pipe shall be a 2 in. x 2 in. x 3/16 in. angle attached to the pipe with a continuous weld. The fittings shall have a loose ring "Van Stone" flange. A 5/8 in. flange shall be provided to act as a gasketing surface for sealing with the angle ring being a rolled, welded ring 2 in. x 2 in. x 3/16 in. Bolt hole spacing for angle rings shall be 6 in. centers.
- f. If longitudinal seam duct greater than 60 in. in diameter is supplied in lengths greater than 4 ft., one angle ring must be welded to the duct on 4 ft. centers for support.

2.4 DUCTWORK SEALING

- A. SMACNA Duct Sealing Classification shall be used for duct systems using the following criteria:
 - 1. Ductwork and all plenums with pressure class ratings shall be constructed to seal Class A, as required to meet the requirements of SMACNA Duct Construction Standards and with standard industry practice, including transverse joints, longitudinal seams, fitting connections, and all penetrations of the duct wall.
 - 2. Openings for rotating shafts shall be sealed with bushings or other devices that seal off air leakage. Pressure sensitive tape or sealing compounds shall not be used. Sealing compounds used to seal openings for rotating shafts shall not be used.
 - 3. All connections shall be sealed, including but not limited to spin-ins, taps, other branch connections, access doors, access panels and duct connections to equipment.
 - 4. Sealing that would void product listings is not required.
 - 5. Spiral lock seams need not be sealed.
- B. Sealants and tapes shall be listed and labeled in accordance with UL 181A or UL181B and marked according to type, and per manufacturer product requirements for associated system and application/installation location.
 - 1. Duct sealant for indoor applications shall be non-fibred, water based, Hardcast Iron-Grip IG-601, Ductmate PRO Seal, Foster 32-17 or Childers CP146, or approved equal.

2. Duct sealant for outdoor applications shall be fibrated, water based, Hardcast Versa-Grip VG-102, Ductmate Fiberseal, Foster 32-17 or Childers CP148, or approved equal.

2.5 TURNING VANES

- A. Provide in mitered elbows as shown on contract drawings. Vanes 36 in. or longer shall be double wall air foil type. All turning vanes shall be installed as per the latest SMACNA Standards. Turning vane size and spacing shall be as per SMACNA. Turning vane spacing greater than SMACNA Standards is not acceptable.
- B. Turning vanes shall be Harper or equivalent double wall turning vanes fabricated from the same material as the duct.
- C. Turning vane front and back panels shall be securely locked together with adequate crimping to prevent twisting of vane. Vane shall be capable of withstanding 250 pounds of tensile load when secured according to the manufacturer's instructions.
- D. Rails for mounting turning vanes shall have self locking, friction fit tabs designed to facilitate proper alignment of vanes. Tab spacing shall be as specified in Figure 4-3 of the 2005 SMACNA Manual, "HVAC Duct Construction Standards, Metal and Flexible". Rail systems with non-compliant tab spacing shall not be accepted.
- E. Acoustical Turning Vane: Shall be used in applications that require quiet operating systems. Mounting rails shall have friction insert tabs that align the vanes automatically.
- F. Acceptable Manufacturer: Ductmate Industries PRO-Rail Turning Vane or approved equal.

2.6 DAMPERS IN DUCTWORK

- A. Blade Type Volume Dampers: Constructed per SMACNA, one gauge heavier than duct material, securely fastened to 3/8 in. sq., cold rolled steel operator rod. Provide stainless steel operator rod in stainless steel ductwork. Provide Ventlock 639 elevated dial regulator for 2 in. insulated ductwork or equal. Provide Ventlock 635 dial regulator for non-insulated ductwork or equal.
- B. Multiple Blade Type Volume Dampers: Provide multiple blade volume dampers in ductwork above 12 in. in height.
 1. Heavy duty, manual balancing dampers suitable for application in HVAC systems with velocities to 1,500 ft. per minute, open position and max. pressure of 3 in. w.g. close position. Ruskin MD 35 or equivalent.
 2. Fabrication:
 - a. Frame: 5 in. x minimum 16 gauge roll formed, galvanized steel hat-shaped channel, reinforced at corners. Structurally equivalent to 13 gauge U-channel.

3. Blades:
 - a. Style: Single skin with 3 longitudinal grooves.
 - b. Action: Opposed.
 - c. Orientation: Horizontal
 - d. Material: Minimum 16 gauge equivalent thickness, galvanized steel.
 - e. Width: Nominal 6 in.
4. Bearings: Molded synthetic sleeve, turning in extruded hole in frame.
5. Linkage: Concealed in frame.
6. Axles: Minimum 1/2 in. diameter, plated steel, hex-shaped, mechanically attached to blade.
7. Control Shaft: 3/8 in. square plated steel.
8. Finish: Mill galvanized.
 - a. Actuator: Hand quadrant for 3/8 in. square extended shaft.
 - b. Hand Quadrant Standoff Bracket: 2 in. standoff for insulated ductwork.
 - c. Oillite bearings.
 - d. Factory Sleeve: Minimum 20 gauge thickness, minimum 12 in. length.
- C. Fire and Smoke Dampers: See "Fire and Smoke Dampers" Section.
- D. Automatic Air Dampers: Furnished as part of "Building Management System" Section 230923, and installed by this Contractor.
- E. Blast Gates: Aluminum housing, locking thumbscrew, galvanized slide blade. Provide stainless steel housing and slide blade in welded stainless steel ductwork.

2.7 FLEXIBLE CONNECTIONS TO FANS AND EQUIPMENT

- A. Basis-of-Design: Ventfabrics, Inc.
- B. Acceptable Manufacturers: Ductmate Industries, Inc., Duro Dyne Inc., Elgen Manufacturing, Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- C. Materials: Flame-retardant or noncombustible fabrics, water and mildew resistant UL Standard 214.
- D. Coatings and Adhesives: Comply with UL 181, Class 1.

- E. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 in. wide attached to two (2) strips of 2-3/4-in. wide, 0.028-in. thick, galvanized sheet steel or 0.032 in. thick aluminum sheets. Provide metal compatible with connected ducts.
- F. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd.
 - 2. Tensile Strength: 480 lbf/in. in the warp and 360 lbf/in. in the filling.
 - 3. Service Temperature: Minus 40 to plus 200°F.
- G. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
 - 1. Minimum Weight: 24 oz./sq. yd.
 - 2. Tensile Strength: 530 lbf/in. in the warp and 440 lbf/in. in the filling.
 - 3. Service Temperature: Minus 50 to plus 250°F.
- H. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.
 - 1. Minimum Weight: 14 oz./sq. yd.
 - 2. Tensile Strength: 450 lbf/in. in the warp and 340 lbf/in. in the filling.
- I. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
 - 1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
 - 2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 - 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 - 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
 - 7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-in. movement at start and stop.

2.8 ACCESS DOORS

A. General:

1. Provide access doors of adequate size to allow easy access to the equipment that will require maintenance. Provide insulated or acoustically lined doors to prevent condensation where applicable.
2. Manufacturer to provide an installed neoprene gasket around perimeter of access door for airtight seal.
3. Systems 3 in. w.g. or less shall utilize a hinged, cam, or hinged and cam square framed access door.
4. Systems 4 in. w.g. and above shall utilize a sandwich type access door. Construct doors in accordance with Figure 7-3 of the 2005 SMACNA Manual, "HVAC Duct Construction Standards, Metal & Flexible" Third Edition.
5. Approved Manufacturer: Ductmate Industries "Sandwich" style door or approved equal.
6. All access doors shall be continuous piano hinged type, unless noted otherwise.
7. Non-hinged only allowed where clearance to ceiling does not allow a full 90° swing.
8. Double panel insulated type when used in insulated duct.
9. Single panel uninsulated type allowed in un-insulated duct.
10. Pressure rated according to system in which being installed. Door-to-frame and frame-to-duct gasketing.
11. Provide specified Seal Class A or B ductwork sealing around frame, and hand adjust the latch tension for proper seal, on all access doors other than sandwich panel (Ductmate) style.
12. MINIMUM access door size for ducts 12 in. or less in depth is 12 in. x 8 in.
13. MINIMUM access door size for ducts 12 in. to 18 in. in depth is 18 in. x 14 in.
14. MINIMUM access door size for ducts more than 18 in. in depth is 24 in. x 18 in.
15. In ducts which require multiple section fire dampers due to duct size, provide one access door for each fire damper section.
16. Access doors for fire and smoke dampers shall be permanently labeled with 1/2 in. high lettering reading "SMOKE DAMPER" or "FIRE DAMPER".

B. Door Types:

1. Low Pressure Systems (2 in. w.g. pressure class): National Controlled Air ADH-1, Ruskin ADH22, Vent Products 9701, Air Balance FSA-100, Safe Air SAH, Nailor.
2. Medium and High Pressure Systems (3 in. w.g. pressure class and higher):
 - a. Rectangular Duct: Ductmate Industries "Ultimate" Style Door, or equal.
 - b. Round Duct: Ductmate Industries Round Sandwich type, or equal. 8 in. x 4 in. for ducts 14 in. and less in diameter. Ductmate Industries Round Sandwich type 16 in. x 12 in. for ducts more than 14 in. in diameter.
 - c. Furnish and install factory supplied protector molding on cut medal edge for all Ductmate access doors.

2.9 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Ventlock 699 or 699-2 based upon insulation thickness.
- C. Install duct test holes where required for duct traverse testing and balancing purposes.

2.10 ACOUSTIC-THERMAL DUCT LINING IN DUCTWORK

- A. General: Comply with NFPA Standard 90 and NAIMA Standard AHC-101.
- B. Materials: ASTM C 1071, Type I. Glass mineral wool insulation coated with an anti-microbial EPA registered coating that seals the airstream surface fibers into a smooth, low-friction surface acoustic ductliner shall be of thickness shown in the table. Density at 1.5 PCF. Maximum "K" value to be 0.24 btu/in. /sq. ft. /degrees F. /hr. when tested in accordance to ASTM C177. Acoustic duct liner to be suitable for use up to 6000 feet per minute air velocity and temperatures up to 250°F. The acoustic duct liner shall not accelerate the corrosion of steel, copper or aluminum. The liner shall not absorb greater than 3% by weight when tested per ASTM C1104. Acoustic duct liner shall provide the minimum sound absorption coefficients shown below when tested per ASTM C423 and ASTM E795, Mounting Type A.

OCTAVE BAND FREQUENCIES HZ							
Thickness	125	250	500	1000	2000	4000	NRC
1-1/2 in.	.23	.50	.87	.92	.93	.93	.80
2 in.	.37	.76	1.02	1.00	.98	.92	.95

- C. Thickness: Unless otherwise noted, all supply air ductwork indicated to be acoustically lined, shall have 1-1/2 in. thick liner with a minimum R value of 6. Return or exhaust ductwork, if acoustically lined, shall be of a thickness specifically noted. Note that per the symbol list (L) equals 1-1/2 in. thick. All lining shall be double wall construction and have perforated metal lining and film barrier layer on the air stream side.
- D. Fire Hazard Classification: Flame spread rating of not more than 25 and a smoke developed rating of no higher than 50, when tested in accordance with ASTM E84, UL 723, UL/ULC S102-M88 and NFPA 255.
- E. Liner Adhesive: Comply with NFPA Standard 90A, ASTM C919, and maximum VOC requirements of LEED EQ 4.1 and EQ 4.2.
- F. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct. Provide fasteners that do not damage the liner when applied as recommended by the manufacturer, that do not cause leakage in the duct, and will indefinitely sustain a 50 pound tensile dead load test perpendicular to the duct wall.
 - 1. Fastener Pin Length: As required for thickness of insulation, and without projecting more than 1/8 inch into the airstream.
 - 2. Adhesive for Attachment of Mechanical Fasteners: Comply with the "Fire Hazard Classification" of duct liner system.
- G. Design Equipment: Knauf Atmosphere.
- H. Acceptable Makes: Knauf Atmosphere, Certainteed ToughGard R.,

OCTAVE BAND FREQUENCIES HZ							
Thickness	125	250	500	1000	2000	4000	NRC
1-1/2 in.	.10	.47	.85	1.01	1.02	.99	.85

- I. For duct velocities above 4000 fpm, provide metal "build-outs" of proper height, welded to the ductwork for turning vanes and dampers.

2.11 FLEXIBLE AIR DUCTS

- A. Flexible air ducts and connectors shall be constructed in compliance with NFPA Bulletin 90A, 90B and UL Standard 181 and shall be listed and labeled as Class I Air Duct.
- B. Flexible air ducts and connectors shall be tri-laminate:
 - 1. Consisting of corrosion resistant galvanized steel helix encapsulated by a double lamination of polyethylene or spun bond nylon.
 - 2. Factory applied (R 6.0) fiberglass exterior insulation, sheathed in a seamless, tri-directionally reinforced, metalized polyester, exterior vapor barrier.

3. R-value shall be classified by Underwriters Laboratories, and certified by the Air Diffusion Council, in accordance with ADC Flexible Duct Performance and Installation Standard (1991), using ASTM C-518, at installed wall thickness, on flat insulation only. Comply with ASHRAE/IESNA 90.1.
 4. Recommended operating pressure for flexible ductwork shall be three times maximum system press but not less than 6 in. w.g. positive pressure for 4 in. - 20 in. dia., 5 in. w.g. negative pressure through 16 in. dia., 1 in. negative pressure for 18 in. and 20 in. dia. Maximum velocity of 5500 fpm.
 5. Operating temperature range - 20°F to 250°F, intermittent @1/2 in. pos. w.g. max., -20°F to 140°F, continuous at maximum pressure.
 6. Flame Spread: 25 max. smoke developed rating: 50 max.
 7. Porous inner core flexible duct shall not be used.
- C. Static pressure and thermal performance shall be tested and certified in accordance with Air Diffusion Council (ADC) Test Code FD-72-R1 under conditions of 140°F for 164 hours and 180°F for 4 hours.
- D. Acoustical performance shall be certified in accordance with ASTM E 477 and/or Air Diffusion Council Test Code FD-72-R1.
1. Minimum Acoustic Performance:
 - a. The insertion loss (dB) of a 6 foot length of duct when tested in accordance with ASTM E477 at a velocity of 1000 feet per minute shall be at least:
- | | <u>125</u>
<u>Hz</u> | <u>250</u>
<u>Hz</u> | <u>500</u>
<u>Hz</u> | <u>1000</u>
<u>Hz</u> | <u>2000</u>
<u>Hz</u> | <u>4000</u>
<u>Hz</u> |
|-------------|-------------------------|-------------------------|-------------------------|--------------------------|--------------------------|--------------------------|
| 8 inch dia. | 26 | 27 | 27 | 31 | 32 | 27 |
| 12 inch dia | 22 | 26 | 24 | 31 | 31 | 20 |
- E. Friction loss and leakage for flexible duct only shall be certified in accordance with Air Diffusion Council Test Code FD-72-R1. Leakage for connections shall be accordance with UL 181 requirements.
- F. Basis-of-Design: Flexmaster 6B (R-6.0).
- G. Acceptable Manufacturers:
1. Dundas-Jafine Type SPC R6.0
 2. Hart & Cooley Type F216 (R-6.0)
 3. Flexible Technologies, Inc. Thermaflex Type M-KE (R-6.0)
 4. Atco Rubber Products, Inc. Type 036 (R-6.0)

PART 3 - EXECUTION

3.1 REQUIREMENTS

- A. Equipment and systems shall be installed in accordance with local and state codes and regulations having jurisdiction. Bracing and hanging of ductwork shall be per SMACNA - HVAC Duct Construction Standard.
- B. Install all ductwork concealed and tight to the structure above unless noted otherwise on shop drawings. Fabricate only after the approval of shop drawings, and in locations to avoid interferences. Ductwork installed without approved shop drawings, which requires removal/modification and/or reinstallation due to conflicts or improper installation shall be repaired at no cost to the Owner.
- C. Sizes given on contract drawings are inside dimensions.
- D. The ductwork sizes and types (round and rectangular) were selected for space limitation and acoustical requirements within the building. In addition, the ductwork sizes and types were chosen to allow space above the ceilings for future ductwork, piping and/or conduit. It is not acceptable for the contractor to change the size or type of ductwork for bidding or installation unless specifically approved by the engineer.
- E. Keep openings continuously closed and sealed with protective plastic wrapping during construction to prevent entrance of dirt and debris.
- F. Extend access openings, damper rods and levers, to outside of external insulation make systems airtight.
- G. No piping, conduit or other obstruction to airflow is permitted in ductwork.
- H. Provide necessary openings, hanger inserts, framing, chases, and recesses, not provided by other trades.
- I. Exposed exhaust or return registers and grilles shall be flush with face of duct; exposed supply registers and grilles shall be mounted outside airstream with 45° shoe-tap extension collars.
- J. Provide 14 gauge sleeves for ducts passing through Mechanical Room floors. Set sleeves 4 in. above finished floor in Mechanical Rooms, seal watertight to floor.
- K. Where a return or exhaust duct is shown to be left open ended, provide hardware mesh screen at opening.
- L. Do not utilize flexible ductwork or connection in any way to connect variable or constant volume boxes to ductwork.

- M. For duct penetrations of non-rated walls, provide sheet metal angle framing or sheet metal closure panels around the entire perimeter of each duct wall penetration on both sides of the wall, where the gap exceeds 1/4 inch. Where the gap is less than 1/4 inch, the gap may be caulked on both sides of the wall. Non-rated wall penetrations SHALL NOT be fire caulked under any circumstances.
- N. For duct penetrations of rated walls, see Specification Section 230500 - Basic Mechanical and Electrical Requirements.
- O. Ductwork that is called for to be welded shall be fully welded, continuous around the entire perimeter at all joints/seams, and shall be fully airtight and watertight.

3.2 FLEXIBLE CONNECTIONS

- A. Provide flexible connections for the intake and discharge connections of duct connected to fans and air handling equipment.
- B. Round connections are to be made with adhesive and metal drawbands with ends tightly bolted.
- C. Rectangular connections shall be made with material securely held in grooved seam between flanges. Attach with adhesive and mechanical fasteners on 6 in. centers.
- D. Connections shall be made with a minimum of 2 in. space between duct and equipment collars, installed in line, and with 1 in. excess material folded so as not to interfere with airflow through connection.
- E. Mechanically fastened and sealed, with specified duct sealant, at duct and equipment connections.

3.3 TURNING VANES

- A. Install only in square elbows of equal dimensions.
- B. Install as per latest SMACNA Standards.
- C. Secure vane runners to duct with spot welding, riveting or sheet metal screws.
- D. When installing in ductwork with internal insulation.
 - 1. Install runners in ductwork inside insulation and bolt through insulation and duct sides, welding bolts to insure rigid installation. Provide build-outs for duct Velocity-Pressure classes above 2 in. w.g.

3.4 DUCT CLEANLINESS AND CLEANING AFTER INSTALLATION

A. Duct Cleanliness:

1. All ductwork on the project shall meet the SMACNA Duct Cleanliness For New Construction Guidelines, "Advanced Level" of duct cleanliness for production, delivery, storage and installation of ductwork.
2. Prior to shipment to the jobsite, all duct ends and openings must be covered with a heavy duty, dual-ply, clear polyethylene protective film. Open ends are to be kept covered during transport, storage, and installation. As ductwork is installed at the job site, open ends are to be covered to maintain cleanliness.
3. The film must be securely affixed to protect against dirt and debris, and must be translucent to facilitate inspection of interior surfaces without removing the film. The film is have a elongation rating of 600% and a break strength of 13.1 lbs./in. The film shall contain no VOC's, and shall leave no residue on duct after removal.
4. Manufacturer: Ductmate Industries ProGuard (heavy duty grade clear).

B. Cleaning After Installation:

1. Interior surfaces shall be free of dust and debris prior to initial start up. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes. Any cleaning of duct systems shall comply with recommendations of NAIMA and NADCA.
2. Clean external surfaces of foreign substances that might cause corrosion, deterioration of the metal, or where ductwork is to be painted.
3. Clean debris from system before fans are turned on.
4. Keep openings continuously closed during the construction period.
5. Pay damages resulting from dirt blown on painted or other finished surfaces.
6. Repair or replace damaged fan wheels, dampers, or other system parts damaged as a result of debris.
7. Clean system as many times as required until the entire system is dirt free.

3.5 INSTALLATION OF ROUND DUCTWORK

A. Use factory-fabricated couplings for joints.

B. After the joint is slipped together, sheet metal screws are placed 1/2 in. from the joint bead for mechanical strength.

- C. Sealer is applied to the outside of the joint and covering the screw heads.
- D. Flanged joints shall be made with neoprene rubber gaskets.

3.6 TEST OF DUCTWORK

- A. Conduct duct leakage tests per SMACNA "HVAC Air Duct Leakage Test Manual" and per the requirements of the Energy Conservation Construction Code of New York State, for ductwork systems as indicated below. Positive pressure leakage testing is acceptable for negative pressure ductwork. The rate of air leakage (CL) must be less than or equal to 4.0 for rectangular ductwork and 2.0 for round ductwork, as determined by the equation in the code referenced above, which reads: $CL=F/P^{0.65}$ where F = measured leakage rate in CFM per 100 sq. ft. of duct surface, and P = static pressure of the test. When leakage above stated limits occurs, ascertain location of leaks and rebuild, repair, or seal the ductwork as required. Repeat tests as required to obtain allowable leakage rates. Prepare a report similar to that suggested by SMACNA and submit for review.
- B. Leakage testing shall be witnessed by representatives from Cornell University.
- C. Systems designed to operate at 3-inches w.c. and below: All duct mains and duct risers as well as all associated ductwork located out-of-doors shall be leak tested. If any of the sections fail the leakage test, the entire system shall be leakage tested.
- D. Systems designed to operate at static pressures of 3.0" w.c. and below: All duct mains, duct sub-mains, duct branch mains, and duct risers shall be leak tested. If any of the duct sections fail the leakage test, the entire system shall be re-tested until it passes. Duct mains and sub-mains shall include all supply and return ductwork from an air handling unit, to the space(s) served. Branch ducts to terminal units, diffusers and grilles do not require testing, and pressure testing should be done prior to making the branch duct connections.
 - 1. A duct main is defined as a duct containing the system's total airflow.
 - 2. A duct sub-main is defined as a duct containing part of the system's airflow and serving two or more duct branch mains.
 - 3. A duct branch main is defined as a duct serving two or more terminals.
 - 4. A branch duct is defined as a duct serving a single terminal.
 - 5. A terminal unit is defined as a VAV terminal.
- E. Systems designed to operate in excess of 3-inches w.c.: The entire system shall be leak tested.
- F. Provide test reports indicating pressure tests performed. Include date, section tested, test pressure and leakage rate.

- G. Ductwork not required to be tested for leakage, shall be checked and guaranteed to meet the standards of the specified SMACNA Duct Seal Class A. Air balancing and testing shall be used to determine satisfactory operation of duct systems. Balancing reports indicating excessive leakage amounts shall be required to rebuild, repair or seal ductwork having excessive leakage.

3.7 DAMPERS AND AIR CONTROL DEVICES

- A. Provide volume dampers at all air outlets, diffusers, grilles and as noted on plans. Provide volume dampers at all low pressure supply, return and exhaust, branch ducts and as noted on the plans.
- B. Provide dampers necessary to permit proper balancing of air quantities. Comply with code requirements for smoke and fire control. Prevent introduction of uncontrolled outside air into building through roof and wall openings.
- C. When dampers are installed in acoustically lined ductwork, install with insulated "build-outs" per SMACNA.
- D. Install fire and smoke dampers in accordance with "Fire and Smoke Dampers" Section and applicable codes.
- E. Install all dampers furnished as part of "Building Management System" Section.

3.8 ACCESS DOORS

- A. Provide for access to upstream side of duct mounted reheat coils, dampers, damper motors, fire dampers, smoke dampers, smoke detectors, control devices, fan bearings, and equipment requiring periodic inspection or service. Provide labels for fire and smoke dampers as called for in Part 2 - Products.
- B. For ducts that are too small to install an access door of the minimum specified size, provide a 12" long section of removable ductwork for maintenance and inspection access. Removable ductwork shall be fastened between device requiring access and next duct section with duct flanges or Donaldson Torit clamp with PVC foam seal. For ducts that are required to be insulated, provisions shall be made to allow insulation to be easily removed and re-installed.

3.9 DUCT SUPPORTS

- A. Provide per SMACNA, same material as duct. Hanger bands to extend down sides and turn under bottom 2 in. Minimum two metal screws per hanger. Angle iron on larger duct spaced per building structural system but not greater than 8 ft. Provide extra support angles as required.
- B. Provide additional supports as required to support reheat coils, air terminal units, filter enclosures, and any other duct mounted equipment independent from the associated ductwork system.

3.10 AIR AND WATERTIGHT DUCTWORK

- A. Where water and snow may accumulate on ductwork or where odors or corrosive gasses may collect, ductwork and plenums shall be made watertight by soldering, brazing or welding of joints. Grade ducts down toward waste points and/or toward louvers. Provide valve and drain piping from low point to waste point.
 - 1. Chemical fume hood exhaust.
- B. Test for Watertightness: Before concealment, apply water by hose to check for leaks, witnessed by Owner's Representative.

3.11 SMOKE DETECTION

- A. Smoke detectors shall be furnished by Division 28 " Electronic Safety and Security ". This Contractor shall install detectors located in ductwork. Clearly indicate locations of smoke detectors on the sheet metal shop drawings.
- B. Increase duct size at smoke detectors, where required for proper installation, per smoke detector manufacturer's recommendations. Coordinate minimum duct size required with Division 28 " Electronic Safety and Security".

3.12 DUCT SEALING

- A. Preparation:
 - 1. Clean surfaces of dirt, oil, grease and loose of foreign matter that could impair adhesion, using soap and water or solvent.
 - 2. Allow surfaces to dry completely before proceeding.
- B. Installation of Sealant System:
 - 1. Apply sealant system to duct joints, fasteners, and seams in accordance with manufacturer's instructions.
 - 2. Apply sealant by brush, putty knife or caulk gun, to full coverage. Remove excess adhesive immediately.
 - 3. Completely seal duct joint, fasteners and seams without voids, to a minimum 20 mil thick wet film.
 - 4. Apply and store at ambient temperature of 40°F to 100°F; and protect from freezing until dry.
- C. Field Quality Control:
 - 1. Allow duct sealant system to cure a minimum of 72 hours before operating the system.

2. Do not apply external duct insulation or coatings until the joints have been inspected by the Owner's Representative.

3.13 FLEXIBLE AIR DUCTS

- A. "Air duct" applies to conduit or passageway for conveying air to or from heating, cooling, air conditioning or ventilating equipment but not including the plenum as defined in NFPA 90A. "Air connector" applies to conduit for transferring air between an air duct or plenum and an air terminal device or an air inlet or an air outlet as defined by the NFPA 90A.
- B. For round to oval connections, provide round-oval flexible adapter.
- C. Flexible air ducts and connectors shall be provided in fully extended condition, free from kinks.
- D. Flexible air ducts and connectors shall not be used in systems with entering air temperatures in excess of 250°F.
- E. Flexible air ducts and connectors shall use only the minimum length required to make the connection and shall be installed in the horizontal or vertical position. Flexible elbows are not acceptable. Do not exceed a maximum length of 36 in., fully extended.
- F. Flexible air ducts and connectors shall use minimum 1/2 in. wide positive locking, steel worm drive clamp, or nylon plenum rated straps for joints and connections. One clamp or strap for the inside core liner and one clamp or strap for the outer jacketing. When non-metallic (nylon) straps are used, they should be listed and labeled to standard UL 181B. Fastener package should be marked UL 181 B-C.
- G. Collars to which flexible duct is attached shall be beaded and a minimum of 2 in. in length. Wrap twice with UL 181 tape and secure with clamp or strap. Sleeves used for joining two sections of flexible duct shall be beaded and a minimum of 4 in. in length. The draw band shall be positioned behind the bead on the metal collar.
- H. Outer vapor barrier and insulation shall be slid over inner core and collar, wrapped twice with UL 151 tape and secured with a clamp or strap.
- I. Connections shall be per SMACNA "HVAC Duct Construction Standards - Metal and Flexible", Air Diffusion Council "Flexible Duct Performance and Installation Standards" and NAIMA Installation Standards.
- J. Flexible duct shall be supported at manufacturer's recommended intervals, but no greater distance than 2'-6" on center and prior to all 90 degree bends. Maximum permissible sag shall be 1/2 in. per foot of support spacing. Provide a minimum of one hanger on each run of flexible duct.
- K. A connection to rigid duct or equipment shall be considered a support joint. Long horizontal duct runs with sharp bends shall have additional supports before and after the bend approximately one duct diameter from the centerline of the bend.

- L. Hanger or saddle material in contact with the flexible duct shall be of sufficient width to prevent any restriction of the internal diameter of the duct when the weight of the supported section rests on the hanger or saddle material. In no case shall the material contacting the flexible duct be less than 1-1/2 in. wide. Factory installed suspension systems integral to the flexible duct are an acceptable alternative hanging method when the manufacturer's recommended procedures are followed.
- M. The hanger shall be strapped around the flexible duct and secured to the structure above. Hangers shall not be attached to other mechanical or electrical objects. Hangers may be attached to an approved trapeze. Ceiling grid shall not be used to fabricate a trapeze. Support hangers shall be installed horizontal. Screws shall not be used to penetrate the flexible duct to attach to the hanger.
- N. Provide flexible duct connections and splices in accordance with manufacturer's recommended installation instructions.
- O. Seal flexible duct connections with sealing materials listed and labeled in accordance with UL 181B. Mechanically secure connections with approved clamping materials.

3.14 ACOUSTIC-THERMAL DUCT LINING

- A. Increase metal duct dimensions to accommodate lining. Adhere lining to interior side of duct; minimum 90% coverage of Benjamin Foster 85-20 fire retardant adhesive, UL approved. Stapling method of attaching will not be permitted. Mechanical fasteners shall not pierce the sheet metal. Installing fasteners with spacing as per SMACNA Standards. Multiple layers of liner to achieve indicated thickness is prohibited.
- B. Abutting edges of acoustic linings shall be sealed with a fire resistant neoprene coating, and exposed edges of acoustic linings shall be installed with sheet metal nosing to prevent erosion.
- C. Lining shall not impart odor to the air, delaminate or be loosened by the airstream under normal operating conditions. Lining which is damaged during fabrication or shipment shall not be installed.
- D. Provide 1-1/2 in. thick acoustical lining where noted on drawings.

EXHIBIT I - DUCTWORK MATERIALS

<u>SERVICE</u>	<u>MATERIAL</u>	<u>SPECIAL REQUIREMENTS</u>
Supply, return, vent, relief, outside, general exhaust,	Lock forming quality, galvanized steel ASTM A653 and A924, galvaneal/paint grip if not insulated and exposed	Joints and features as called for
Accessories, dampers and air turns	Same material and gauge as parent duct	-----
Field constructed apparatus casings	Galvanized steel ASTM 525	Sealed airtight

END OF SECTION

SECTION 233313

FIRE AND SMOKE DAMPERS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services required for the complete testing and certification as shown on the Contract Documents.
- B. Test and certify the existing fire smoke dampers.
- C. Provide information in report form listing items required by specifications. Results shall be guaranteed. Contractor shall be subject to recall to site to verify report information before acceptance of the report by the Owner's Representative.

1.2 SUBMITTALS

- A. Examination Report: Provide a summary report of the examination review to the Engineer and Owner's Representative, documenting issues that may preclude the proper certification and testing of the dampers per the requirements in Section 3.2.A with information that may be considered in resolving deficiencies.
- B. Certified report format shall consist of the following:
 - 1. Title sheet with job name, contractor, engineer, date, testing contractor's name, address, telephone number and contact person's name and the testing technician's name.
 - 2. Location of the damper(s).
 - 3. Deficiencies discovered, if any
 - 4. Indication of when and how deficiencies were corrected, if applicable.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine existing construction and notify Owner's Representative and Engineer of issues related to the testing and certification of the existing fire/smoke damper, as part of "Examination Report" submittal. The summary shall include a list of items that do not meet testing requirements outlined in Section 3.2.B, with information that may be considered in resolving deficiencies.

3.2 TESTING AND CERTIFICATION OF EXISTING FIRE SMOKE DAMPER

- A. Testing shall be witnessed by Cornell University EH&S and the Ithaca Fire Department Present. Coordinate schedule with Cornell University Project Manager.

- B. Testing shall be in compliance with NFPA 80 requirements:
1. Confirm that the damper is in the full-open or full-closed position as required by the system design.
 2. Visually confirm the damper moved to the full-closed or full-open position when commanded.
 3. Visually confirm that the damper returns to the original operating position as required by the system design.

3.3 CERTIFICATION

- A. Contractor shall certify that existing and new dampers are accessible for servicing, are installed properly, are operational and in compliance with NFPA 80. After acceptance by the Owner's Representative, submit three (3) physical copies of signed certification to the Owner for record.

3.4 IDENTIFICATION

- A. Provide damper tags and charts.
1. Fasten tag to ductwork adjacent to the dampers.
 2. Number each damper and make chart listing.
 - a. Number.
 - b. Location.
 - c. Air system in which they are installed.
- B. Submit three (3) copies of chart to the Owner's Representative for review.

END OF SECTION

SECTION 233600

VARIABLE VOLUME TERMINAL UNITS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide labor, materials, equipment and services as required for the complete installation as shown on the Contract Drawings.

1.2 SUBMITTALS

- A. Submit product data for terminal units including room number, maximum and minimum CFM, accessories, pressure drops, discharge and sound power data by octave band. Clearly indicate box sizes being proposed. Submit separately the controller and control interface devices being utilized.

PART 2 - PRODUCTS

2.1 TERMINAL UNITS

- A. General Unit Construction:
 - 1. Unit casing shall be constructed of 22 gauge welded galvanized steel. Factory label each unit with size, location, minimum and maximum CFM, and calibration chart. Air terminal units shall be capable of operating at 10 in. w.g., pressure maximum without damage. Maximum casing leakage at 3 in. W.G. shall be 11 cfm.
 - 2. Unit insulation liner shall comply with the requirements of UL 181 (erosion, mold growth and humidity) and ASHRAE 62.1, and shall have a maximum flame/smoke spread of 25/50 for both the insulation and the adhesive when tested in accordance with ASTM E84. Insulation shall be secured with adhesive. Liner shall be:
 - a. Fiber-free foam insulation 1 in. thick (R4.0)
 - 3. Units to be certified under ARI Standard 880-94 Certification Program and carry ARI seal.
 - 4. Units to be provided with a factory control enclosure suitable for field installed controls.
 - 5. Units shall be provided with factory access door option.
 - 6. Units shall be provided with 3 ft. integral sound attenuators, where noted.

B. Control and Volume Regulating Devices:

1. Internal unit damper shall be constructed of galvanized steel with blade-end seals for tight shut-off with a maximum damper leakage of 7 CFM against a maximum of 3 in. w.g. Damper shall be mounted on a galvanized steel shaft extending through the unit on torque free bearings. Terminal shall have normally open dampers. Minimum and maximum air quantities shall be factory set, but may be field adjustable. Neither the radiated or discharge sound power levels shall exceed the ratings of design equipment as scheduled on the Contract Drawings.

C. Hydronic Reheat Coil:

1. Coil shall be factory installed on the terminal unit and shall be constructed of 1/2 in. copper tube with aluminum plate fins, non ferrous headers and connections. Tested at the factory to 250 PSI hydrostatic pressure. Control valves shall be provided by the temperature control subcontractor as described in Section 230923. Output capacity and rows as scheduled on the Contract Drawings.

D. Terminal Volume Controller (Microprocessor Based):

1. Provide unit with airflow velocity and total pressure sensor suitable for up to 3000 fpm inlet velocity. Sensor shall be averaging type with multiple sampling points on cross grids.
2. Wall mounted thermistor type electric space sensor provided by Control subcontractor.
3. The VAV box manufacturer shall provide the box and the airflow sensor. The temperature control subcontractor shall field install the microprocessor based controller and damper motor calibration.

E. Design Equipment: Titus DESV.

F. Acceptable Makes: Anemostat, Envirotech, Price, Krueger, Titus.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Suspended terminal units from the building structural system independent of the ceiling system. If this cannot be accomplished, provide additional intermediate angle iron from which the units shall be suspended. Level each unit.
- B. Access to the terminal unit controls shall be accomplished by removal of ceiling panels or through an access door. Coordinate locations of access doors.

END OF SECTION

SECTION 233713

REGISTERS AND DIFFUSERS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

- A. Registers/Grilles/Diffusers: Submit product data including room schedule listing size, CFM, throw, direction of throw, accessories, finish, material type, color chart, pressure drop and noise criteria.

1.3 GENERAL REQUIREMENTS

- A. Each manufacturer shall check noise level ratings for registers and diffusers to ensure that the sizes selected will not produce noise to exceed N.C. - 24, measured at occupant level; notify Owner's Representative of problems prior to submittal.
- B. Pressure drop, airflow and noise criteria selection is based on design equipment. Manufacturers not submitting design makes must provide written certification in front of submittal that equipment submitted has been checked against and performs equal to the design make.
- C. Borders and frames shall be coordinated with materials and ceiling systems to integrate with architectural ceiling details and finishes scheduled.
- D. Locations of ceiling mounted air terminal devices shall be coordinated with locations shown on architectural reflected ceiling plans.
- E. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw and pressure drop. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- F. General:
 - 1. A register is defined as a grille plus a volume damper.
 - 2. Registers shall be installed "sight-proof" where possible, i.e.: High wall register with horizontal blades inclined up, or along a wall with blades facing the wall.
 - 3. Borders and frames shall be of the same material as register face unless specified otherwise.

G. Mounting Frames:

1. Provide with screw holes in register face punched and countersunk at factory, and mounting frame drilled and tapped to suit. Sponge rubber gasket between frame and wall or ceiling for all surface mounted frames.
2. Frame shall be overlap type and shall be suitable for type of ceiling where register is to be installed.

H. Finishes:

1. Baked enamel (of colors as selected from the manufacturer's standard color chart) as scheduled.

I. Design Equipment: Titus unless otherwise noted.

J. Manufacturers: Krueger, Titus, Price, Tuttle and Bailey, Nailor.

1.4 REQUIREMENTS FOR DIFFUSERS

A. General:

1. Provide four way blow unless otherwise noted.
2. Where manufacturer's size recommendations require duct sizes or connections differing from design, Contractor shall provide at no change in contract price.
3. Suitable for recessed mounting unless otherwise indicated.
4. Provide square to round neck transitions as required.
5. Provide sponge rubber gasket for all surface mounted frames.

B. Finishes:

1. Baked enamel (of colors as selected from the manufacturer's standard color chart), as scheduled.

C. Frame style shall be suitable for ceiling type in which diffuser is to be installed.

D. Design Equipment: Titus unless otherwise noted.

E. Manufacturers: Architectural Grille Company, Krueger, Titus, Price, Tuttle and Bailey, Nailor.

PART 2 - PRODUCTS

2.1 SUPPLY TYPES

A. Type 1 - (Smooth Face Type):

1. Steel construction with 22 gauge back pan and 22 gauge face panel with rolled edges that finishes flush with ceiling system.
2. Round neck - minimum 1-1/4 in. collar for duct connection.
3. Frame suitable for ceiling type.
4. Face panel shall be removed and securely held in place to the back pan without noise or vibration.
5. Horizontal airflow pattern.
6. Panel Size: 24 in. x 24 in. or 12 in. x 12 in., refer to plans.
7. Model: Titus OMNI.

B. Type 2 - (slot diffuser):

1. Extruded aluminum slot diffusers. Minimum material thickness of .062 inches.
2. (1) One Slot.
3. Dual patten controller.
4. Manufactured insulated plenums of active lengths, as indicated on drawings, and flat back blank-off panels for inactive sections.
5. Diffusers shall be curved where shown on plans. Coordinate radius of curve with Architect.
6. Length as specified on plans.
7. Border type 11 for hard ceiling applications. Border type 66 for acoustical ceiling applications.
8. End caps to match ceiling installation details. Coordinate with Architect.
9. Custom Color Finish to be selected by Architect, where noted on plans.
10. Model: Titus Model FL-10-JT.

C. Type B - (linear bar grille):

1. Linear bar shall have 1/8-inch thick fixed bars at 0° deflection, spaced 1/4-inch on center.

2. One piece lengths and size as shown on the construction documents.
3. The diffuser core shall have extruded aluminum bars locked into a heavy extruded aluminum border. The deflection bars must be fixed and parallel to the long dimension. The core must have support bars located no more than 9 inches apart and shall be parallel to the short dimension.
4. Type "A" Frame with 1/8" band around the core, 1/2" return on the bottom for support with removable core.
5. The finish shall be satin. Surface shall be created by using fine polishing uniform directional grit lines in the metal by using a grit belt. After polishing, the metal shall be softened with a greaseless compound or non-woven pad or belt
6. Make: Architectural Grille Company Model AG30 Frame Type "A"

2.2 RETURN/EXHAUST TYPES

A. Type A - (Exhaust and Return Grilles):

1. Steel construction with 22 gauge frame and blades, with horizontal bars on a 1/2 in. spacing set at 35° fixed deflection.
2. 1-1/4 in. wide flange.
3. The blades shall be parallel to long dimension.
4. Model: Titus 355-RL.

B. Type B - (Slot Exhaust and Return Grilles):

1. Extruded aluminum slot diffusers. Minimum material thickness of .062 inches.
2. (1) One Slot.
3. Dual patter controller.
4. Manufactured plenums of active lengths, as indicated on drawings, and flat back blank-off panels for inactive sections. Return hood/light shield for sections without plenums.
5. Diffusers shall be curved where shown on plans. Coordinate radius of curve with Architect.
6. Length as specified on plans.
7. Border type 11 for hard ceiling applications. Border type 66 for acoustical ceiling applications.
8. End caps to match ceiling installation details. Coordinate with Architect.

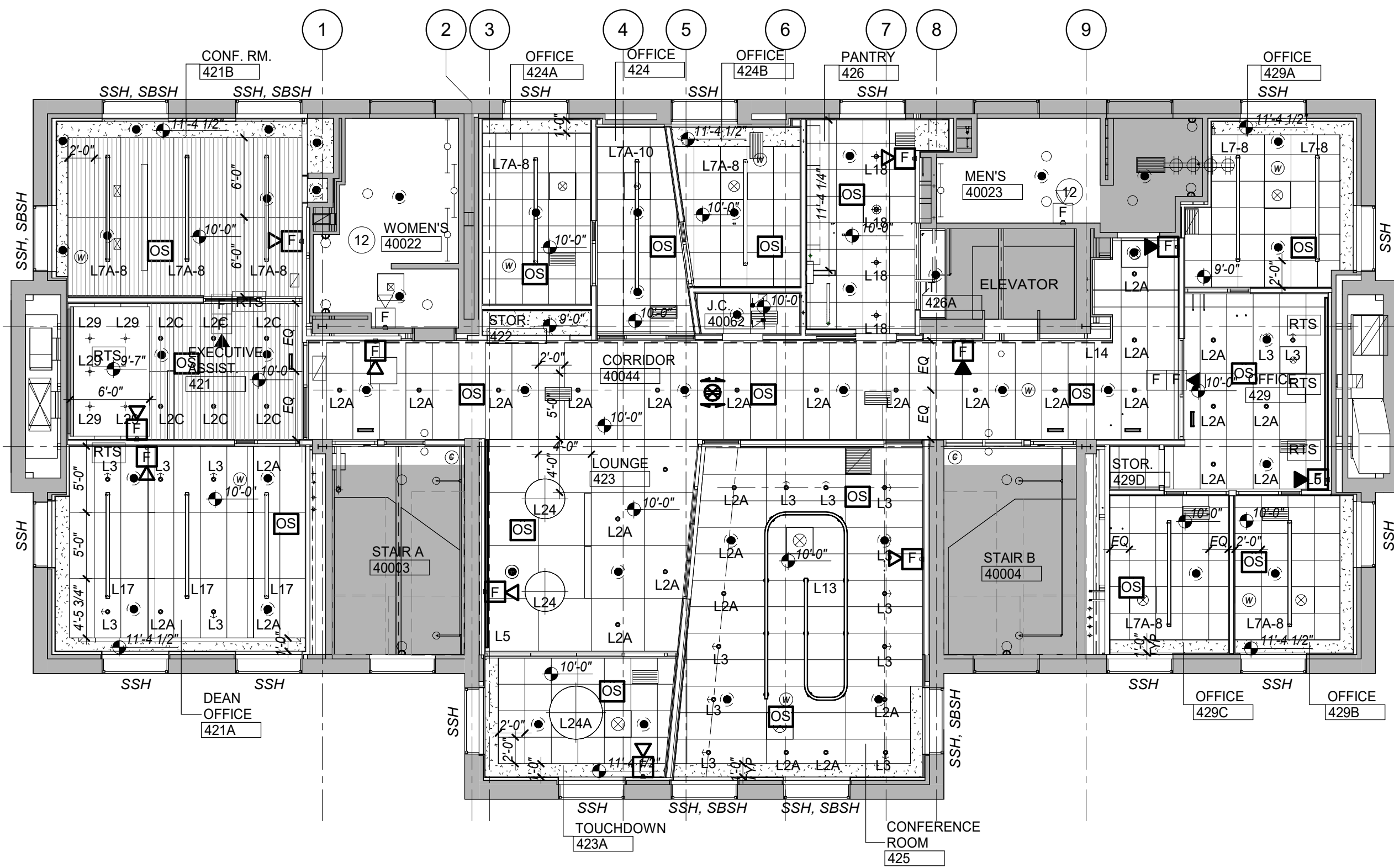
9. Custom Color Finish to be selected by Architect, where noted on plans.
10. Model: Titus Model FL-10-JT.

PART 3 - EXECUTION

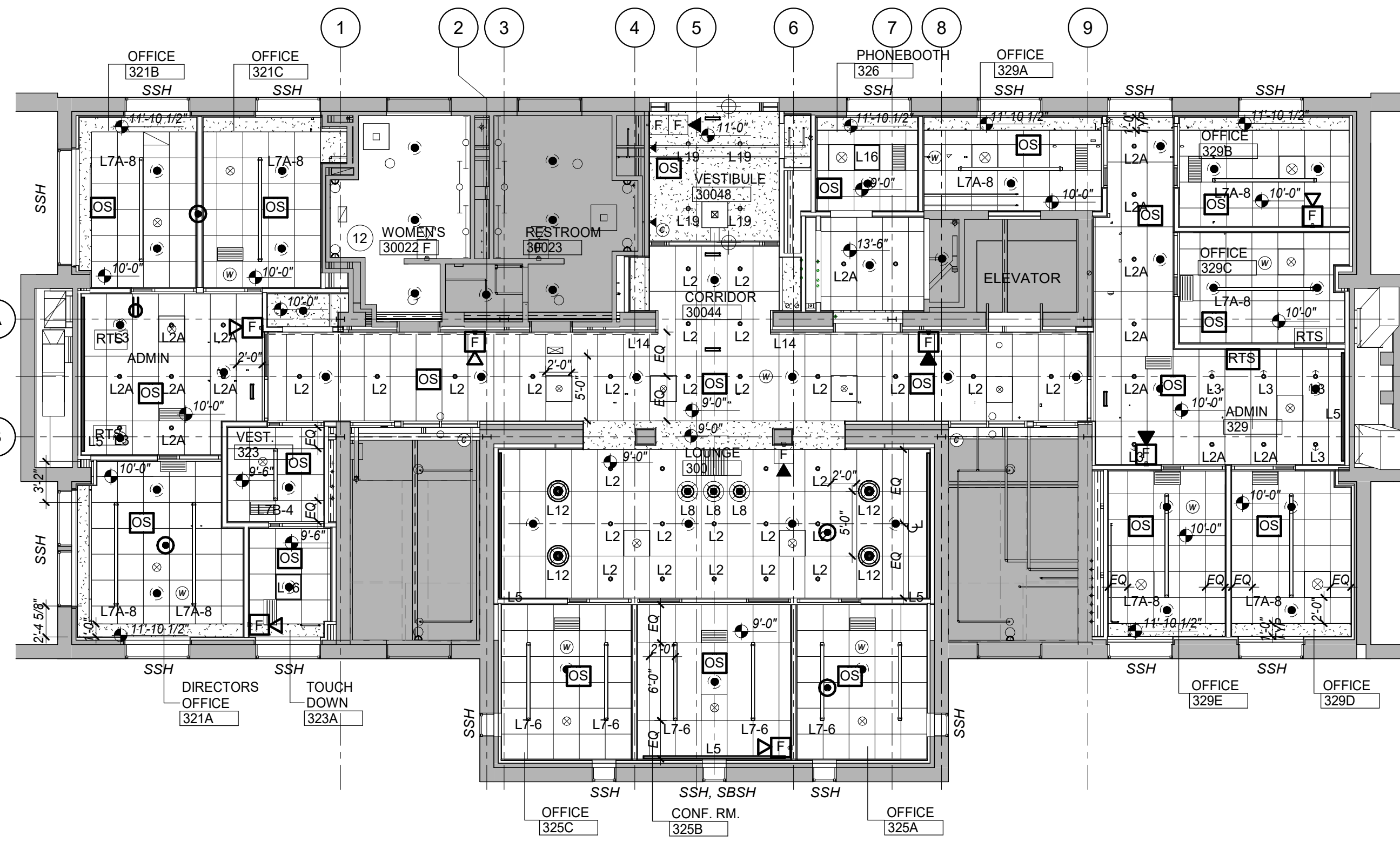
3.1 INSTALLATION

- A. Install equipment in strict accordance with manufacturer's instructions. Rough in or install per reflected ceiling plan or in location instructed by Owner's Representative.
- B. Provide approved air extractors behind all duct mounted supply registers in exposed ductwork.
- C. When the final connection to an exhaust or return grille is made, a 12 in. minimum height plenum box must be supplied to all grilles. Plenum dimensions shall match grille size. Paint inside of plenum box flat black. Provide 1 in. acoustical lining in plenum box. Oversize the plenum to account for the thickness of the lining.
- D. Seal all supply and return registers, grilles and diffusers during construction operations to limit dust entering HVAC systems and ductwork. Seals may be removed just prior to testing and balancing, but not without the approval of the Owner's Representative.

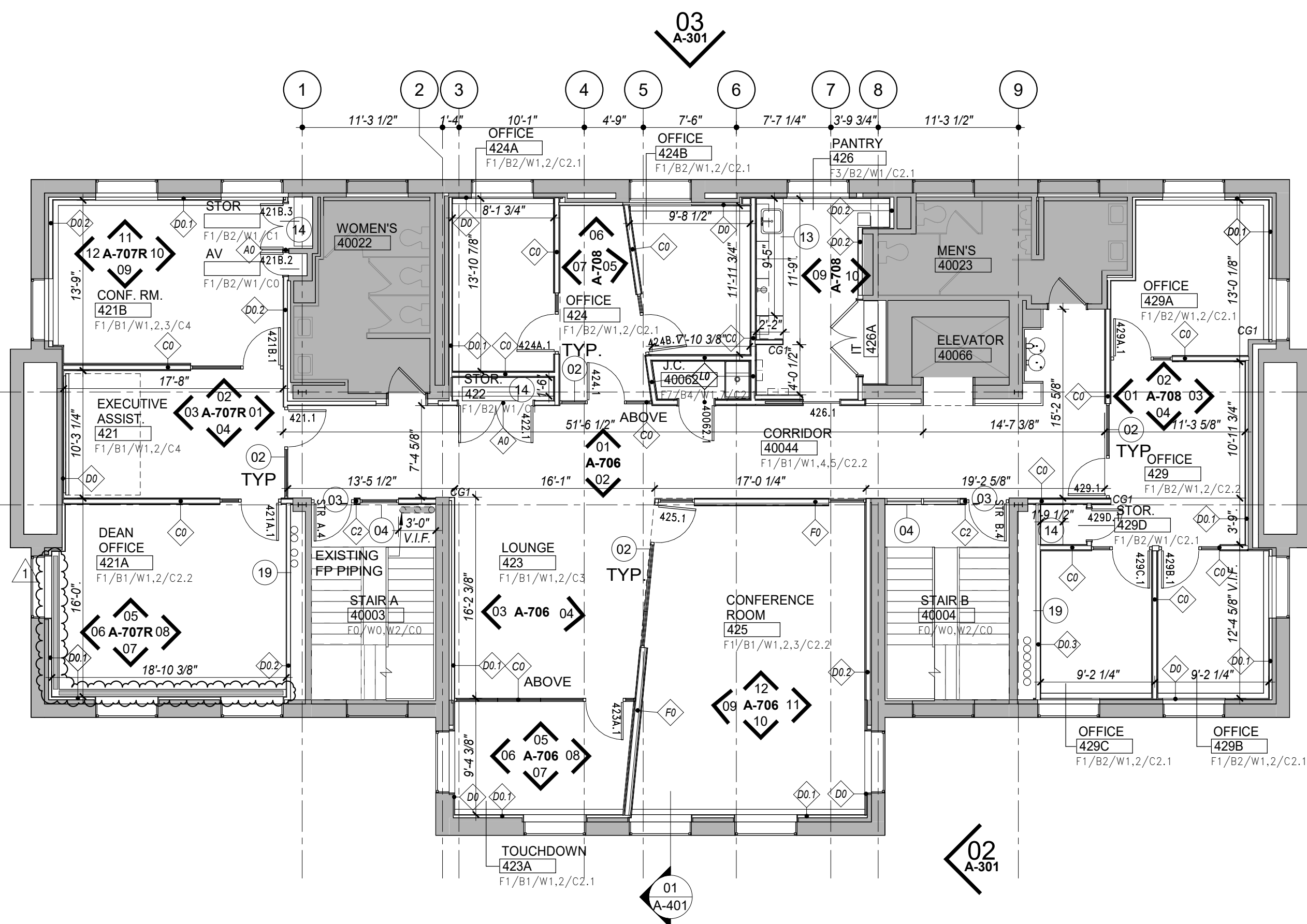
END OF SECTION

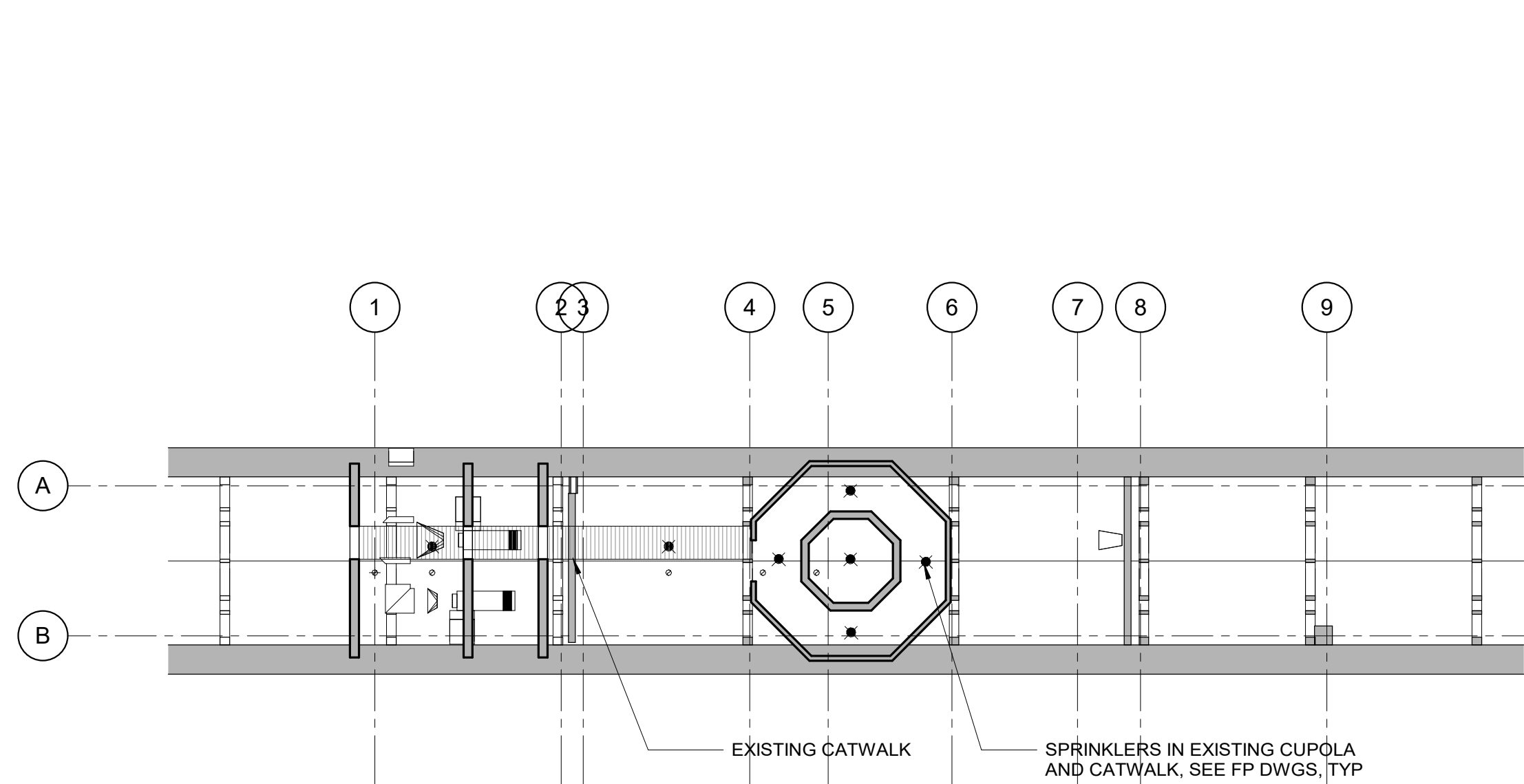


04 REFLECTED CEILING PLAN - FOURTH FLOOR
SCALE: 1/8" = 1'-0"

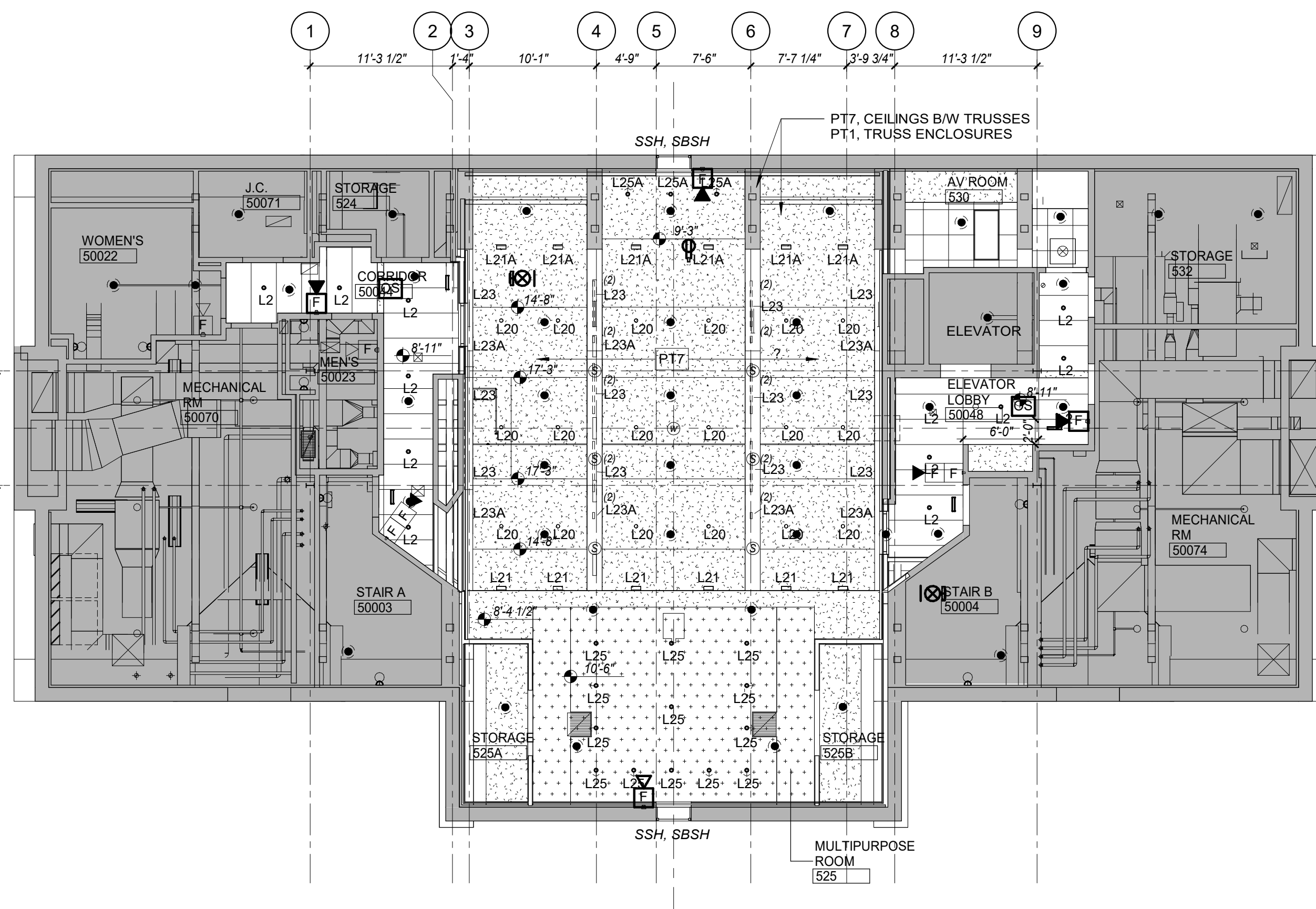


03 REFLECTED CEILING PLAN - THIRD FLOOR
SCALE: 1/8" = 1'-0"

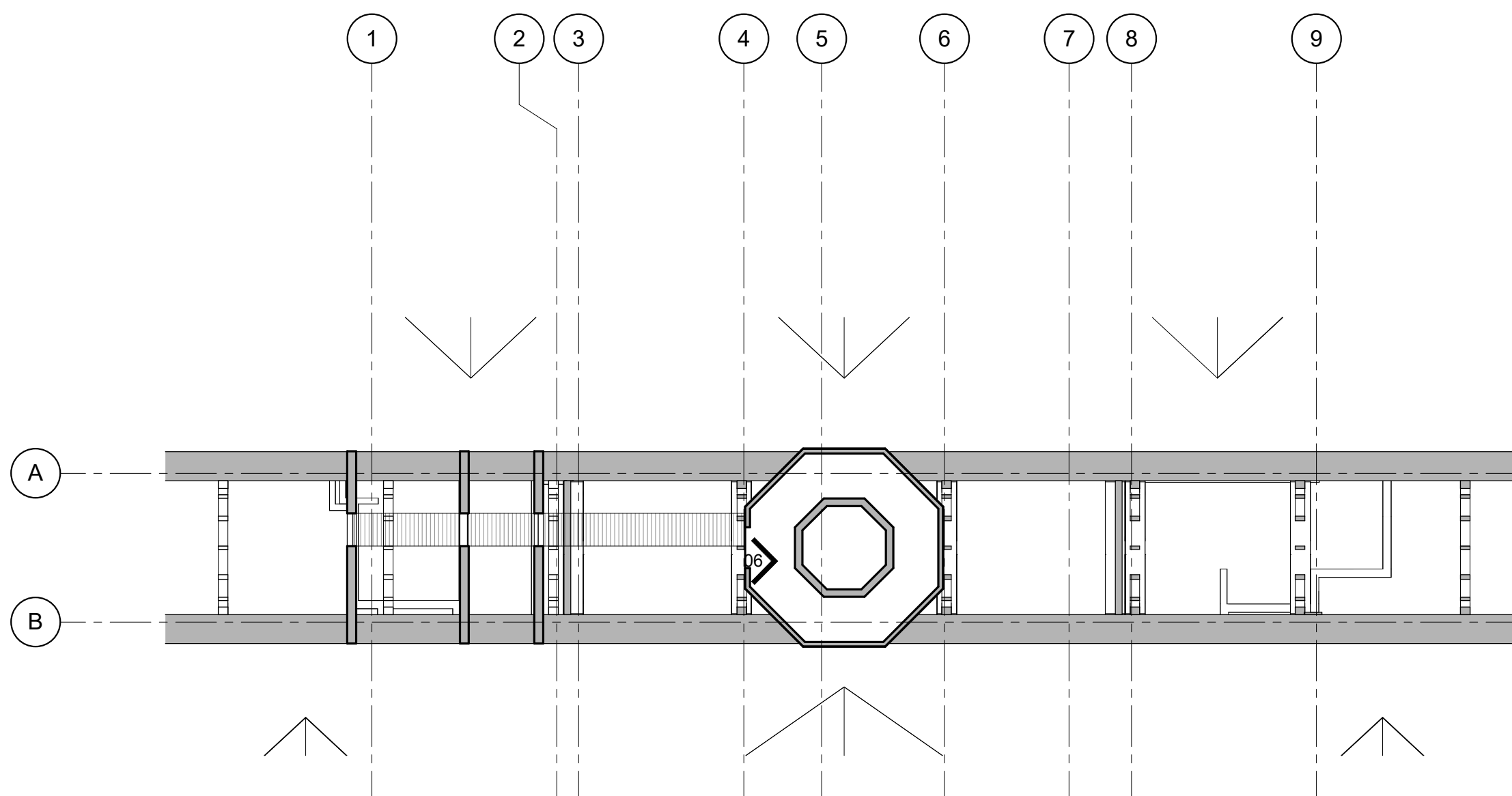




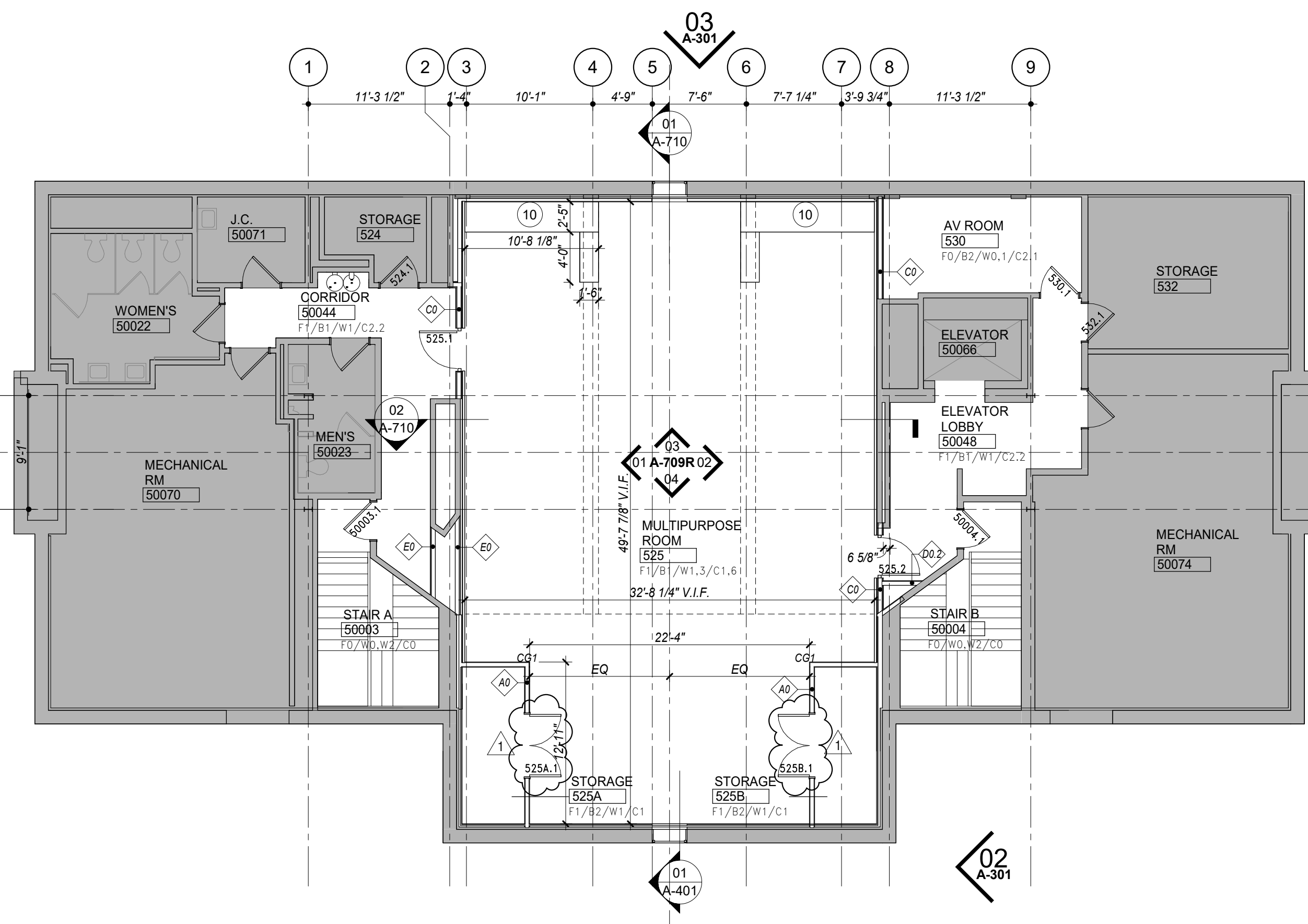
04 REFLECTED CEILING PLAN - UPOLA
SCALE: 1/8" = 1'-0"



02 REFLECTED CEILING PLAN - FIFTH FLOOR
SCALE: 1/8" = 1'-0"



03 FLOOR PLAN - CUPOLA
SCALE: 1/8" = 1'-0"

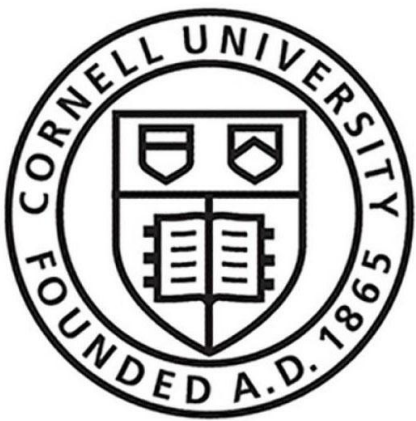


01 FLOOR PLAN - FIFTH FLOOR
SCALE: 1/8" = 1'-0"

LEGEND	
	EXISTING WALL
	NEW WALL
	GLAZED METAL PARTITION SYSTEM, TYPE VARIES
	CORNER GUARD, SEE DETAILS
	PTD GWB
	ACOUSTIC BD
	2' x 2' ACT
	2' x 4' ACT
	2' x 5' ACT
	WOOD CEILING PANEL
	REPURPOSED WOOD PANEL
	RECESSED DOWNLIGHT
	RECESSED WALL WASHER
	DECORATIVE PENDANT
	PERIMETER WALL GRAZER
	LINEAR FIXTURE
	WALL MOUNTED UPLIGHT
	SOLAR SHADE
	BLACKOUT SHDE
	SECURITY CAMERA
	WIRELESS ACCESS POINT
	OCCUPANCY SENSOR
	SPEAKER

FINISH SCHEDULE	
FLOOR	
F0	CLEAN EXISTING
F1	CARPET TILE
F2	ENTRANCE FLOOR MAT
F3	RUBBER TILE
F4	NOT USED
F5	STONE PANEL
F6	CLEAN EXISTING STONE FLOOR
F7	PORCELAIN TILE
BASE	
B0	NO BASE
B1	WOOD
B2	RUBBER
B3.1	BLUESTONE TILE
B3.2	LIMESTONE TILE
B4	CERAMIC TILE
WALL	
W0	CLEAN EXISTING
W1	PTD GYP BD
W2	ARCH WALL SYSTEM
W3	FABRIC PANEL
W4	STONE PANELS
W5	WOOD VENEER PANELS
W6	NOT USED
W7	CERAMIC TILE
W8	FIBERGLASS REINF. PLASTIC PANEL
CEILING	
C0	NO CEILING
C1	PTD GYP BD
C2.1	ACT
C2.2	ACT PLANK
C2.3	ACT SCRUBBABLE
C3	LARGE FORMAT ACOUSTIC PANEL
C4	WOOD CEILING PANEL
C5	REPURPOSED WOOD PANEL
C6	ACOUSTICAL FINISHING SYSTEM

KEY NOTES:	
01	WOOD PANEL FRAMED OPENING
02	GLAZED METAL PART SYSTEM W/ GLASS DOOR. SEE ELEVATIONS FOR GLASS TYPES AND PRIVACY FILM TYPES.
03	FIRE RATED WOOD DOOR. SEE 10/A-704 FOR ADD. ALTH# SCOPE - FIRE RATED GLASS DOOR
04	FIRE RATED GLASS WALL SYSTEM
05	ALUM-FRAMED STOREFRONT DOOR W/ SIDELITE
06	ALUM-FRAMED WINDOW
07	LOCKABLE DISPLAY PIVOT DOORS
08	S.S. CABINET AND SHELVES W/ QUARTZ COUNTERTOP, AND QUARTZ & PORCELAIN TILE FASCIA
09	P.LAM MILLWORK W/ QUARTZ COUNTERTOP
10	MOBILE P.LAM MILLWORK W/ QUARTZ COUNTERTOP, LOCKABLE WHEEL
11	REFURBISHED QUARTZTOP
12	REINSTALL EXISTING CEILING
13	WOOD VENEER CABINETS W/ REFURBISHED QUARTZ COUNTERTOP
14	ADJUSTABLE WOOD VENEER SHELVING ON MTL STANDARDS, SEE DTL 04/A-730
15	SECURITY GATE ON TRACK
16	BLUESTONE SILL, SEE FLOOR FINISH PLANS
17	WOOD FRAMED WINDOW. SEE ELEVATION & DETAIL
18	
19	V.I.F. CLEARANCE FOR EXISTING PIPING



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SEAL:

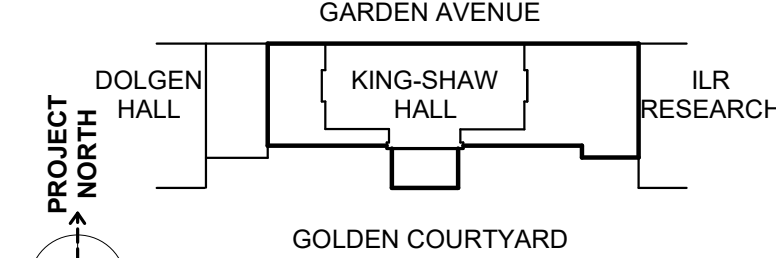


ISSUE/REVISION:

NO.	DATE	COMMENTS
1	04/29/25	ADDENDUM 03

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ALL DIMENSIONS AND EXISTING CONDITIONS SHALL BE CHECKED AND VERIFIED BY THE CONTRACTOR BEFORE PROCEEDING WITH THE WORK.

KEY PLAN:



PROJECT:

**RENOVATE 2ND - 5TH FLOOR
AT KING-SHAW HALL**

140 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:

**FLOOR PLAN AND
REFLECTED CEILING
PLAN - FIFTH FLOOR**

PROJECT NO: 240400	DATE: 01/31/2025
PHASE: 100% CD	SCALE: 1/8" = 1'-0"

A-203R

INTERIOR FINISH

FM-X FABRIC, MATCH EXISTING	UF1 UPHOLSTERY, COLOR 1	WC WALLCOVERING
FM1 FABRIC TYPE 1	UF2 UPHOLSTERY, COLOR 2	CT-1A CERAMIC TILE 1
FM2.1 FABRIC TYPE 2, COLOR 1	WD-X REPURPOSED WOOD	CT-1B CERAMIC TILE 2
FM2.2 FABRIC TYPE 2, COLOR 2	WD1 WOOD, MATCH EXISTING	CT2 CERAMIC TILE 3
FM2.3 FABRIC TYPE 2, COLOR 3	WD2 WOOD PANEL / SOLID WD	CT3 CERAMIC TILE 4

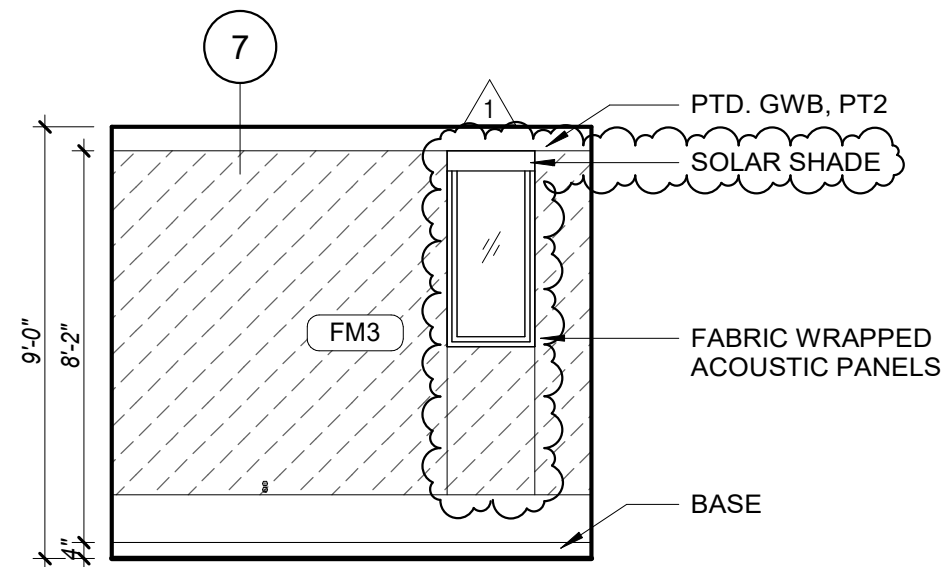
INTERIOR GLAZING TYPES

IG1 FIRE RATED GLASS	REFER TO SPECIFICATION FOR ACOUSTIC REQ
IG2 SINGLE, LOW-IRON GLAZING, CLEAR	
IG3 DOUBLE, LOW-IRON GLAZING, CLEAR	
IG4 DOUBLE, LOW-IRON GLAZING, CLEAR W/ TRANSLUCENT WHITE INTERLAYER	
IG5 DOUBLE, TEMPERED ACID ETCHED GLAZING W/ RAISED LINEAR PATTERN, MATCH EXISTING	

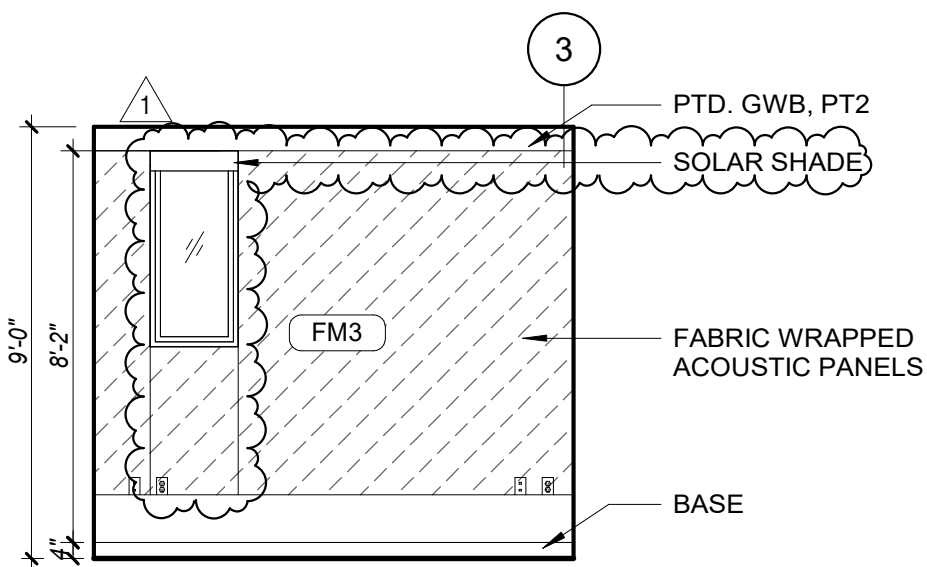
WALL FINISH

PT0 MATCH EXISTING	PT5 OFF-WHITE 1	PT-X STRIP, SAND & PREP AS NECESSARY FOR NEW PAINT
PT1 WHITE	PT6 OFF-WHITE 2	
PT2 RED	PT7 LIGHT GRAY	
PT3 CREAM	PT8 TBD	
PT4 GRAY		

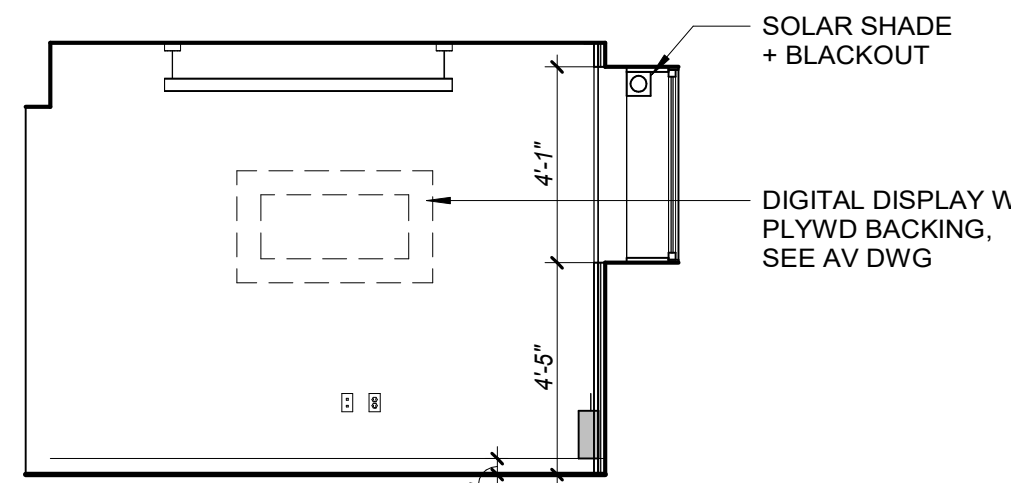
NOTE:
1) ALL COLUMNS, WALLS & CEILINGS PT1 U.O.N. REFER TO ELEVATIONS FOR ADDITIONAL FINISH INFO
2) SR, PTD, SCUFF RESISTANT PAINTED.
3) SEE FINISH SCHEDULE FOR PT AND FM COLOR/TYPE



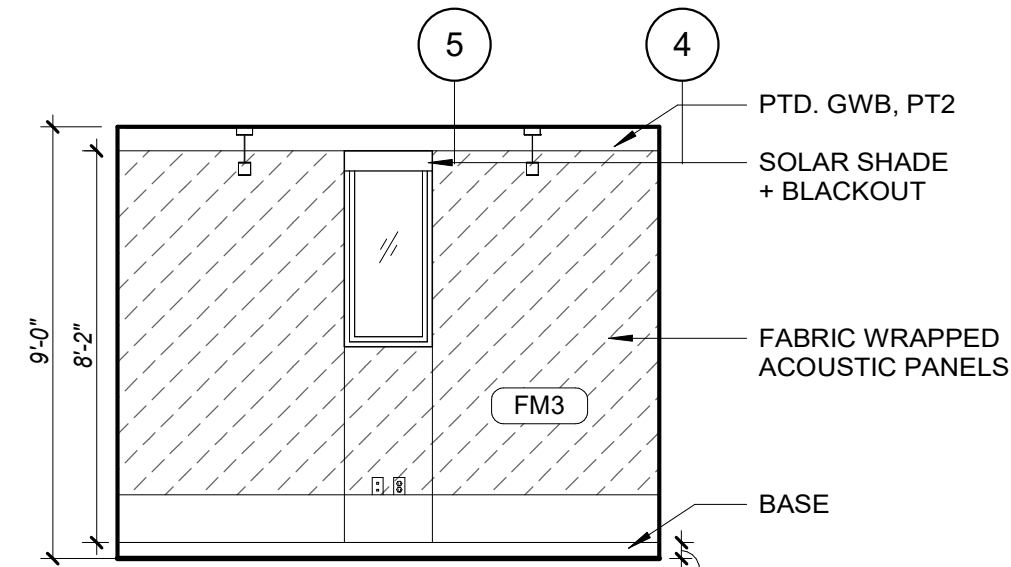
09 RM 325A - W. ELEVATION
SCALE: 1/4" = 1'-0"



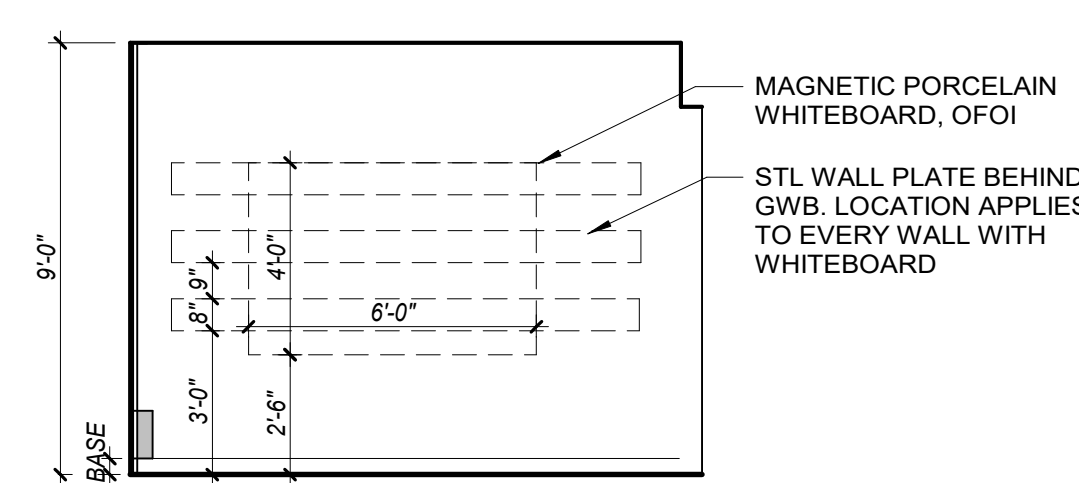
08 RM 325C - W. ELEVATION
SCALE: 1/4" = 1'-0"



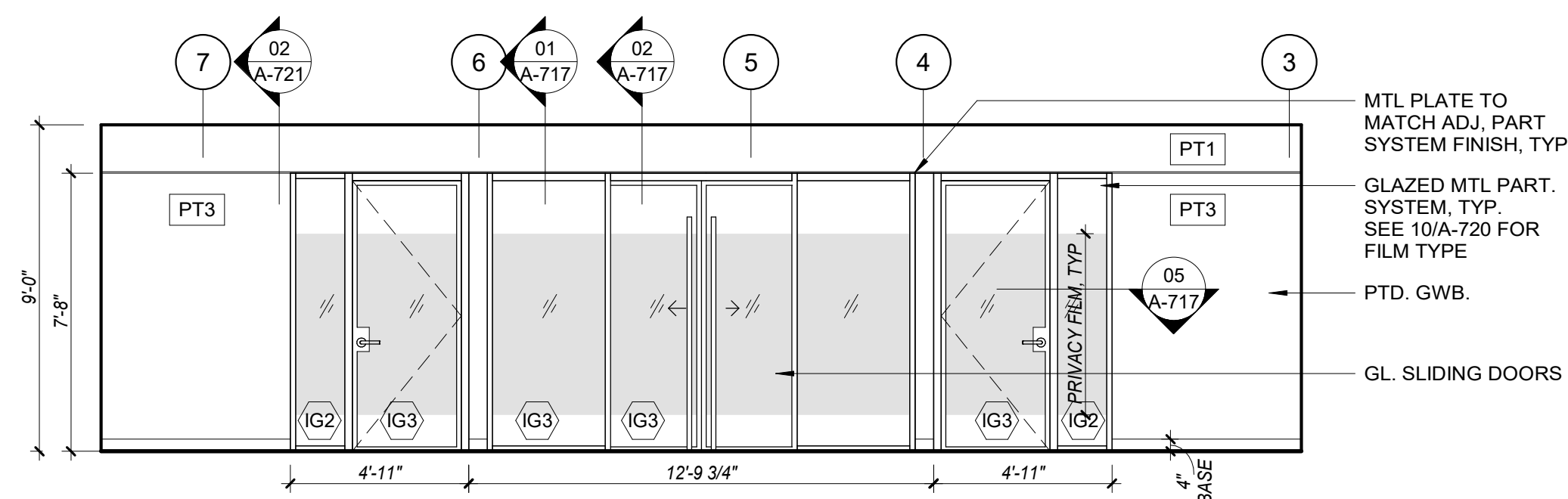
07 CONF. RM 325B - S. ELEVATION
SCALE: 1/4" = 1'-0"



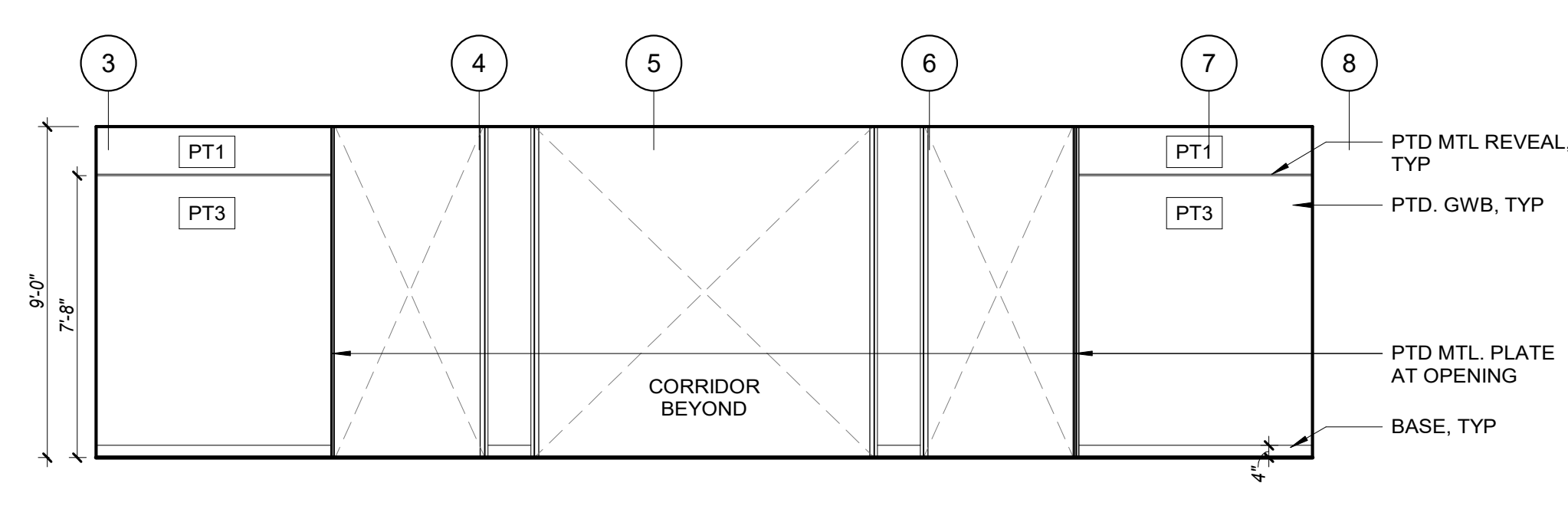
06 CONF. RM 325B - W. ELEVATION
SCALE: 1/4" = 1'-0"



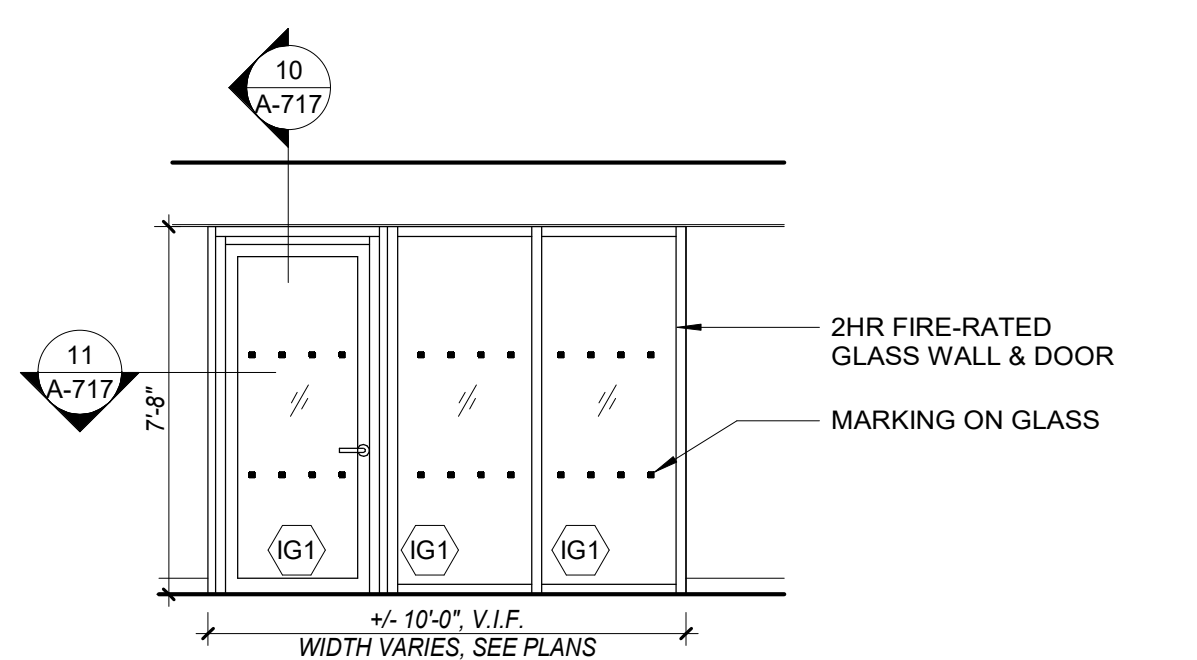
05 CONF. RM 325B - N. ELEVATION
SCALE: 1/4" = 1'-0"



04 THIRD FL LOUNGE - W. ELEVATION
SCALE: 1/4" = 1'-0"

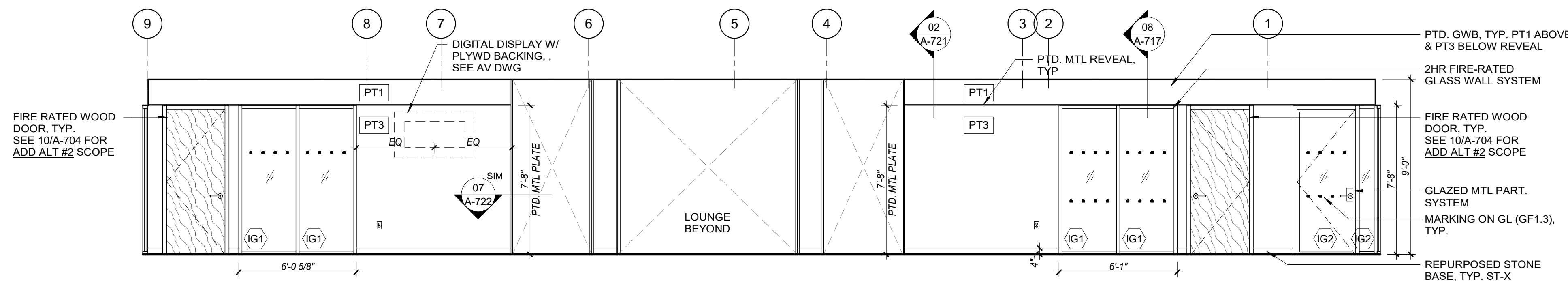


03 THIRD FL LOUNGE - E. ELEVATION
SCALE: 1/4" = 1'-0"

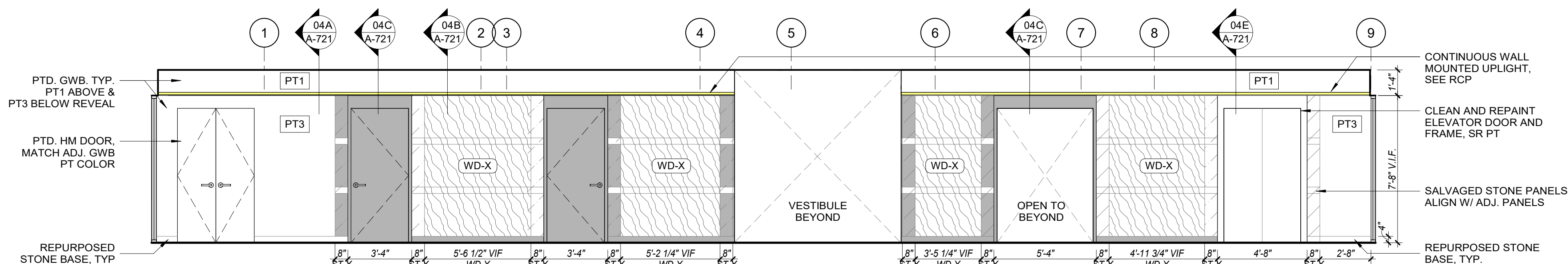


10 PARTIAL ELEV. - RATED GL. PART & DOOR AT STAIRS
SCALE: 1/4" = 1'-0"

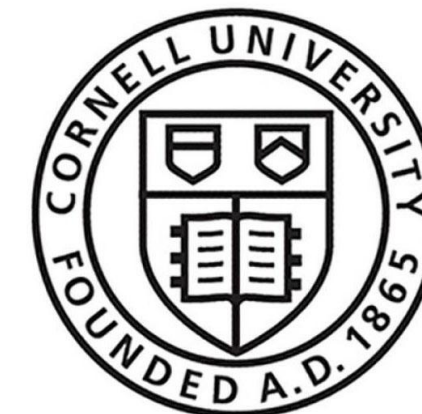
ADD ALT #2 @ STAIR A&B ON THIRD AND FOURTH FL.



02 THIRD FL CORRIDOR - W. ELEVATION
SCALE: 1/4" = 1'-0"



01 THIRD FL CORRIDOR - E. ELEVATION
SCALE: 1/4" = 1'-0"



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SEAL:

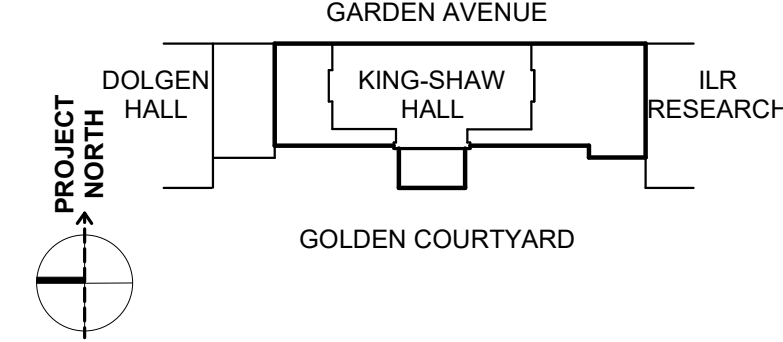


ISSUE/REVISION:

NO.	DATE	COMMENTS
1	04/29/25	ADDENDUM 03

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ALL DIMENSIONS AND EXISTING CONDITIONS SHALL BE CHECKED AND VERIFIED BY THE CONTRACTOR BEFORE PROCEEDING WITH THE WORK.

KEY PLAN:



PROJECT:

**RENOVATE 2ND - 5TH FLOOR
AT KING-SHAW HALL**

140 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:

**INTERIOR ELEVATIONS -
THIRD FLOOR**

PROJECT NO: 240400 DATE: 01/31/2025

PHASE: 100% CD SCALE: As indicated

A-704R

INTERIOR FINISH

FM-X) FABRIC, MATCH EXISTING	UF1) UPHOLSTERY, COLOR 1	WC) WALLCOVERING
FM1) FABRIC TYPE 1	UF2) UPHOLSTERY, COLOR 2	CT-1A) CERAMIC TILE 1
FM2.1) FABRIC TYPE 2, COLOR 1	WD-X) REPURPOSED WOOD	CT-1B) CERAMIC TILE 2
FM2.2) FABRIC TYPE 2, COLOR 2	WD1) WOOD, MATCH EXISTING	CT2) CERAMIC TILE 3
FM2.3) FABRIC TYPE 2, COLOR 3	WD2) WOOD PANEL / SOLID WD	CT3) CERAMIC TILE 4

INTERIOR GLAZING TYPES

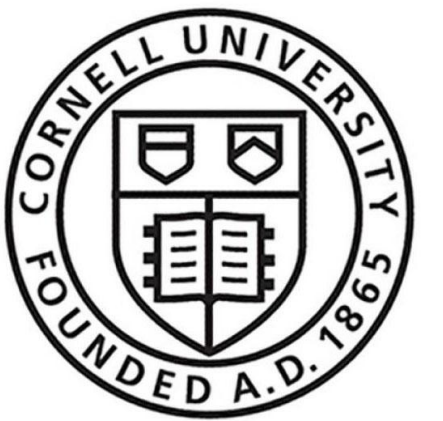
REFER TO SPECIFICATION
FOR ACOUSTIC REQ

IG1) FIRE RATED GLASS
IG2) SINGLE, LOW-IRON GLAZING, CLEAR
IG3) DOUBLE, LOW-IRON GLAZING, CLEAR
IG4) DOUBLE, LOW-IRON GLAZING, CLEAR W/ TRANSLUCENT WHITE INTERLAYER
IG5) DOUBLE, TEMPERED ACID ETCHED GLAZING W/ RAISED LINEAR PATTERN, MATCH EXISTING

WALL FINISH

PT0) MATCH EXISTING	PT5) OFF-WHITE 1	PT-X) STRIP, SAND & PREP AS NECESSARY FOR NEW PAINT
PT1) WHITE	PT6) OFF-WHITE 2	
PT2) RED	PT7) LIGHT GRAY	
PT3) CREAM	PT8) TBD	
PT4) GRAY		

NOTE:
1) ALL COLUMNS, WALLS & CEILINGS PT1 U.O.N. REFER TO ELEVATIONS FOR ADDITIONAL FINISH INFO
2) SR, PTD, SCUFF RESISTANT PAINTED.
3) SEE FINISH SCHEDULE FOR PT AND FM COLOR/TYPE



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SEAL:

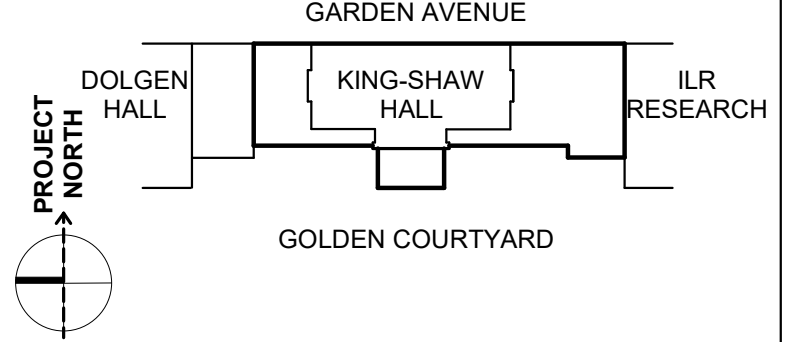


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KEY PLAN:



PROJECT:

RENOVATE 2ND - 5TH FLOOR AT KING-SHAW HALL

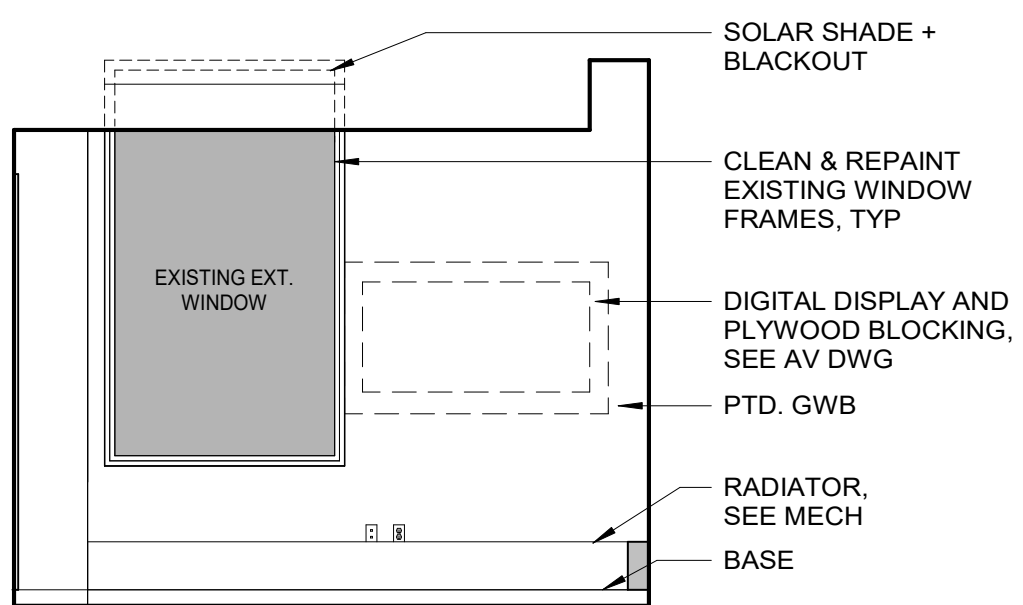
140 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:

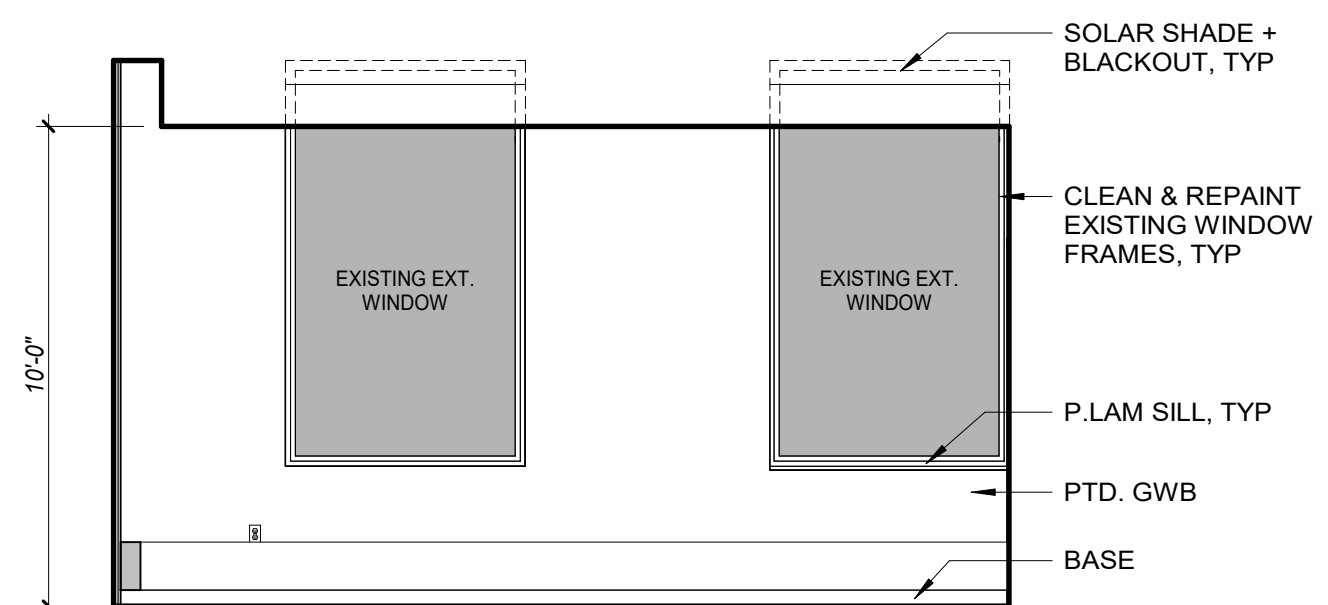
INTERIOR ELEVATIONS - FOURTH FLOOR

PROJECT NO: 240400	DATE: 01/31/2025
PHASE: 100% CD	SCALE: As indicated

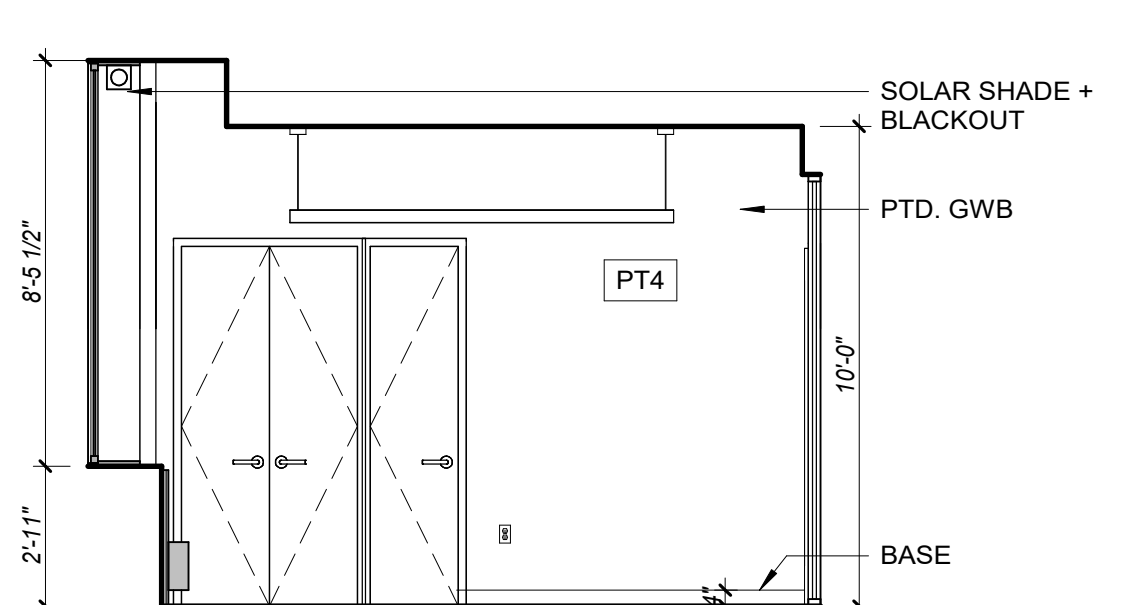
A-707R



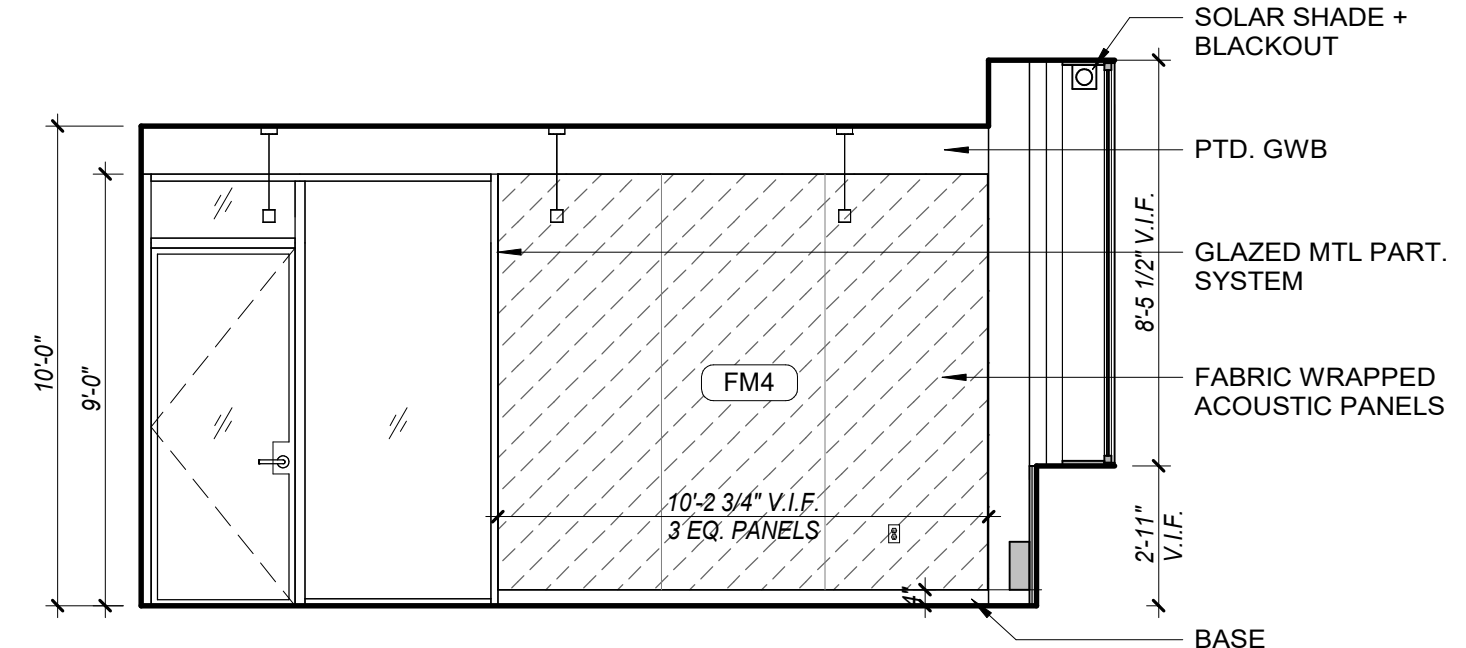
12 CONFERENCE RM 421B- N. ELEVATION
SCALE: 1/4" = 1'-0"



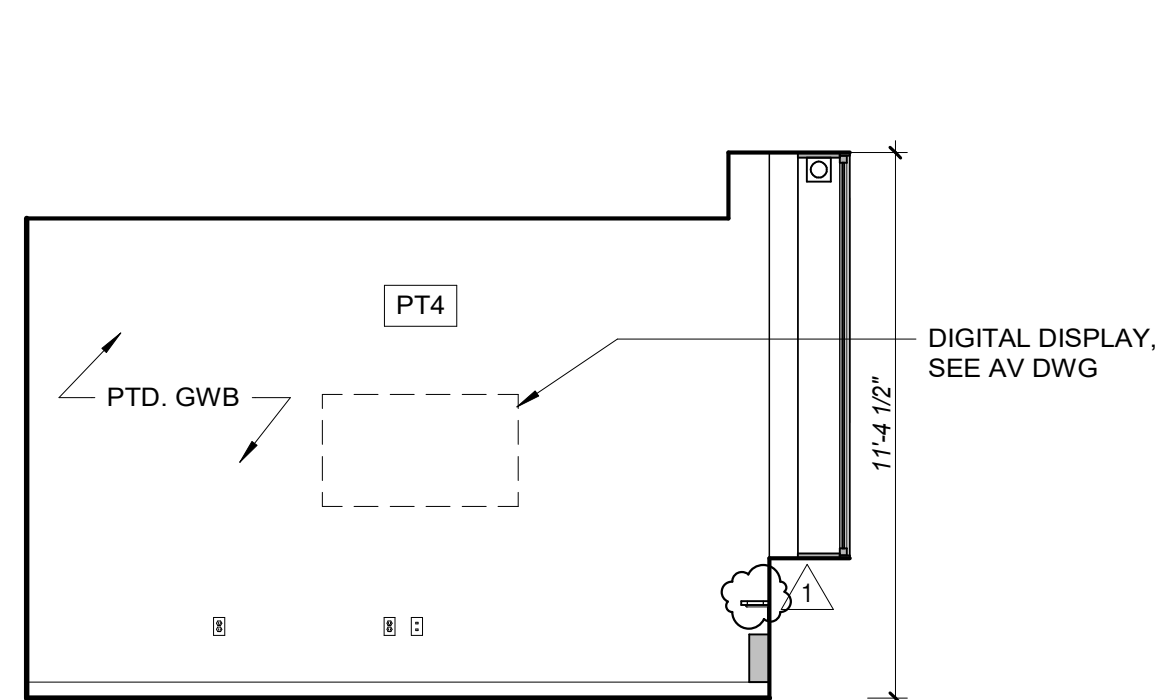
11 CONFERENCE RM 421B- E. ELEVATION
SCALE: 1/4" = 1'-0"



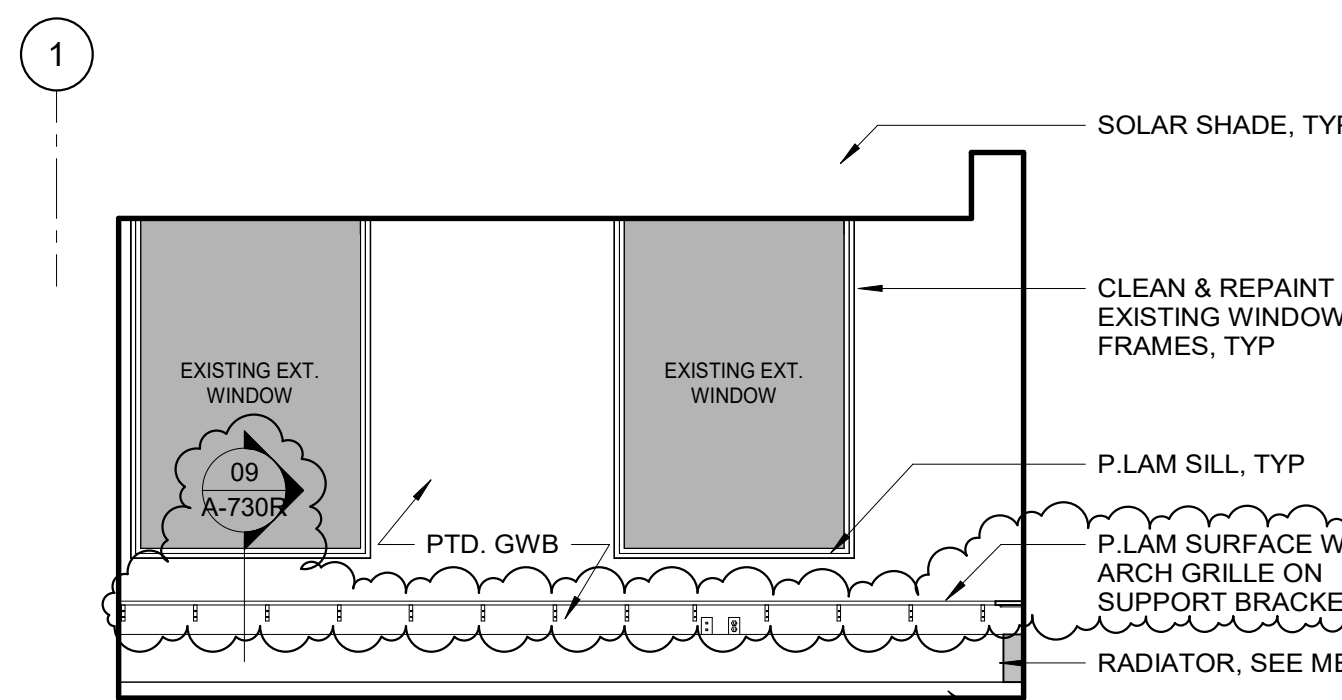
10 CONFERENCE RM 421B- S. ELEVATION
SCALE: 1/4" = 1'-0"



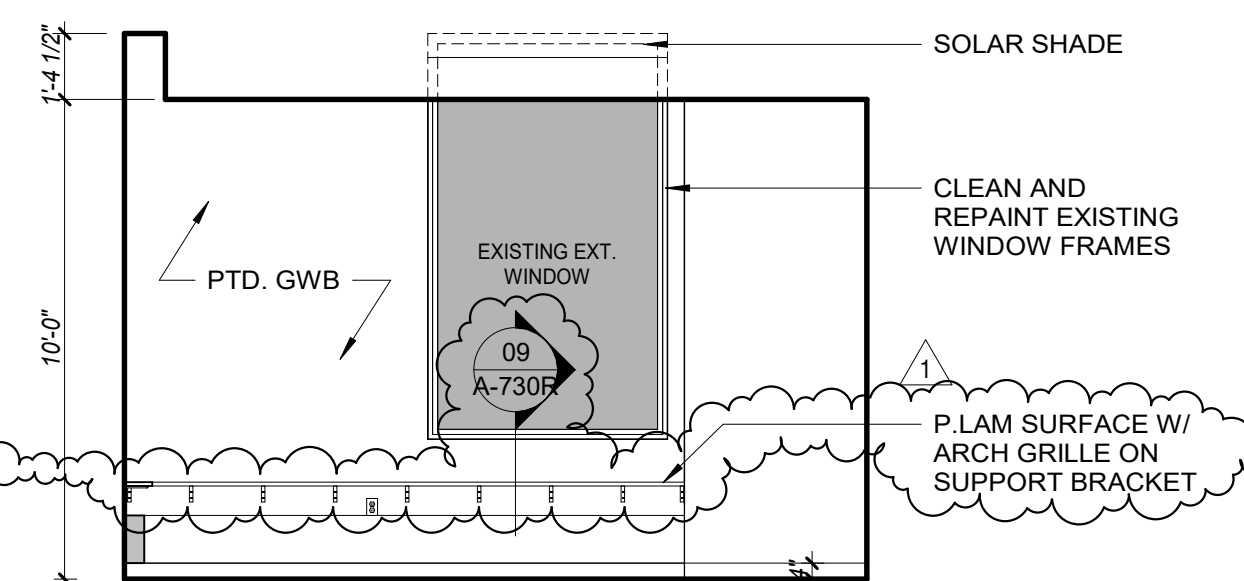
09 CONFERENCE RM 421B- W. ELEVATION
SCALE: 1/4" = 1'-0"



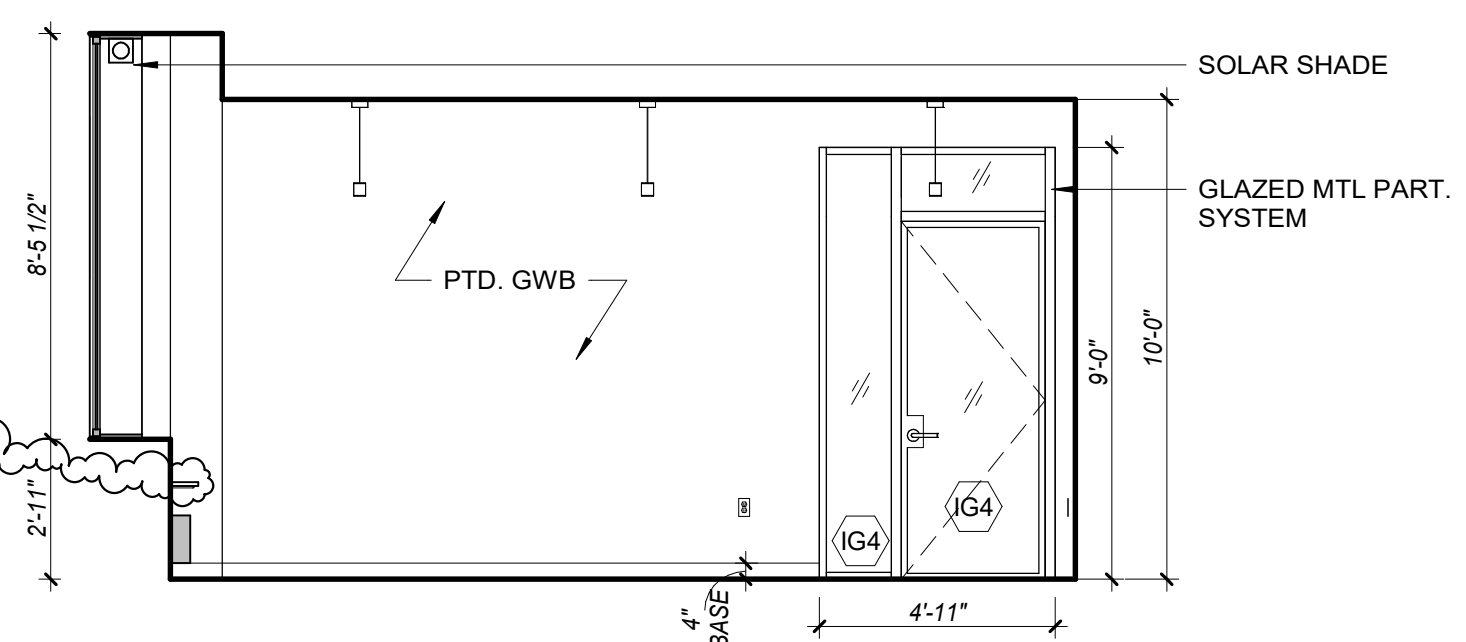
08 DEAN OFFICE - S. ELEVATION
SCALE: 1/4" = 1'-0"



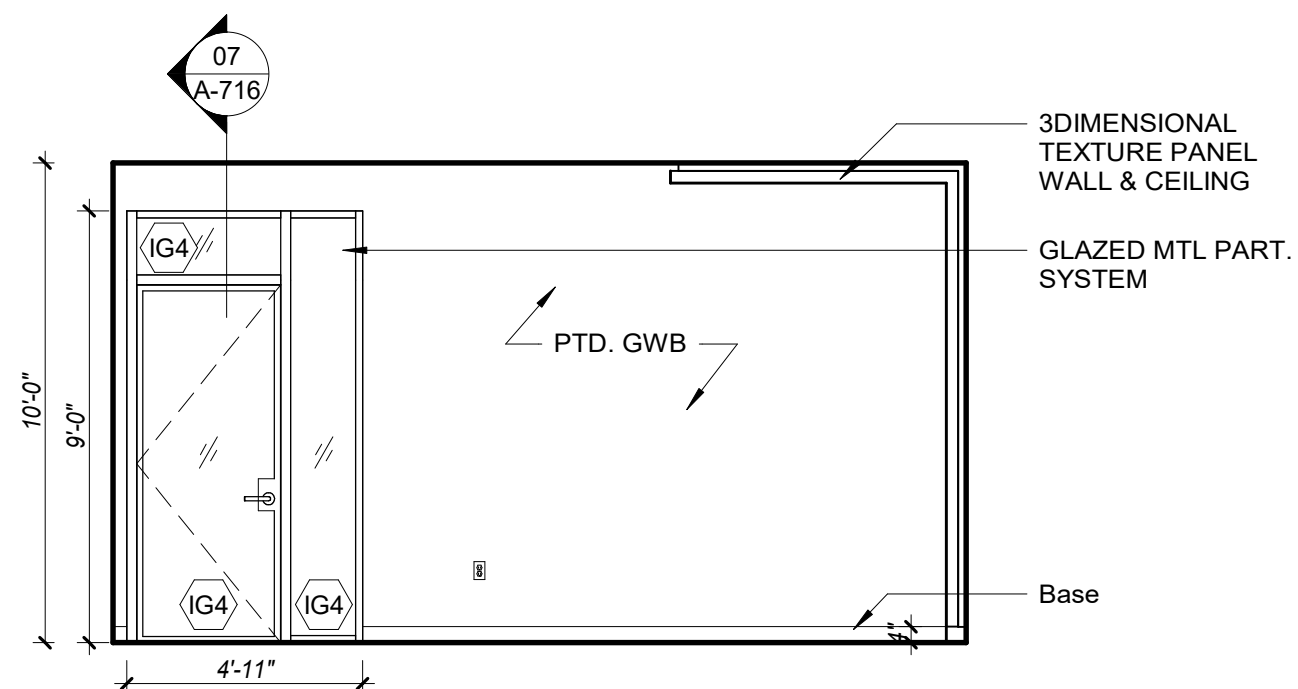
07 DEAN OFFICE - W. ELEVATION
SCALE: 1/4" = 1'-0"



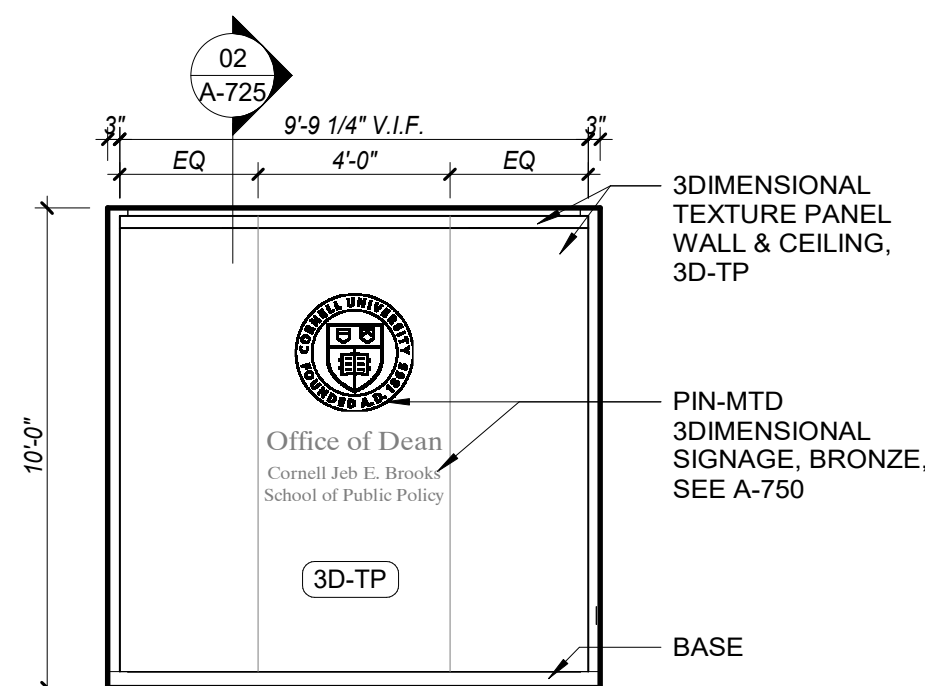
06 DEAN OFFICE - N. ELEVATION
SCALE: 1/4" = 1'-0"



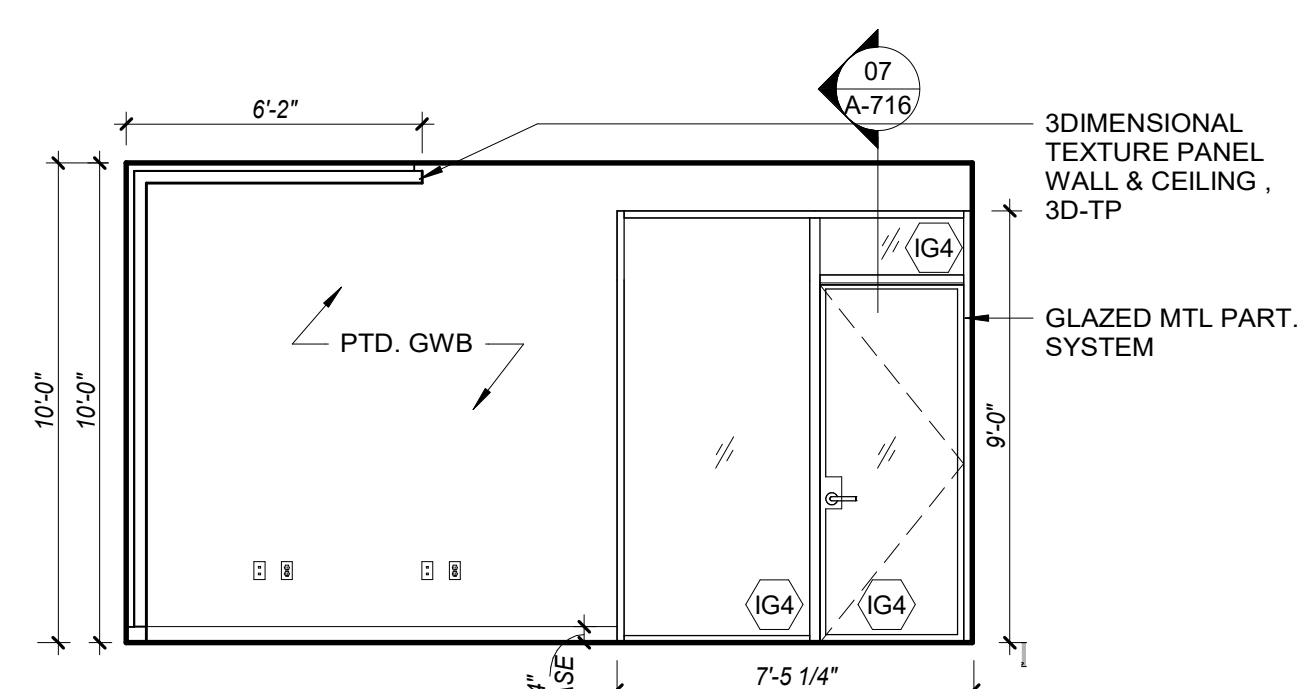
05 DEAN OFFICE - E. ELEVATION
SCALE: 1/4" = 1'-0"



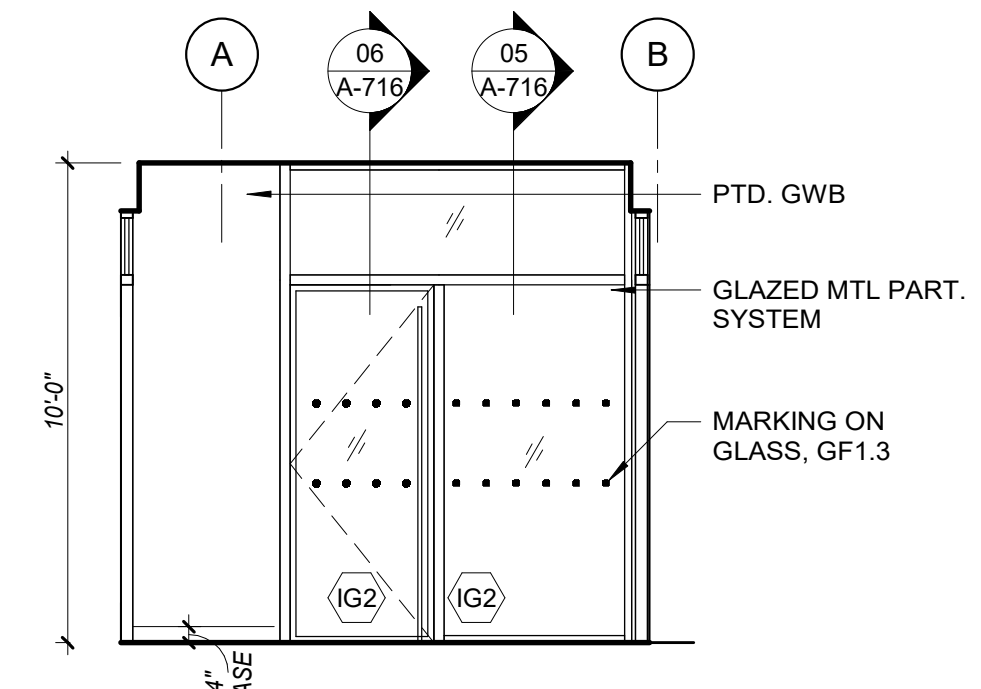
04 EXECUTIVE ASSIST. - W. ELEVATION
SCALE: 1/4" = 1'-0"



03 EXECUTIVE ASSIST. - N. ELEVATION
SCALE: 1/4" = 1'-0"



02 EXECUTIVE ASSIST. - E. ELEVATION
SCALE: 1/4" = 1'-0"



01 EXECUTIVE ASSIST. - S. ELEVATION
SCALE: 1/4" = 1'-0"

INTERIOR FINISH

FM-X FABRIC, MATCH EXISTING	UF1 UPHOLSTERY, COLOR 1	WC WALLCOVERING
FM1 FABRIC TYPE 1	UF2 UPHOLSTERY, COLOR 2	CT-1A CERAMIC TILE 1
FM2.1 FABRIC TYPE 2, COLOR 1	WD-X REPURPOSED WOOD	CT-1B CERAMIC TILE 2
FM2.2 FABRIC TYPE 2, COLOR 2	WD1 WOOD, MATCH EXISTING	CT2 CERAMIC TILE 3
FM2.3 FABRIC TYPE 2, COLOR 3	WD2 WOOD PANEL / SOLID WD	CT3 CERAMIC TILE 4

INTERIOR GLAZING TYPES

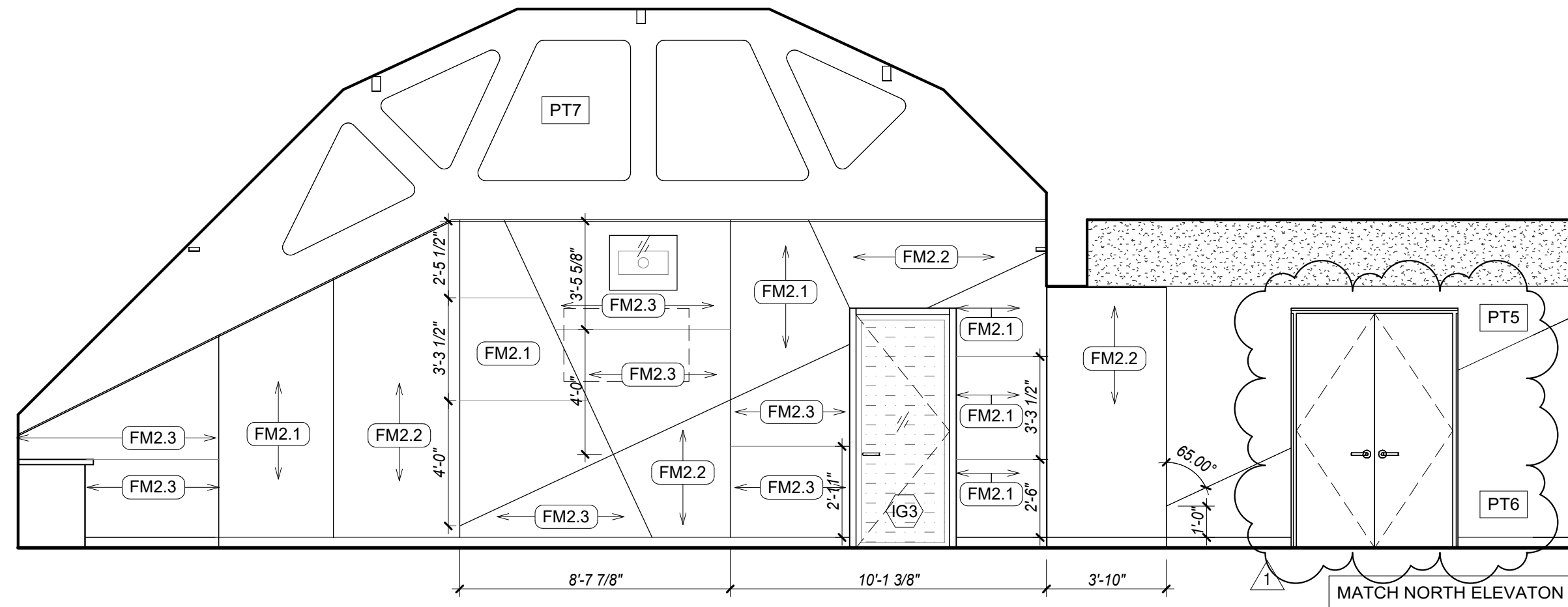
REFER TO SPECIFICATION
FOR ACOUSTIC REQ

IG1 FIRE RATED GLASS
IG2 SINGLE, LOW-IRON GLAZING, CLEAR
IG3 DOUBLE, LOW-IRON GLAZING, CLEAR
IG4 DOUBLE, LOW-IRON GLAZING, CLEAR W/ TRANSLUCENT WHITE INTERLAYER
IG5 DOUBLE, TEMPERED ACID ETCHED GLAZING W/ RAISED LINEAR PATTERN, MATCH EXISTING

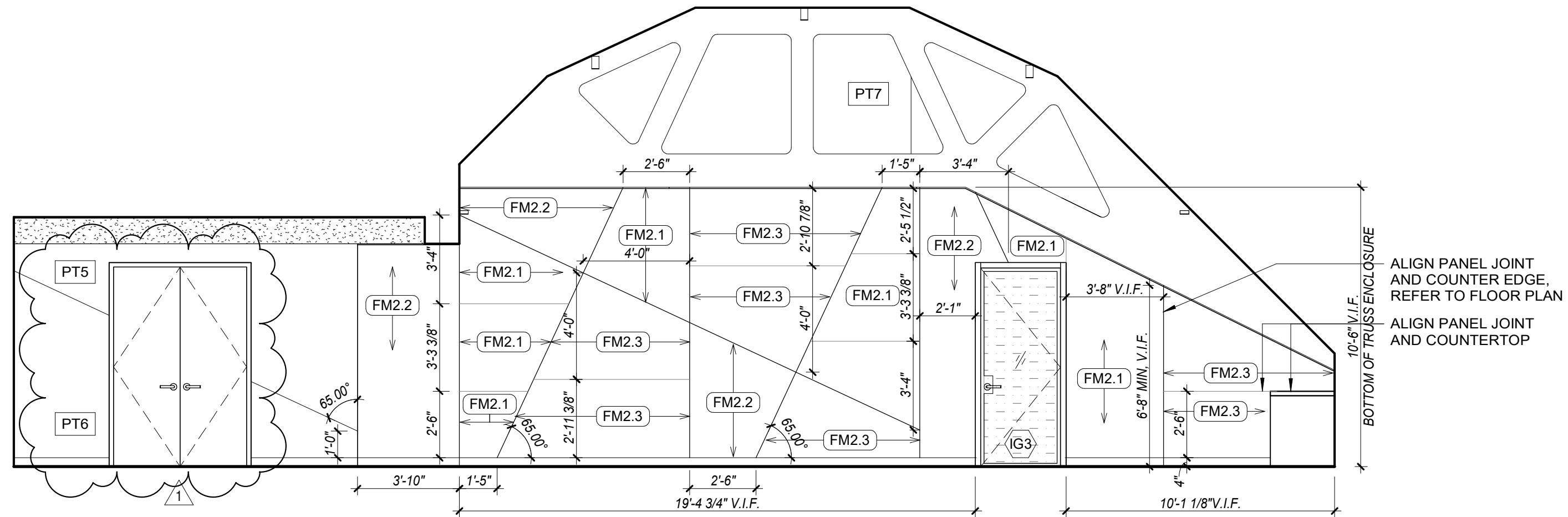
WALL FINISH

PT0 MATCH EXISTING	PT5 OFF-WHITE 1	PT-X STRIP, SAND & PREP AS NECESSARY FOR NEW PAINT
PT1 WHITE	PT6 OFF-WHITE 2	
PT2 RED	PT7 LIGHT GRAY	
PT3 CREAM	PT8 TBD	
PT4 GRAY		

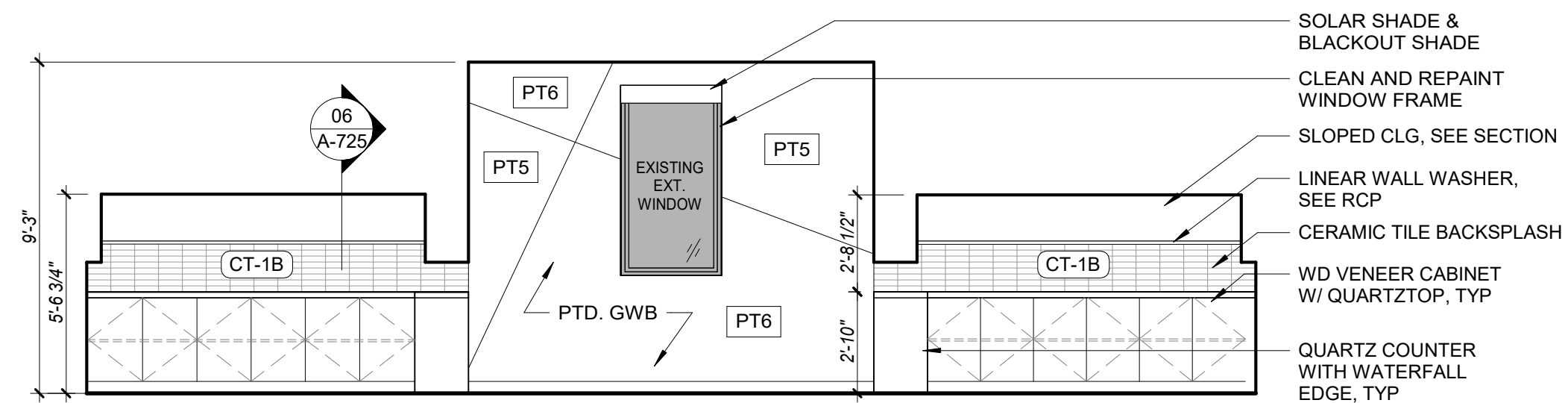
NOTE:
1) ALL COLUMNS, WALLS & CEILINGS PT1 U.O.N. REFER TO ELEVATIONS FOR ADDITIONAL FINISH INFO
2) SR, PTD, SCUFF RESISTANT PAINTED.
3) SEE FINISH SCHEDULE FOR PT AND FM COLOR/TYPE



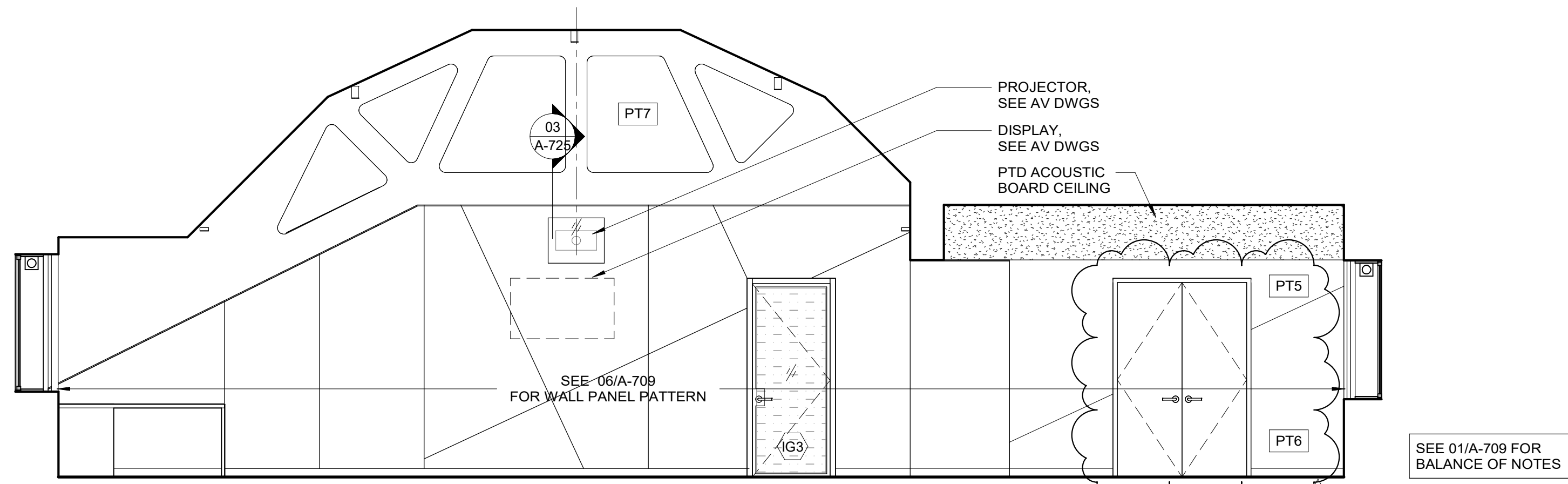
06 MPR WALL PANEL PATTERN - S. ELEVATION
SCALE: 1/4" = 1'-0"



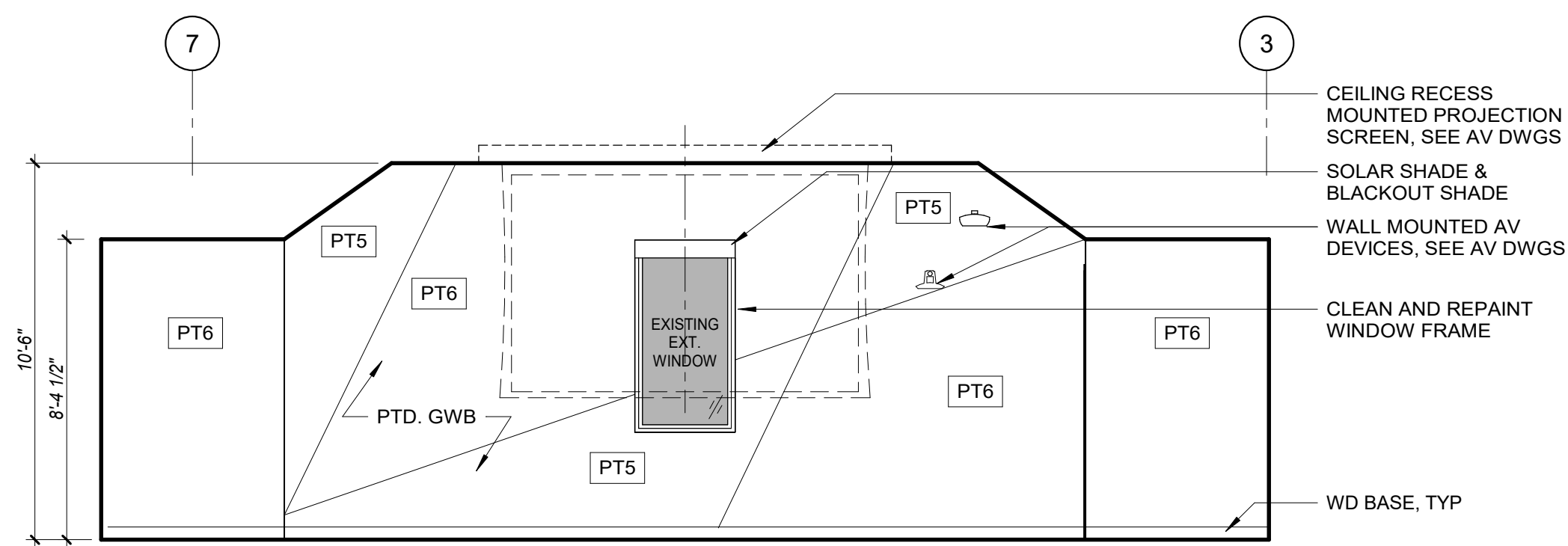
05 MPR WALL PANEL PATTERN - N. ELEVATION
SCALE: 1/4" = 1'-0"



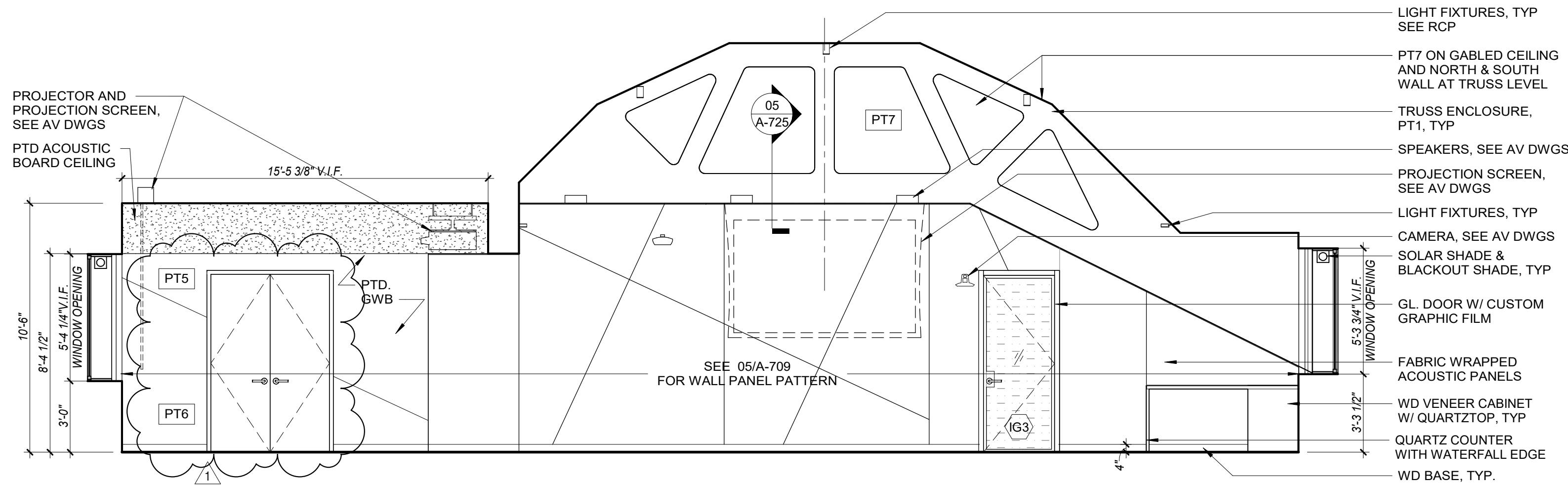
03 MULTIPURPOSE ROOM 525 - E. ELEVATION
SCALE: 1/4" = 1'-0"



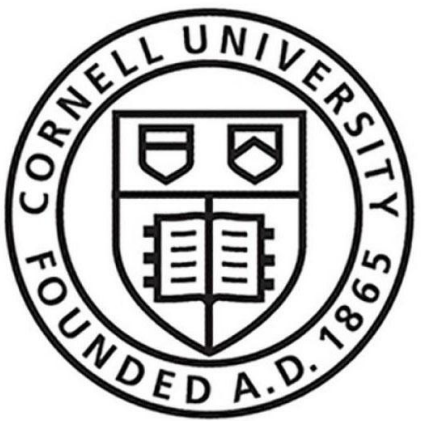
02 MULTIPURPOSE ROOM 525 - S. ELEVATION
SCALE: 1/4" = 1'-0"



04 MULTIPURPOSE ROOM 525 - W. ELEVATION
SCALE: 1/4" = 1'-0"



01 MULTIPURPOSE ROOM 525 - N. ELEVATION
SCALE: 1/4" = 1'-0"



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SEAL:

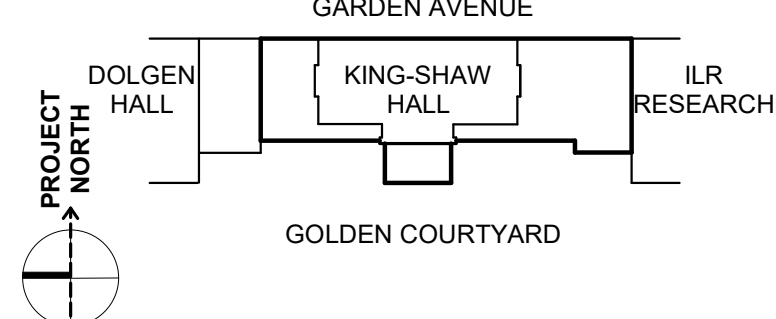


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KEY PLAN:



PROJECT:

RENOVATE 2ND - 5TH FLOOR AT KING-SHAW HALL

140 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:

INTERIOR ELEVATION - FIFTH FLOOR

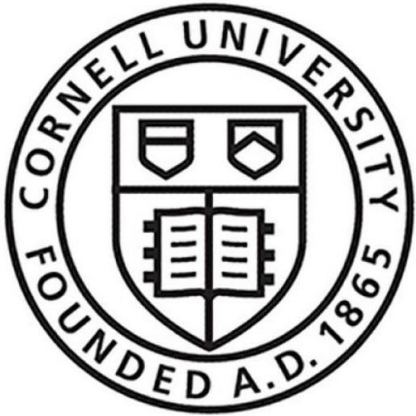
PROJECT NO: 240400 DATE: 01/31/2025

PHASE: 100% CD SCALE: As indicated

A-709R

DOOR NO.	ROOM NO.	ROOM NAME	DIMENSIONS			DOOR TYPE	DOOR MATERIAL	FRAME TYPE	FRAME MATERIAL	DETAILS			HDWR	CARD READER	DOOR LABEL	REMARKS
			DOOR WIDTH	DOOR WIDTH 2	DOOR HEIGHT					HEAD	JAMB	TSHLD				
SECOND FLOOR																
221.1	221	MEETING ROOM	3'-0"	3'-0"	6'-9 1/2"	D	AGPS	C	AGPS	04/A-716	03/A-717	05E/A-718	E2	CR		
221.2	221	MEETING ROOM	3'-0"	0"	6'-9 1/2"	C	AGPS	B	AGPS	04/A-716	14/A-716	05A/A-718	E1	CR		
221A.1	221A	AV CLOSET	2'-0"	2'-0"	7'-8"	B	WD	F	WD	05/A-724	01/A-724	05A/A-718	8			
221B.1	221B	STOR.	3'-0"	0"	7'-8"	A	WD	F	WD	05/A-724	01/A-724	05A/A-718	9			
221C.1	221C	STOR.	2'-9"	2'-9"	7'-8"	B	WD	F	WD	05/A-724	01/A-724	05A/A-718	8			
221D.1	221D	STOR.	2'-9"	0"	7'-8"	A	WD	F	WD	05/A-724	01/A-724	05A/A-718	9			
221E.1	221E	STOR.	2'-0"	0"	7'-8"	A	WD	F	WD	05/A-724	01/A-724	05A/A-718	9			
225.1	225	ILR SUITE	3'-0"	3'-0"	7'-5 1/2"	D	AGPS	C	AGPS	03/A-716	10/A-716	05K/A-718	E5	CR		
225.2	225	ILR SUITE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	03/A-716	11/A-716	05A/A-718	E6	CR		
225B.1	225B	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
225C.1	225C	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
225D.1	225D	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
225G.1	225G	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
225H.1	225H	MEETING RM	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
226.1	226	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
227.1	227	STOR.	2'-10"	2'-10"	7'-6"	B	HM	A	HM	03/A-718	04/A-718	05B/A-718	4			
228.1	228	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
229.1	229	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
233.2	233	PREP ROOM	3'-2"	0"	7'-0"	J	HM	A	HM	03/A-718	04/A-718	05L/A-718	5			DOUBLE SWING DOOR
233.3	233	PREP ROOM	2'-6"	0"	7'-0"	A	HM	A	HM	03/A-718	04/A-718	05B/A-718	2			
20062.1	20062	JANITOR	3'-0"	0"	7'-6"	A	HM	A	HM	03/A-718	04/A-718	05G/A-718	2A			
20065.1	20044	ELEV. CORR.	2'-10"	0"	7'-6"	A	HM	A	HM	03/A-718	04/A-718	05B/A-718	2			
STR A.2	20003	STAIR A	3'-0"	0"	7'-3 1/2"	G	WD	A	HM			05J/A-718	3		B	
STR B.2	20004	STAIR B	3'-0"	0"	7'-3 1/2"	G	WD	A	HM			05J/A-718	3		B	
THIRD FLOOR																
321.1	321	ADMIN	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	03/A-716	11/A-716	05A/A-718	E7	CR		
321A.1	321A	DIRECTORS OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
321B.1	321B	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
321C.1	321C	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
323.1	323	VEST.	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	03/A-716	11/A-716	05A/A-718	E1	CR		
323A.1	323A	TOUCH DOWN	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
324.1	324	STORAGE	2'-0"	2'-0"	7'-0"	B	HM	A	HM	03/A-712	04/A-712	05A/A-718	4			
325A.1	325A	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
325B.1	325B	CONF. RM.	2'-9"	2'-9"	7'-5 1/2"	E	AGPS	C	AGPS	02/A-717	05/A-717	05A/A-718	10			
325C.1	325C	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
326.1	326	PHONEBOOTH	3'-0"	0"	7'-0"	A	HM	A	HM	03/A-718	04/A-718	05A/A-718	E1A	CR		
329.1	329	ADMIN	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	03/A-716	11/A-716	05A/A-718	E7	CR		
329A.1	329A	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
329B.1	329B	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
329C.1	329C	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
329D.1	329D	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
329E.1	329E	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
30048.1	30048	VESTIBULE	3'-6"	3'-6"	7'-5 1/2"	H	AGPS	C	AGPS	07/A-711	06/A-711		6			
30048.2	30048	VESTIBULE	2'-6"	0"	7'-4"	A	HM	F	HM	03/A-718	04/A-718		2B			
30063.1	30044	CORRIDOR	2'-8"	2'-8"	7'-0"	B	HM	A	HM	03/A-718	04/A-718	05A/A-718	4A			
STR A.3	30003	STAIR A	3'-0"	0"	7'-5 1/2"	K	WD	A	HM			05H/A-718	E3	CR	B	
STR B.3	30004	STAIR B	3'-0"	0"	7'-5 1/2"	K	WD	A	HM			05H/A-718	E3	CR	B	
FOURTH FLOOR																
421.1	421	EXECUTIVE ASSIST.	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	06/A-716	11/A-716	05A/A-718	E7	CR		
421A.1	421A	DEAN OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	D	AGPS	07/A-716	13/A-716	05A/A-718	1			
421B.1	421B	CONF. RM.	3'-0"	0"	7'-5 1/2"	C	AGPS	D	AGPS	07/A-716	13/A-716	05A/A-718	1			
421B.2	421B	CONF. RM.	1'-10"	0"	7'-6"	A	HM	A	HM	03/A-718	04/A-718	05A/A-718	9			
421B.3	421B	CONF. RM.	1'-10"	1'-10"	7'-6"	B	HM	A	HM	03/A-718	04/A-718	05A/A-718	8			
422.1	422	STOR.	3'-0"	3'-0"	7'-0"	B	WD	A	WD	03/A-718	04/A-718	05A/A-718	4A			
423A.1	423A	TOUCHDOWN	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	13/A-716	05A/A-718	E1	CR		
424.1	424	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	03/A-716	11/A-716	05A/A-718	E7	CR		
424A.1	424A	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
424B.1	424B	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
425.1	425	CONFERENCE ROOM	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	13/A-716	05A/A-718	E1	CR		
426.1	426	PANTRY	3'-0"		7'-0"	F	WD	G	WD	03/A-718	04/A-718	05F/A-718	7			
429.1	429	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	03/A-716	11/A-716	05A/A-718	E7	CR		
429A.1	429A	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
429B.1	429B	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-718	1			
429C.1	429C	OFFICE	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	12/A-716	05A/A-712	1			
429D.1	429D	STOR.	2'-6"	0"	7'-6"	A	HM	A	HM	03/A-718	04/A-718	05A/A-718	2B			
40062.1	40062	J.C.	2'-10"	0"	7'-0"	A	WD	A	WD	03/A-718	04/A-718	05D/A-718	2			
STR A.4	40003	STAIR A	3'-0"	0"	7'-5 1/2"	K	WD	A	HM			05H/A-718	E3	CR	B	
STR B.4	40004	STAIR B	3'-0"	0"	7'-5 1/2"	K	WD	A	HM			05H/A-718	E3	CR	B	
FIFTH FLOOR																
525.1	525	MULTIPURPOSE ROOM	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	14/A-717	05A/A-718	E3A	CR		
525.2	525	MULTIPURPOSE ROOM	3'-0"	0"	7'-5 1/2"	C	AGPS	B	AGPS	04/A-716	14/A-717	05A/A-718	E3A	CR		
525A.1	525A	STORAGE	2'-6"	2'-6"	7'-6"	B	HM	A	HM	03/A-712	04/A-712	05A/A-718	E8	CR		
525B.1	525B	STORAGE	2'-6"	2'-6"	7'-6"	B	HM	A	HM	03/A-712	04/A-712	05A/A-718	E8	CR		

EXISTING																
SECOND FLOOR																
233.1	233	PREP ROOM											E4	CR		
FIFTH FLOOR																
524.1	524	STORAGE											E4	CR		
530.1	530	AV ROOM											E4	CR		
532.1	532	MECHANICAL RM											E4	CR		
50003.1	50003	STAIR A											E4	CR		
50004.1	50004	STAIR B											E4	CR		



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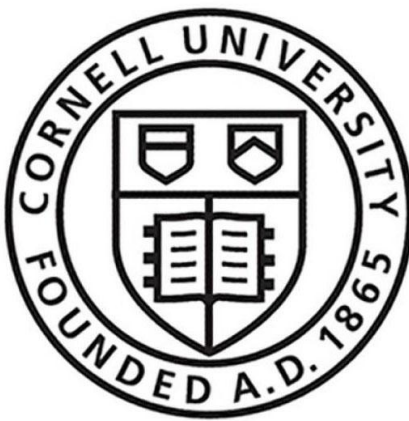
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ISSUE/REVISION:

NO.	DATE	COMMENTS
1	04/29/25	ADDENDUM 03



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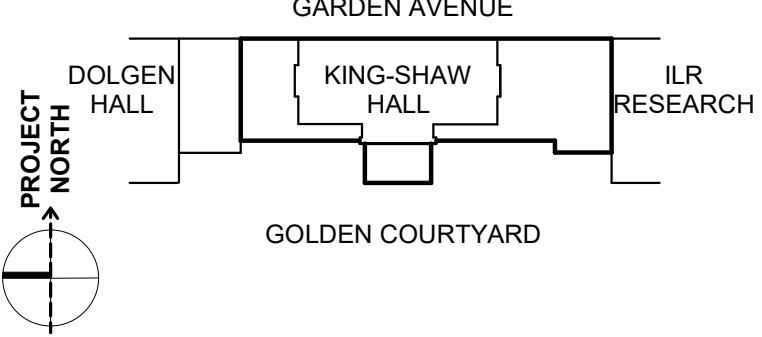


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1	04/29/25	ADDENDUM 03

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ALL DIMENSIONS AND EXISTING CONDITIONS SHALL BE CHECKED AND VERIFIED BY THE CONTRACTOR BEFORE PROCEEDING WITH THE WORK.

KEY PLAN:



PROJECT:

**RENOVATE 2ND - 5TH FLOOR
AT KING-SHAW HALL**

140 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:

**MILLWORK - TYPICAL
DETAILS**

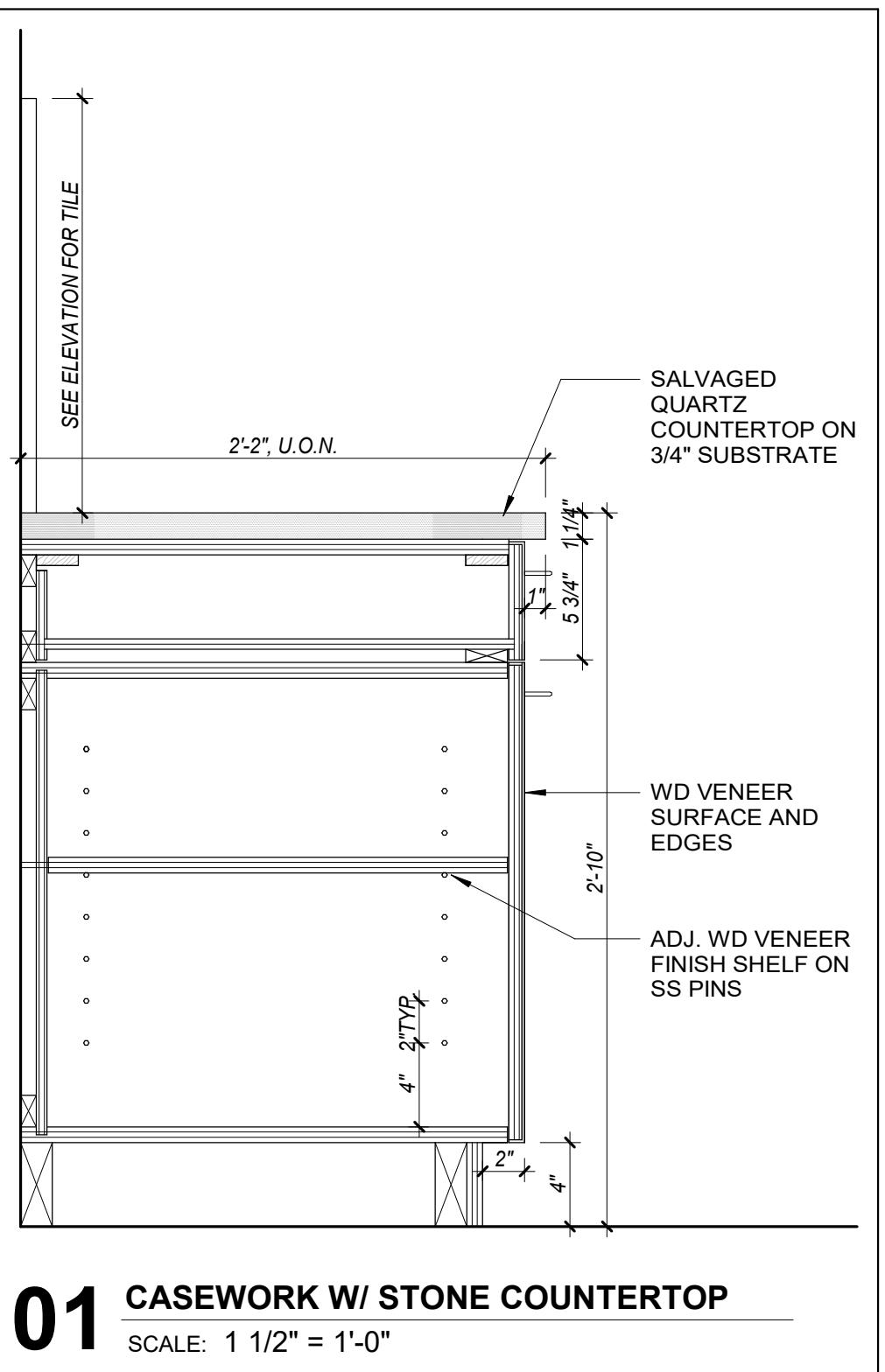
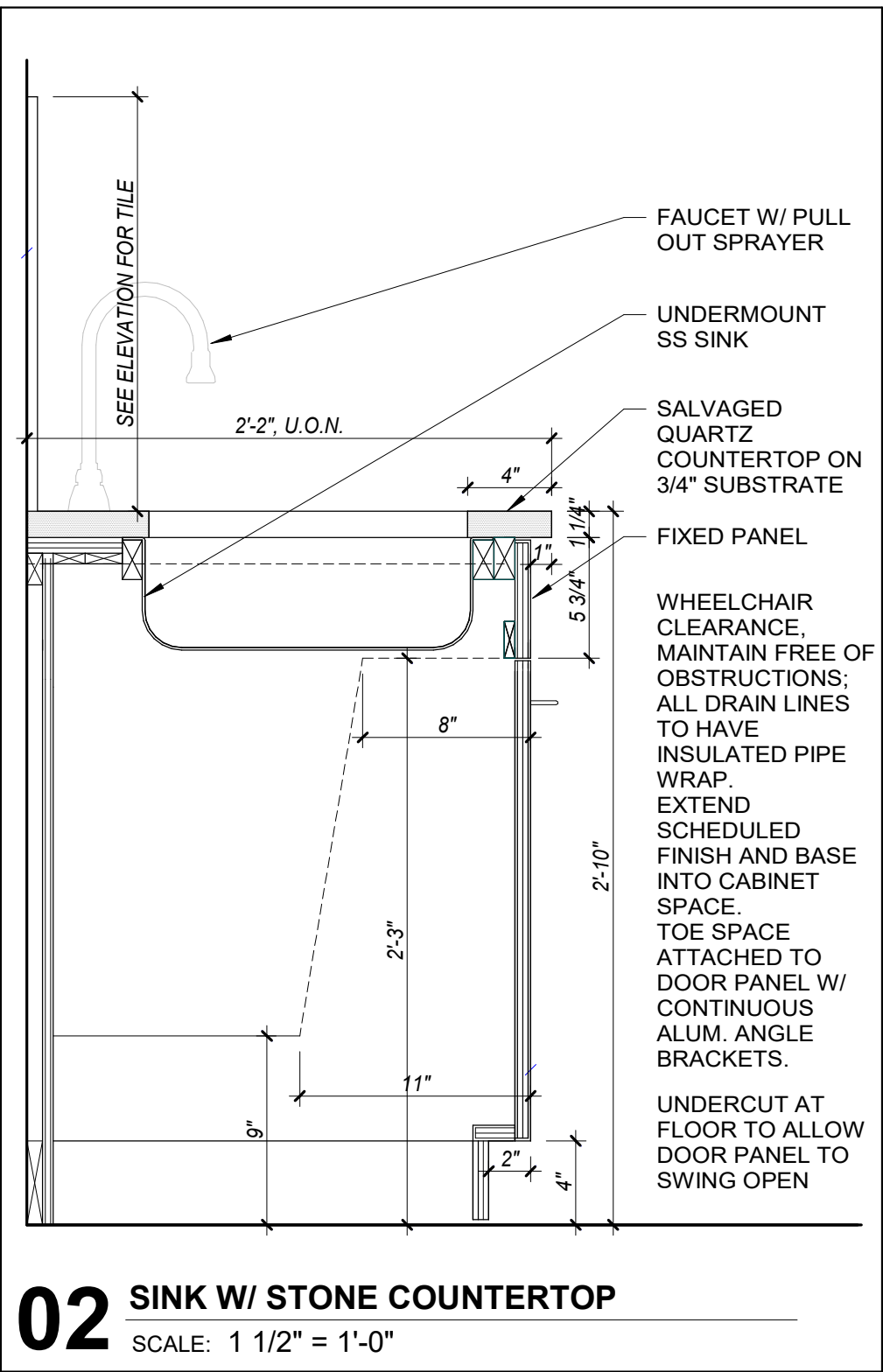
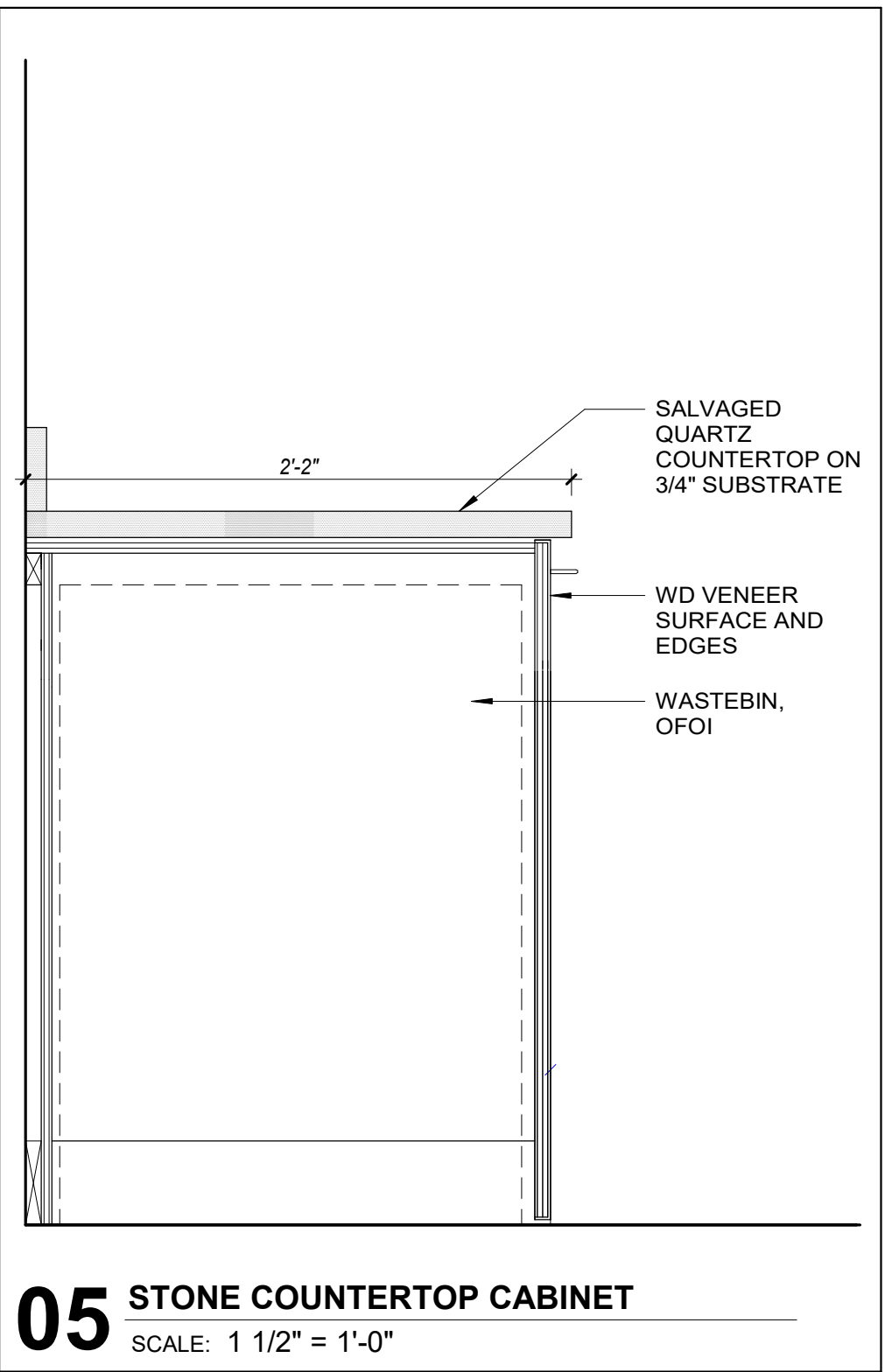
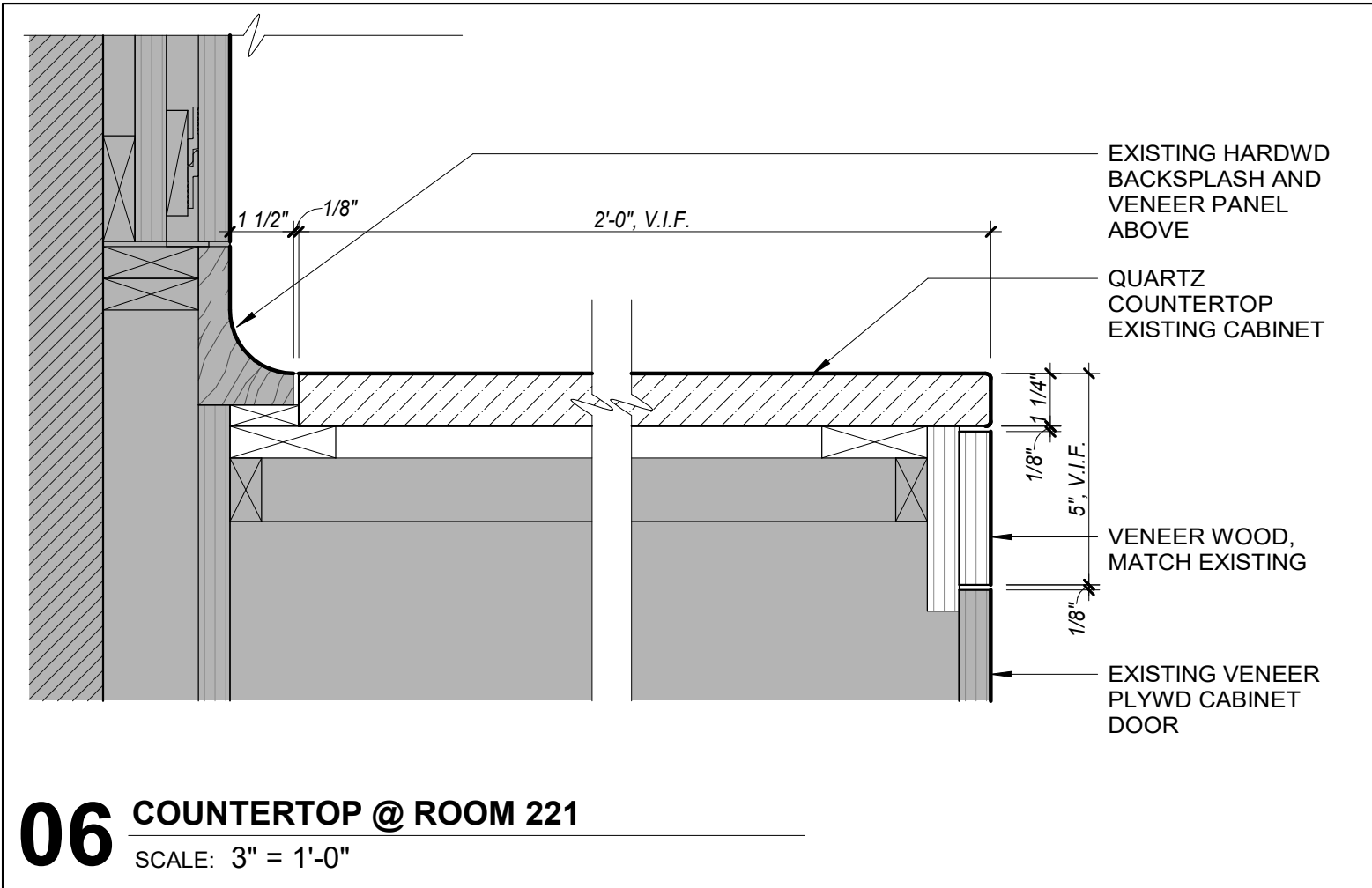
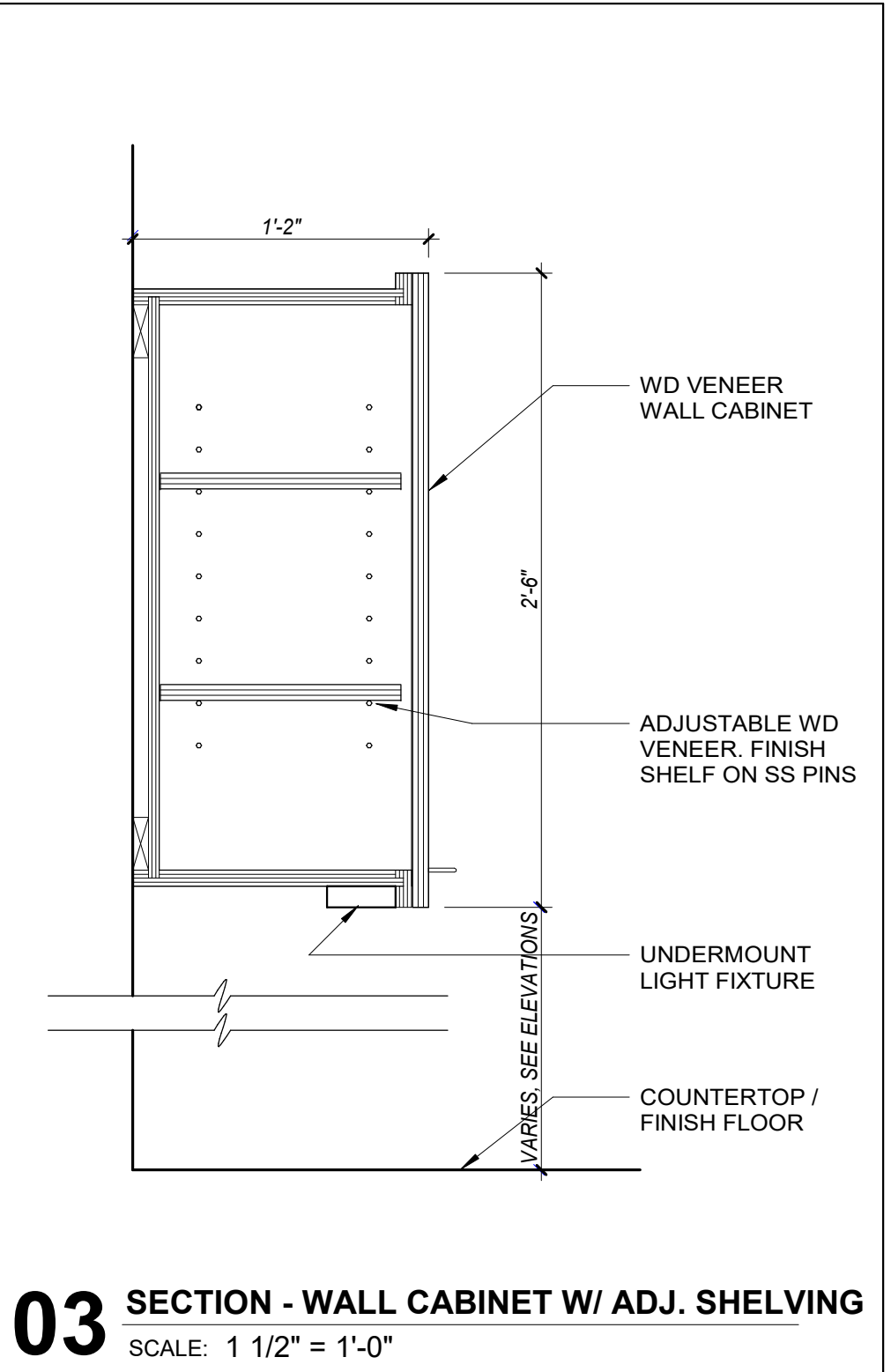
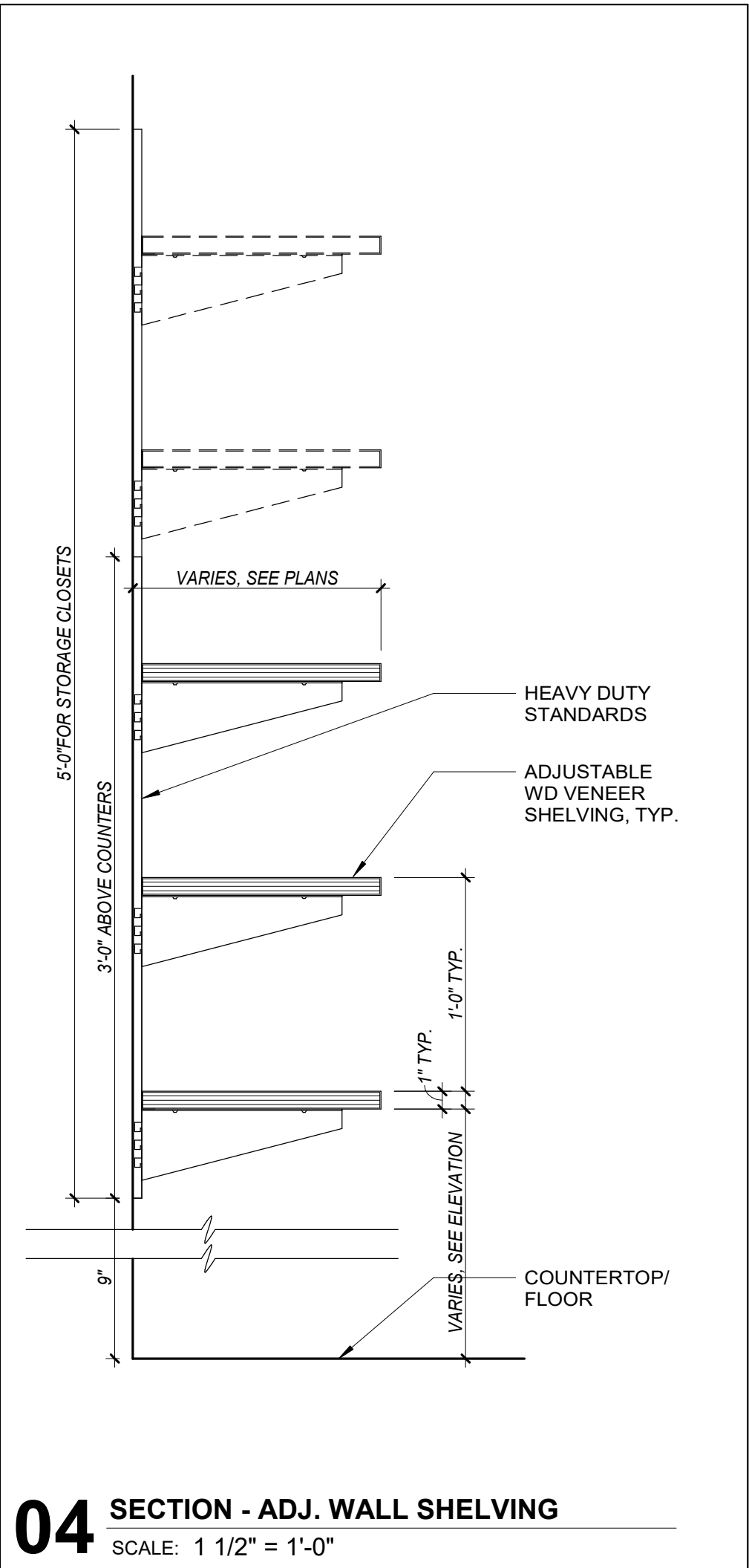
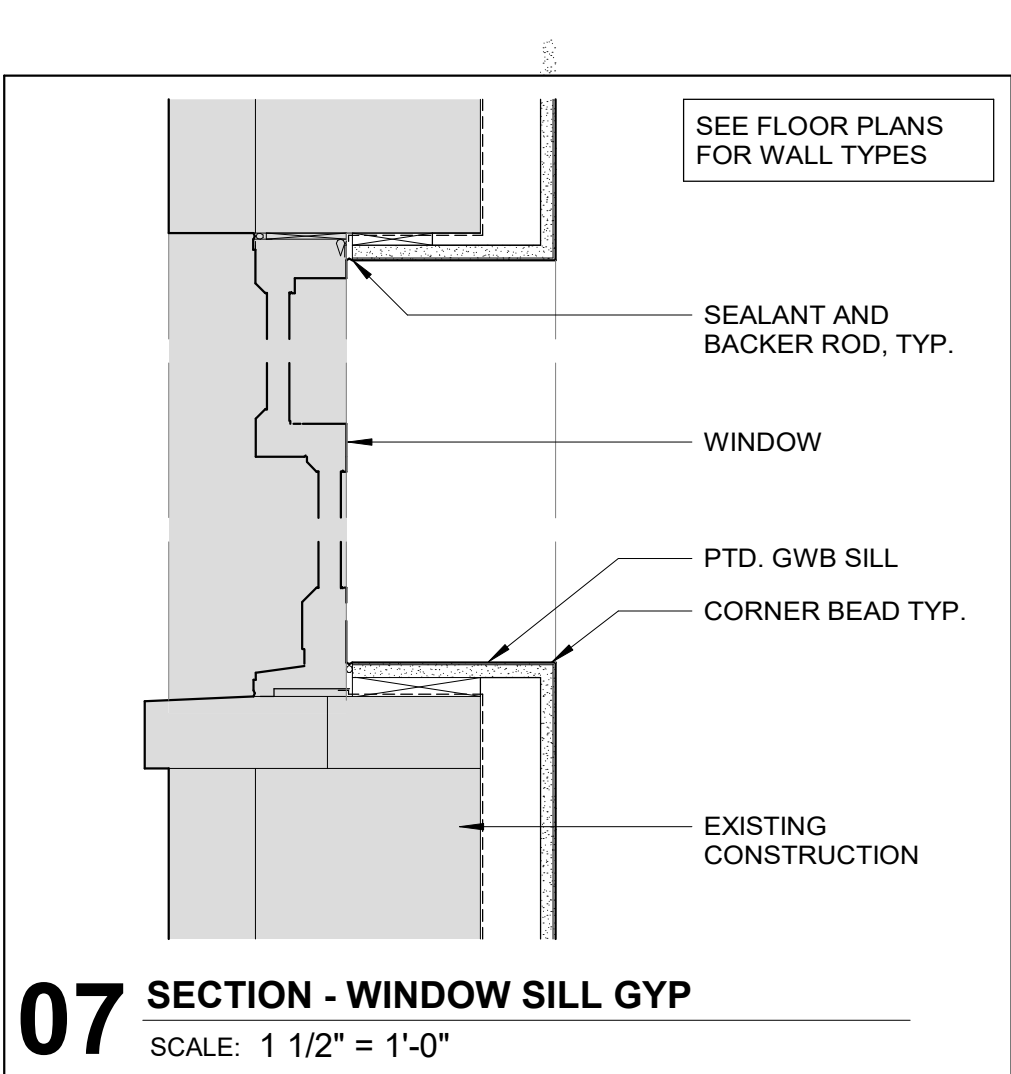
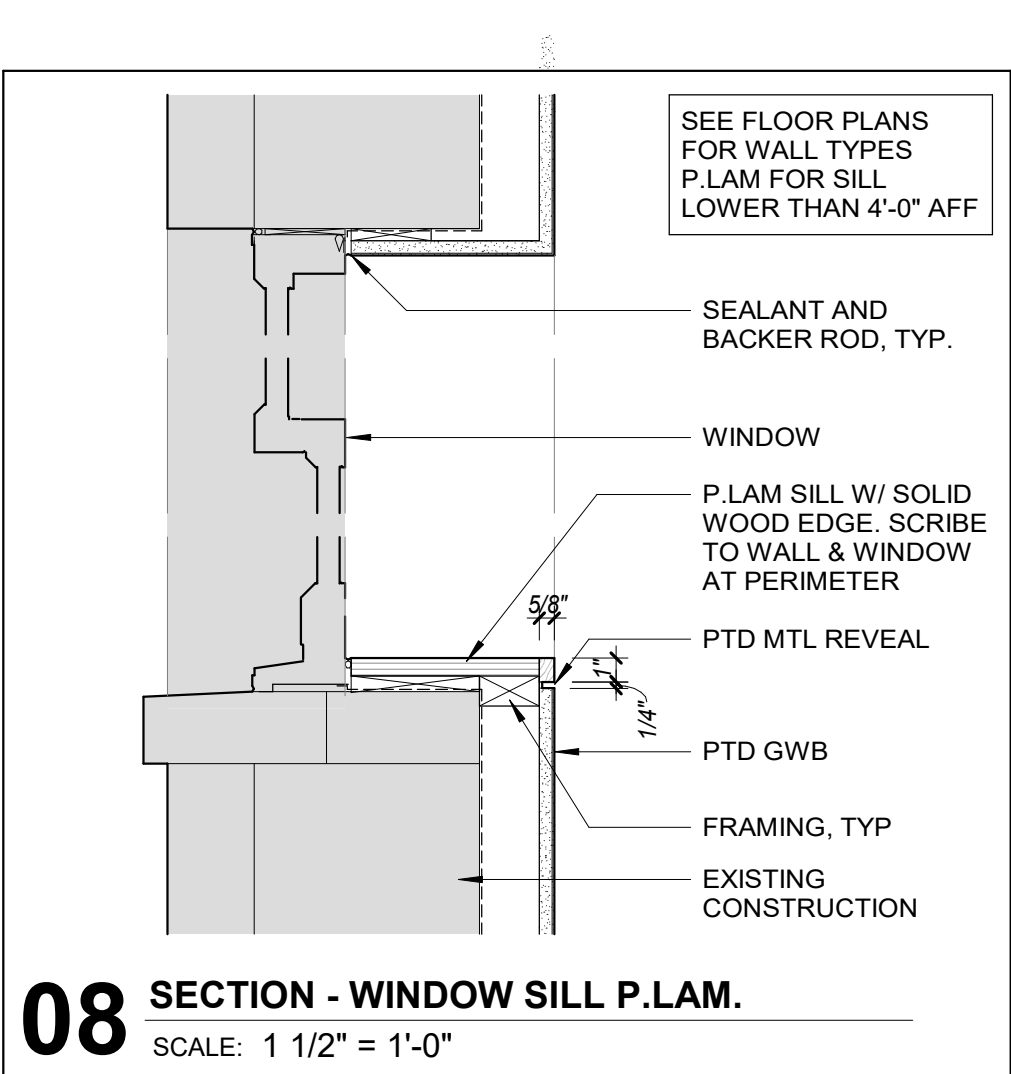
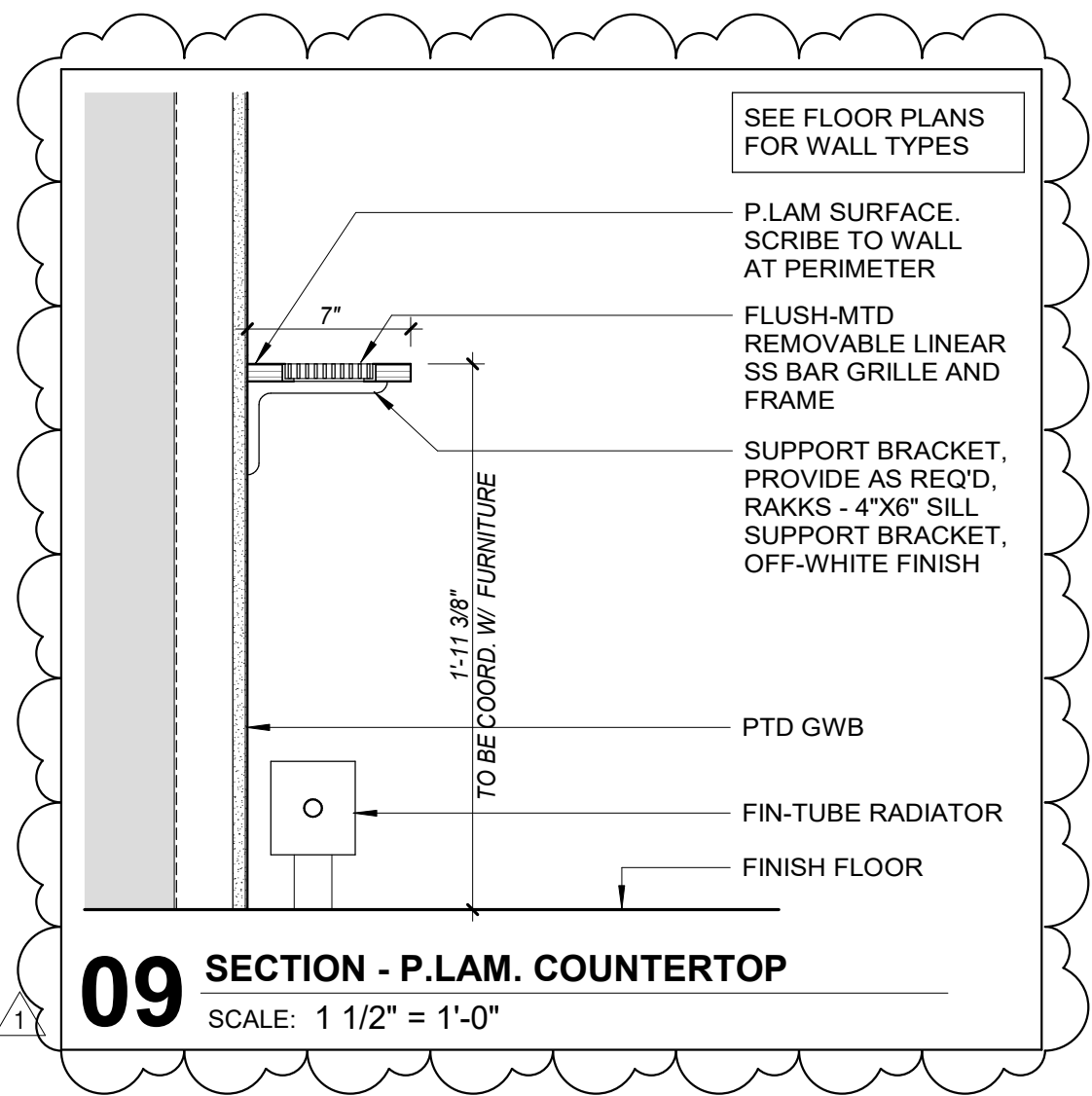
PROJECT NO: 240400

DATE: 01/31/2025

PHASE: 100% CD

SCALE: As indicated

A-730R



GENERAL

- THESE DRAWINGS REPRESENT THE COMPLETED PROJECT WHICH HAS BEEN DESIGNED FOR THE STRUCTURE SELF WEIGHT AND SUPERIMPOSED GRAVITY LOADS INDICATED IN THE DESIGN LOAD CRITERIA AND OTHER LOADS WHERE INDICATED IN THE DRAWINGS. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE STABILITY OF THE STRUCTURE AT ALL STAGES OF CONSTRUCTION UNTIL ERECTION IS COMPLETE.
- CONSTRUCTION LOADS AND SHORING:
 - CONSTRUCTION PHASE LOADS IMPOSED ON THE BASE BUILDING STRUCTURE AND TEMPORARY CONDITIONS INTENDED TO ACCOMMODATE CONSTRUCTION MEANS AND METHODS ARE NOT EXPLICITLY CONSIDERED IN THIS DESIGN. THE CONTRACTOR WILL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION-PHASE LOADS IMPOSED.
 - STRUCTURAL STABILITY IS ACHIEVED IN THE FINISHED CONSTRUCTION INSTALLED IN ITS ENTIRETY. THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE UNTIL THE CONSTRUCTION OF THE STRUCTURE REACHES ITS FINISHED STATE. NOT ALL SHORING NECESSARY TO COMPLETE THE PROJECT IS SHOWN. THE CONTRACTOR WILL IDENTIFY AND DETERMINE WHERE AND TO WHAT EXTENT TEMPORARY SHORING IS REQUIRED.
 - THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN, INSTALLATION, AND REMOVAL OF ALL TEMPORARY BRACING AND CONSTRUCTION SUPPORTS, FOR NEW AND EXISTING STRUCTURES, AS NECESSARY TO COMPLETE THE PROJECT.
 - MATERIALS AND EQUIPMENT WILL BE STORED AND TRANSPORTED IN A MANNER SO AS NOT TO EXCEED THE LESSER OF THE ALLOWABLE FLOOR LOADINGS INDICATED IN THE DRAWINGS OR PERMITTED BY THE CONTRACTOR PROVIDED CONSTRUCTION LOADING DESIGN.
 - THE CONTRACTOR WILL RETAIN A PROFESSIONAL ENGINEER LICENSED IN THE PROJECT JURISDICTION TO EVALUATE EXISTING STRUCTURAL AND FOUNDATION ELEMENTS FOR THEIR ABILITY TO SUPPORT PROPOSED CONSTRUCTION LOADS AND TO PROVIDE PROPER STRUCTURAL DESIGN OF SCAFFOLDING, FALSE WORK, STAGING, BRACING, SEQUENCING, SHEETING AND SHORING, ETC.
- DEVELOPING AND IMPLEMENTING JOB SITE SAFETY AND CONSTRUCTION PROCEDURES ARE SOLELY THE RESPONSIBILITY OF THE CONTRACTOR.
- ALL COSTS OF INVESTIGATION AND REDESIGN DUE TO CONTRACTOR MIS-LOCATION OF STRUCTURAL ELEMENTS OR OTHER LACK OF CONFORMANCE WITH THE CONSTRUCTION DOCUMENTS WILL BE AT THE CONTRACTOR'S EXPENSE. THE CONTRACTOR WILL REIMBURSE THE EOR FOR REVIEW OF NONCONFORMANCE, REDESIGN, AND ASSOCIATED WORK.
- CONTRACTOR TO REFER TO OTHER DISCIPLINES' DRAWINGS INCLUDING, BUT NOT LIMITED TO, ARCHITECTURAL, MECHANICAL, PLUMBING, AND ELECTRICAL DRAWINGS FOR SIZE AND LOCATION OF OPENINGS, SLEEVES, INSERTS, AND DEPRESSIONS.
- SEE ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR DETAILED INFORMATION REGARDING FINISHES, WATERPROOFING, FIREPROOFING, ETC.
- SEE ARCHITECTURAL DRAWINGS FOR LOCATIONS OF NON-LOAD BEARING PARTITIONS. PROVIDE DEFLECTION CONNECTIONS THAT ALLOW RELATIVE VERTICAL MOVEMENT BETWEEN PARTITION AND PRIMARY STRUCTURE AT THE HEADS OF ALL SUCH PARTITIONS (ALLOW MOVEMENT NOT LESS THAN 3/4 IN. UNLESS NOTED OTHERWISE). ATTACH AND DETAIL WALL SHEATHING AND OTHER CLADDING IN A MANNER THAT DOES NOT INHIBIT MOVEMENT. THE CONNECTIONS, UNLESS SHOWN ON THE DRAWINGS, ARE TO BE DESIGNED TO LATEROALLY BRACE THE TOPS OF THE WALLS FOR THE CODE REQUIRED LATERAL LOAD.
- IN CASE OF CONFLICT BETWEEN THE GENERAL NOTES AND DETAILS, THE MOST STRINGENT GOVERN.
- WORK IN SOME AREAS IS NOT EXPLICITLY DETAILED ON THE DRAWINGS BUT IS IMPLIED TO BE SIMILAR TO CORRESPONDING AREAS. WORK IN THESE AREAS BE THE SAME AS THAT SHOWN AT THE CORRESPONDING LOCATIONS.

SUBMITTALS

- SHOP DRAWINGS FOR ALL STRUCTURAL ELEMENTS SHOWN ON THE CONTRACT DOCUMENTS ARE REQUIRED TO BE SUBMITTED BY THE CONTRACTOR AND REVIEWED BY THE STRUCTURAL ENGINEER. IF A CONTRACTOR OR OWNER FAILS TO SUBMIT THE SHOP DRAWINGS, SIMPSON GUMPERTZ & HEGER INC., P.C. WILL NOT BE RESPONSIBLE FOR THE STRUCTURAL CERTIFICATION AND DESIGN OF THE PROJECT.
- UNAUTHORIZED REPRODUCTION OF ANY PORTION OF THE STRUCTURAL CONTRACT DRAWINGS FOR RE-SUBMITTAL AS SHOP DRAWINGS IS PROHIBITED. SHOP DRAWINGS PRODUCED IN SUCH A MANNER WILL BE REJECTED AND RETURNED.
- SHOP DRAWINGS WILL BE SUBMITTED ELECTRONICALLY IN PORTABLE DOCUMENT FORMAT (PDF). A MARKED-UP PDF COPY OF THE SHOP DRAWINGS WITH THE STRUCTURAL ENGINEER'S COMMENTS WILL BE RETURNED TO THE CONTRACTOR.
- ALLOW 10 BUSINESS DAYS FOR STRUCTURAL REVIEW OF SHOP DRAWINGS. THIS TIME SHOULD BE ALLOTTED IN THE CONTRACTOR'S SCHEDULE.
- SHOP DRAWINGS WILL BEAR THE CONTRACTOR'S STAMP OF APPROVAL WHICH WILL CONSTITUTE CERTIFICATION THAT THEY HAVE VERIFIED ALL FIELD MEASUREMENTS, CONSTRUCTION CRITERIA, MATERIALS, AND SIMILAR DATA AND HAVE CHECKED EACH DRAWING FOR COMPLETENESS, COORDINATION, AND COMPLIANCE WITH THE CONTRACT DOCUMENTS. SHOP DRAWINGS NOT REVIEWED BY THE CONTRACTOR WILL NOT BE REVIEWED BY SIMPSON GUMPERTZ & HEGER.
- CONTRACTOR WILL FURNISH DIMENSIONED SHOP DRAWINGS SHOWING LOCATIONS OF ALL SLEEVES AND OPENINGS REQUIRED BY ALL TRADES FOR REVIEW BY THE MEP, ARCHITECT, AND STRUCTURAL ENGINEER. THESE DRAWINGS WILL BE SUBMITTED FOR REVIEW A MINIMUM 21 DAYS PRIOR TO PLACEMENT OF THE SLEEVES AND OPENINGS.

SPECIFICATIONS

- THE WORK SHOWN ON THESE DRAWINGS ADDRESSES STRUCTURAL INFORMATION ONLY. THE STRUCTURAL DOCUMENTS INCLUDE THESE S-SERIES DRAWINGS AND GENERAL NOTES. THERE ARE NO TECHNICAL SPECIFICATIONS IN ADDITION TO THESE GENERAL NOTES.

ELEVATIONS AND DIMENSIONS

- ALL ELEVATIONS AND DIMENSIONS SHOWN FOR NEW CONSTRUCTION ARE BASED ON THE ARCHITECTURAL DRAWINGS. COORDINATE ALL ELEVATIONS AND DIMENSIONS BEFORE PROCEEDING WITH CONSTRUCTION.
- EXISTING BUILDING INFORMATION SHOWN IS BASED ON EXISTING BUILDING DRAWINGS, FIELD OBSERVATIONS, OR AS INDICATED ON THE ARCHITECTURAL DRAWINGS. THE INFORMATION SHOWN ON THESE DOCUMENTS IS THE BEST REPRESENTATION OF EXISTING CONDITIONS AVAILABLE TO THE ENGINEER. THE CONTRACTOR WILL VERIFY ALL EXISTING BUILDING INFORMATION SHOWN (DIMENSIONS, ELEVATIONS, ETC.) AND NOTIFY THE ARCHITECT AND STRUCTURAL ENGINEER OF ANY DISCREPANCIES PRIOR TO COMMENCING WORK. UPON RECEIPT OF THE SHOP DRAWINGS, THE ENGINEER HAS THE RIGHT TO ASSUME THAT ALL FIELD DIMENSIONS, ELEVATIONS, AND CONDITIONS HAVE BEEN VERIFIED BY THE CONTRACTOR AND THAT THE SHOP DRAWINGS ACCURATELY REFLECT SUCH VERIFICATIONS UNLESS STATED OTHERWISE IN THE SHOP DRAWINGS.

BUILDING CODE

- THE FOLLOWING BUILDING CODES AND STANDARDS, INCLUDING ALL SPECIFICATIONS REFERENCED WITHIN, WILL APPLY TO THE DESIGN, CONSTRUCTION, QUALITY CONTROL, AND SAFETY OF ALL WORK PERFORMED ON THE PROJECT.
 - "NEW YORK STATE BUILDING CODE 2020"
 - "INTERNATIONAL BUILDING CODE - 2018," INTERNATIONAL CODE COUNCIL, INCLUDING LOCAL JURISDICTION AMENDMENTS.
 - "INTERNATIONAL EXISTING BUILDING CODE - 2018," INTERNATIONAL CODE COUNCIL, INCLUDING LOCAL JURISDICTION AMENDMENTS.
 - "MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES," (ASCE/SEI 7 - 16, 2016), AMERICAN SOCIETY OF CIVIL ENGINEERS.
 - ADDITIONAL CODES AND STANDARDS FOR DIFFERENT MATERIALS ARE LISTED IN THE SECTIONS THAT FOLLOW.

DESIGN LOADS

- ROOF LIVE LOADS
 - UNIFORM MINIMUM LIVE LOAD: 30 PSF
 - CONCENTRATED ROOF LIVE LOAD: 300 LB
- SNOW LOAD - PLUS DRIFTING AND SLIDING WHERE APPLICABLE
 - GROUND SNOW LOAD, PG = 40 PSF
 - FLAT ROOF SNOW LOAD, PF = 34 PSF
 - EXPOSURE FACTOR, CE = 1
 - SNOW IMPORTANCE FACTOR, IS = 1.1
 - THERMAL FACTOR, CT = 1.1
 - SLOPE FACTOR, CS = 0.77
- WIND LOAD PARAMETERS
 - BASIC WIND SPEED (3-SECOND GUST), V = 116 MPH
 - RISK CATEGORY = III
 - EXPOSURE CATEGORY: B
 - EXISTING BUILDINGS: THE SCOPE OF WORK ON THIS PROJECT DOES NOT CHANGE THE DEMAND UPON NOR REDUCE THE RESISTANCE PROVIDED BY THE WIND FORCE RESISTING SYSTEMS (WFRS) BY MORE THAN 10%. BASED ON IBCB REQUIREMENTS, NO EVALUATION OR UPGRADE OF THE EXISTING WFRS HAS BEEN CONDUCTED.
- SEISMIC LOAD PARAMETERS
 - RISK CATEGORY = III
 - SEISMIC IMPORTANCE FACTOR, IE = 1.25
 - MAPPED SPECTRAL RESPONSE ACCELERATIONS
 - S(S1) = 0.119
 - S(1) = 0.045
 - SITE CLASS: D - DEFAULT (ASSUMED)
 - SPECTRAL RESPONSE COEFFICIENTS
 - S(DS) = 0.127
 - S(D1) = 0.073
 - SEISMIC DESIGN CATEGORY = B
 - EXISTING BUILDINGS: THE SCOPE OF WORK ON THIS PROJECT DOES NOT CHANGE THE SEISMIC DEMAND UPON NOR REDUCE THE RESISTANCE PROVIDED BY THE SEISMIC FORCE RESISTING SYSTEMS (SFRS) BY MORE THAN 10%. BASED ON IBCB REQUIREMENTS, NO EVALUATION OR UPGRADE OF THE EXISTING SFRS HAS BEEN CONDUCTED.

MASONRY

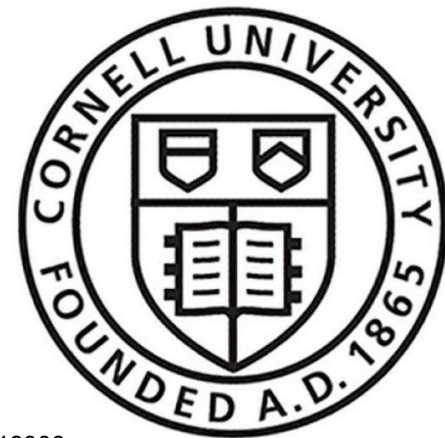
- CODES AND STANDARDS:
 - "BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES, TMS 402-16."
 - "SPECIFICATIONS FOR MASONRY STRUCTURES, TMS 602-16."
- MATERIALS:
 - LOAD BEARING CONCRETE MASONRY:
 - HOLLOW AND SOLID: ASTM C90
 - NORMAL WEIGHT
 - NET AREA COMPRESSIVE STRENGTH OF UNITS = 2000 PSI
 - COMPRESSIVE STRENGTH OF MASONRY, FM = 2000 PSI
 - HOLLOW UNITS TO BE TWO CORE TYPE
 - MORTAR: ASTM C270, TYPE S (CMU); TYPE N (BRICK)
 - GROUT: ASTM C476
 - MINIMUM COMPRESSIVE STRENGTH = 2000 PSI
 - HORIZONTAL JOINT REINF. ASTM A951
 - 9-GAUGE (W1.7) HOT-DIP GALVANIZED
 - TRUSS-TYPE FOR UNREINFORCED AND LADDER-TYPE FOR REINFORCED MASONRY
 - POTABLE WATER
 - SAND: ASTM C144
 - FINENESS MODULUS 2.0 TO 2.5
 - HYDRATED LIME: ASTM C207, TYPE I OR II
 - REINFORCING BARS: ASTM A615, GRADE 60
- GENERAL:
 - PROVIDE HORIZONTAL JOINT REINFORCEMENT AT 16 IN. O.C. PROVIDE ONE PIECE PREFABRICATED UNITS AT 8 IN. O.C. AT ALL WALL CORNERS AND INTERSECTIONS. LAP REINFORCEMENT A MINIMUM OF TWO CELLS.
 - PROVIDE MASONRY ANCHORS AT 16 IN. O.C. SET ON COURSING AND ATTACHED TO ALL BEAMS, COLUMNS, PARTITIONS, AND WALLS ABUTTING OR EMBEDDED IN MASONRY.
 - CORE DRILLING OF FOUNDATIONS, BEAMS, JOISTS, COLUMNS, OR ANY POST-TENSIONED MEMBER IS NOT PERMITTED UNLESS AUTHORIZED IN WRITING BY THE STRUCTURAL ENGINEER. AND WHERE OTHERWISE INDICATED. REINFORCE WITH (2) #4 MINIMUM HORIZONTAL REINFORCEMENT UNLESS NOTED OTHERWISE.
 - ALL PIERS AND PARTITIONS WILL BE BONDED OR ANCHORED TO ADJACENT MASONRY WALLS. PROVIDE TIES TO ADJACENT FLOOR AND ROOF CONSTRUCTION IN ACCORDANCE WITH DETAILS AND DRAWINGS.
 - IN MULTIPLE WYTHE WALLS (CAVITY AND COMPOSITE WALLS) BOND THE WYTHES TOGETHER WITH RIGID METAL TIES OR PREFABRICATED JOINT REINFORCEMENT CONFORMING TO ACI 530 / ASCE 5 REQUIREMENTS. COMPLETELY FILL ALL COLLAR JOINTS IN COMPOSITE WALLS WITH MORTAR OR GROUT.
 - IN GROUTED AND/OR REINFORCED MASONRY WALLS, USE MASONRY UNITS WITH CORES THAT ALIGN VERTICALLY TO PROVIDE CONTINUOUS UNOBSTRUCTED CELLS FOR GROUTING AND REINFORCING STEEL PLACEMENT.
 - LAP SPLICES FOR DEFORMED REINFORCING BARS USED IN MASONRY CONSTRUCTION WILL BE 50 BAR DIAMETERS.
 - ALL WALL SECTIONS AND PIERS LESS THAN 4 FEET SQUARE IN CROSS-SECTIONAL AREA TO BE FULLY GROUTED OR OF 100% SOLID MASONRY UNITS.
 - CONTRACTOR WILL PROVIDE ADEQUATE BRACING AND SUPPORT OF ALL MASONRY WORK UNTIL PERMANENT CONSTRUCTION IS IN PLACE AND GROUT HAS REACHED 75% OF DESIGN STRENGTH.
 - SEE DETAILS FOR GENERAL CONTROL JOINT REQUIREMENTS. JOINTS ARE TO BE CONSTRUCTED IN ALL WALLS AND PARTITIONS.
 - THE CONTRACTOR WILL VERIFY ALL OPENINGS BELOW LINTELS INDICATED ARE ADEQUATE TO ACCEPT DOOR FRAMES, LOUVERS, WINDOW FRAMES, ETC. AS SHOWN ON THE ARCHITECTURAL AND MECHANICAL DRAWINGS. NOTIFY THE ARCHITECT AND STRUCTURAL ENGINEER OF ANY DISCREPANCIES PRIOR TO LINTEL INSTALLATION.
 - NO OPENINGS WILL BE PLACED ABOVE ANY LINTEL WITHIN A HEIGHT LESS THAN OR EQUAL TO THE WIDTH OF THE CLEAR OPENING BELOW THE LINTEL, UNLESS DETAILED OR APPROVED BY THE STRUCTURAL ENGINEER.
 - SUBMIT SHOP DRAWINGS FOR ENGINEER'S APPROVAL INCLUDING COMPLETE BENDING AND PLACING DETAILS OF ALL REINFORCING STEEL INDICATING POSITION OF SPLICES AND LOCATION OF REINFORCEMENT AND GROUT IN THE MASONRY.
 - GROUT ALL REINFORCED (VERTICAL AND HORIZONTAL) CELLS AND UN-REINFORCED CELLS IF INDICATED.
- INSPECTION AND TESTING:
 - THE OWNER WILL ENGAGE A TESTING AGENCY TO PROVIDE SERVICES AS INDICATED IN THESE DRAWINGS AND SUBMIT REPORTS.

CONCRETE WORK

- CODES AND STANDARDS:
 - "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE, ACI 318-14," AMERICAN CONCRETE INSTITUTE.
 - "ACI MANUAL OF CONCRETE PRACTICE - PARTS 1 THROUGH 5," AMERICAN CONCRETE INSTITUTE.
- STANDARD SPECIFICATIONS AND REFERENCE STANDARDS:
 - "MANUAL OF STANDARD PRACTICE," CONCRETE REINFORCING STEEL INSTITUTE.
 - FOLLOW THE LATEST RECOMMENDATIONS AND SPECIFICATIONS OF THE AMERICAN CONCRETE INSTITUTE:
 - ACI 301 SPECIFICATIONS FOR STRUCTURAL CONCRETE
 - ACI 302 CONCRETE FLOOR AND SLAB CONSTRUCTION
 - ACI 304 MEASURING, MIXING, TRANSPORTING, AND PLACING CONCRETE
 - ACI 305 HOT WEATHER CONCRETING
 - ACI 306 COLD WEATHER CONCRETING
 - ACI 315 DETAILING REINFORCING STEEL
 - ACI 318 GENERAL DESIGN OF ITEMS NOT OTHERWISE SPECIFIED
 - ACI 347 FORMWORK
- CONCRETE MATERIALS:
 - CONCRETE MIX PROPERTIES
 - ELEMENT (NORMAL WEIGHT UNO) 28 DAY STRENGTH MAX W/C RATIO AIR CONTENT
 - SLAB-ON-GRADE 4,000 PSI 0.45 AS MIXED
 - PORTLAND CEMENT: ASTM C150, TYPE I, II, OR I/II.
 - BLENDED CEMENT: ASTM C595 OR ASTM C1157
 - FLY ASH: ASTM C618, TYPE C OR F
 - SLAG CEMENT: ASTM C989, GRADE 100
 - NORMAL WEIGHT AGGREGATES: ASTM C33
 - FINE AGGREGATE: FREE OF MATERIALS WITH DELETERIOUS REACTIVITY TO ALKALI IN CEMENT.
 - AIR-ENTRAINMENT: ASTM C260
 - SHRINKAGE REDUCING ADMIXTURE: ASTM C494 TYPE S
 - PRODUCTS:
 - SIKA CONTROL-40: AT DOSAGE INDICATED.
 - SIKA CONTROL-220 (PROPORTIONED TO ACHIEVE SHRINKAGE REDUCTION CONSISTENT WITH USE OF SIKA CONTROL-40 AT DOSAGE RATE INDICATED)
 - APPROVED EQUIVALENT
 - STEEL REINFORCEMENT:
 - DEFORMED REINFORCING BARS: ASTM A615 GRADE 60
 - EPOXY ADHESIVE FOR DOWELING INTO CONCRETE: HILTI HY 200 V3 SYSTEM (ESR-4668)
 - POST-INSTALLED DOWELS:
 - ADHESIVE SUBSTITUTIONS ARE NOT PERMITTED WITHOUT SUBSTITUTION REQUEST APPROVED BY THE EOR PRIOR TO USE.
 - REFER TO PLANS AND DETAILS FOR EMBEDMENT DEPTH REQUIREMENTS.
 - INSTALLATION PROCEDURES (DRILLING METHOD, HOLE CLEANING, ETC.) TO BE IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND THE RELEVANT ICC-ES ESR.
 - INSTALLERS TO BE TRAINED BY THE ADHESIVE MANUFACTURER'S REPRESENTATIVE PRIOR TO CONDUCTING DOWEL INSTALLATIONS. ALL INSTALLERS FOR DOWELS IN OVERHEAD, HORIZONTAL, AND UPWARDLY INCLINED APPLICATIONS WILL HAVE ACI/CRSI ADHESIVE ANCHOR INSTALLER CERTIFICATION OR EQUIVALENT PROGRAM APPROVED IN ADVANCE BY THE SER (REFER TO ACI 318 SECTIONS 17.8.8.2 AND 17.8.8.3).
 - CONCRETE COVER:
 - MILD REINFORCED CONCRETE
 - CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH: 3 IN.
 - CONCRETE EXPOSED TO EARTH OR WEATHER:
 - #5 BAR OR SMALLER 1 1/2 IN.
 - CONCRETE NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND:
 - SLABS, WALLS, AND JOISTS: #11 BAR OR SMALLER 3/4 IN.
 - GENERAL REQUIREMENTS:
 - EXISTING SURFACE TREATMENT: ROUGHEN ALL EXISTING CONCRETE SURFACES COMMON WITH NEW CONCRETE TO AMPLITUDE OF 1/4 IN.
 - CORES AND DRILLED FASTENERS:
 - DRILLED OR POWDER DRIVEN FASTENERS WILL BE PERMITTED WHEN PROVEN TO THE SATISFACTION OF THE STRUCTURAL ENGINEER THAT THE FASTENERS WILL NOT SPALL THE CONCRETE OR DAMAGE EXISTING REINFORCEMENT.
 - CORE DRILLING OF FOUNDATIONS, BEAMS, JOISTS, COLUMNS, OR ANY POST-TENSIONED MEMBER IS NOT PERMITTED UNLESS AUTHORIZED IN WRITING BY THE STRUCTURAL ENGINEER.
 - WHEN INSTALLING POST-INSTALLED FASTENERS, THE CONTRACTOR TO TAKE MEASURES TO AVOID DRILLING OR CUTTING OF ANY EXISTING REINFORCING AND DESTRUCTION OF CONCRETE. ALL FASTENERS TO BE INSTALLED PER THE RELEVANT ICC-ES ESR REPORT AND THE MANUFACTURER'S SPECIFICATIONS.
 - FLOOR SLABS TO BE FINISHED TO A MINIMUM FLATNESS F-NUMBER F(F)=20 AND A MINIMUM LEVELNESS F-NUMBER F(L)=15 IN ANY DIRECTION.
 - CURE UNFORMED CONCRETE SURFACES FOR A MINIMUM OF 7 DAYS FOLLOWING CONCRETE PLACEMENT IN ACCORDANCE WITH ACI 301. IF FORMWORK IS REMOVED PRIOR TO THE END OF THE CURING PERIOD, APPLY ANOTHER METHOD TO CURE THE PREVIOUSLY FORMED CONCRETE FOR THE REMAINDER OF THE CURING PERIOD.
 - MEMBRANES/FORMING CURING COMPOUNDS TO CONFORM WITH ASTM C309, TYPE 1. CURING COMPOUND TO BE REMOVED PRIOR TO PLACING ADHERED FINISHES, ROOFING, AND WATERPROOFING UNLESS MANUFACTURER CERTIFIES THAT CURING COMPOUND IS SUITABLE TO RECEIVE THOSE INSTALLATIONS.
 - CONCRETE QUANTITIES: THE CONCRETE SLABS TO BE FINISHED, WITHIN TOLERANCE AND FLOOR FLATNESS REQUIREMENTS, TO THE ELEVATIONS INDICATED ON THE DRAWINGS. THE CONCRETE FLOOR SURFACE TO BE LEVEL WITH MINIMUM THICKNESS AS SPECIFIED ON THE CONTRACT DOCUMENTS. CONTRACTOR TO PROVIDE ADDITIONAL CONCRETE, AT THEIR COST, AS REQUIRED TO ACHIEVE THIS FINISHED TOP OF SLAB ELEVATION.
 - LOADS GREATER THAN THE DESIGN LIVE LOADS CANNOT BE PLACED ON THE STRUCTURE. A CONCRETE STRUCTURE MAY NOT SUPPORT ITS DESIGN LIVE LOAD UNTIL IT HAS REACHED ITS SPECIFIED COMPRESSIVE STRENGTH. CONTRACTOR TO SUPPORT ADJACENT STRUCTURES, UTILITIES, AND EXCAVATIONS AS REQUIRED FOR COMPLETION OF WORK.
 - SPLICING AND PLACEMENT OF REINFORCEMENT:
 - REINFORCEMENT SPLICES ARE NOT PERMITTED EXCEPT AS DETAILED OR AUTHORIZED BY THE STRUCTURAL ENGINEER. MAKE BARS CONTINUOUS AROUND CORNERS. WHEN PERMITTED, SPLICES WILL BE MADE BY CONTACT TENSION LAP SPICE, UNLESS NOTED OTHERWISE.
 - SPLICE BARS AS SHOWN ON DRAWINGS BUT IN NO CASE LESS THAN 50 BAR DIAMETERS FOR SLABS.
 - REINFORCEMENT WELDING IS NOT PERMITTED UNLESS SPECIFICALLY DETAILED OR APPROVED IN WRITING BY THE STRUCTURAL ENGINEER.
 - PROVIDE #4 CHAIR BARS, HIGH CHAIRS, TIES, SLAB BOLSTERS, AND OTHER ACCESSORIES WHERE NOT SPECIFIED ON THE DRAWINGS IN ACCORDANCE WITH MANUAL OF STANDARD PRACTICE OR DETAILING REINFORCING CONCRETE STRUCTURES ACI 315 OR CRSI/WRSI MANUAL OF STANDARD PRACTICE. USE PLASTIC TIPS ON ALL CHAIRS PLACED ON THE CONCRETE FORMWORK.
 - PROVIDE PLASTIC TIPPED BOLSTERS AND CHAIRS AT ALL LOCATIONS WHERE THE CONCRETE SURFACE IS EXPOSED.
 - REINFORCEMENT SHOP DRAWINGS:
 - SUBMIT FOR APPROVAL, COMPLETE BENDING AND PLACING DETAILS OF ALL REINFORCEMENT, INDICATING POSITION OF SPLICES. INCLUDE ACCESSORY DRAWINGS.
 - CONSTRUCTION AND CONTRACTION JOINTS:
 - CONTRACTION JOINTS IN SLAB ON GRADE TO BE ARRANGED TO LIMIT MAXIMUM LENGTH BETWEEN JOINTS TO 20'-0" IN ANY DIRECTION. ALLOW A MINIMUM OF 48 HOURS TIME BETWEEN PLACEMENTS OF ADJACENT SECTIONS.
 - CONCRETE SLAB ON GRADE CONSTRUCTION:
 - CONCRETE SLAB-ON-GRADE WILL BE PLACED ON A 10 MIL. VAPOR-RETARDER OVER A 12" MIN. LAYER OF CLEAN, WELL-GRADED GRAVEL OR CRUSHED STONE, AND PROPERLY COMPACTED SUBGRADE. REFER TO PLANS FOR THICKNESS AND REINFORCEMENT.
 - INSPECTION AND TESTING:
 - THE OWNER WILL ENGAGE A QUALIFIED TESTING AGENCY TO PROVIDE SERVICES IN ACCORDANCE WITH THE LATEST EDITIONS OF ACI 311.6 AND ACI 311.7 AND AS INDICATED ON THESE DRAWINGS AND TO SUBMIT REPORTS.

STRUCTURAL STEEL & MISC. CARBON STEEL

- CODES AND STANDARDS:
 - "TITTY SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS," AISC 360-16, AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.
 - "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES," AISC 303-16, AMERICAN INSTITUTE OF STEEL CONSTRUCTION.
 - "SPECIFICATION FOR STRUCTURAL STAINLESS STEEL BUILDINGS," AISC 370-21, AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.
 - "CODE OF STANDARD PRACTICE FOR STRUCTURAL STAINLESS STEEL BUILDINGS," AISC 313-21, AMERICAN INSTITUTE OF STEEL CONSTRUCTION
 - "STRUCTURAL WELDING CODE - STEEL," AWS D1.1-2015, AMERICAN WELDING SOCIETY.
 - "SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS," RESEARCH COUNCIL FOR STRUCTURAL CONNECTIONS
 - "METAL BAR GRATING," NATIONAL ASSOCIATIONS OF ARCHITECTURAL METALS MANUFACTURERS.
- DESIGN GUIDES:
 - "STEEL CONSTRUCTION MANUAL," FIFTEENTH EDITION, AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.
 - "DESIGN GUIDE 27: STRUCTURAL STAINLESS STEEL," SECOND EDITION, AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC., 2022.
- STRUCTURAL SHAPES:
 - WIDE FLANGE SHAPES: ASTM A992
 - ANGLES, PLATES, AND CHANNELS: ASTM A36
 - RECTANGULAR TUBULAR SHS SHAPES: ASTM A500, GRADE C, Fy=50KSI
- FASTENERS AND CONNECTORS:
 - HIGH STRENGTH BOLTS: ASTM F3125 GRADE A325 OR F1852
 - WELDING ELECTRODES:
 - CONFORM TO AWS SPECIFICATIONS FOR ELECTRODES BASED ON WELDING PROCESS AND THE TYPE AND GRADE OF STEEL.
 - ET0XX ELECTRODES (MIN) FOR FILLET WELDS
 - USE 70 KSI LOW HYDROGEN ELECTRODES FOR WELDING TO EXISTING CONSTRUCTION.
- FABRICATION:
 - SHOP FABRICATE TO GREATEST EXTENT POSSIBLE BY WELDING, INCLUDING BEAM STIFFENERS, COLUMN CAPS AND BASES, HOLES, AND CONNECTIONS. SUBMIT COMPLETE SHOP DRAWINGS FROM FIELD DIMENSIONS FOR THE ARCHITECT'S APPROVAL OF ALL STRUCTURAL STEEL PRIOR TO FABRICATION.
 - PRIOR TO STARTING FABRICATION, CERTIFIED COPIES OF THE MILL TEST REPORTS WILL BE SUBMITTED TO THE STRUCTURAL ENGINEER FOR REVIEW.
- ERECTION:
 - PROVIDE BEARING PLATES AND WALL ANCHORS OR ANCHOR RODS FOR ALL BEAMS RESTING ON CONCRETE AND ALL OTHER NECESSARY CONNECTING HARDWARE. SET ANCHOR RODS USING TEMPLATE.
 - DO NOT FIELD CUT OR FIELD MODIFY ANY STRUCTURAL STEEL WITHOUT PRIOR WRITTEN APPROVAL BY THE STRUCTURAL ENGINEER FOR EACH SPECIFIC CASE.
 - THE GENERAL CONTRACTOR WILL NOTIFY THE STRUCTURAL ENGINEER OF ANY FABRICATION OR ERECTION ERRORS OR DEVIATIONS AND RECEIVE WRITTEN APPROVAL BEFORE ANY FIELD CORRECTIONS ARE MADE. GAS CUTTING TORCHES WILL NOT BE USED TO CORRECT FABRICATION ERRORS WITHIN THE STRUCTURAL ENGINEER'S JURISDICTION.
 - PERMANENT FRAMING AND FINAL CONNECTION DETAILS ARE SHOWN ON THE DRAWINGS. THE FABRICATOR AND ERECTOR ARE RESPONSIBLE FOR THE DESIGN OF TEMPORARY BRACING AND RECOMMEND ERECTION PROCEDURES.
- CONNECTIONS:
 - ALL SHOP AND FIELD CONNECTIONS WILL BE MADE WITH HIGH STRENGTH BOLTS OR WELDS. ALL HIGH STRENGTH BOLTS AND NUTS WILL BE CLEARLY MARKED AS REQUIRED BY AISC SPECIFICATION. CONNECTIONS MADE WITH UNMARKED BOLTS AND NUTS WILL BE REJECTED.
 - PROVIDE ACCESS FOR INSPECTION OF ALL SHOP AND FIELD CONNECTIONS FOR PROPER MATERIAL AND WORKMANSHIP.
 - CONTRACTOR NOTE: ALTERNATE CONNECTION DESIGNS WILL ONLY BE ALLOWED WITH PRIOR APPROVAL OF THE STRUCTURAL ENGINEER. IF SUCH APPROVAL IS GRANTED, ALL CONNECTIONS, SPLICES, AND ERECTION PIECES NOT IN ACCORDANCE WITH THE CONTRACT DOCUMENTS (FABRICATOR'S REDESIGN) WILL BE DESIGNED BY THE FABRICATOR'S ENGINEER REGISTERED IN THE PROJECT'S JURISDICTION. CALCULATIONS AND SHOP DRAWINGS WILL BE SUBMITTED BEARING THE ENGINEER'S SEAL AND SIGNATURE.
 - CONNECTIONS WILL BE SELECTED FOR REACTIONS AS SHOWN ON PLANS AND AS DETAILED AND SCHEDULED. CONNECTIONS WILL CONSIST OF AT LEAST (2) 3/4 IN. DIAMETER A325-N BOLTS OR WELDS DEVELOPING A MINIMUM OF 10,000 POUNDS (FACTORED). MINIMUM FILLET WELD SIZE IS 3/16 IN.
 - UNLESS DETAILED OTHERWISE, ALL A325 BOLTS WILL BE TIGHTENED TO THE "SNUG TIGHT" CONDITION DEFINED AS THE TIGHTNESS ATTAINED BY A FEW IMPACTS OF AN IMPACT WRENCH OR THE FULL EFFORT OF A PERSON USING AN ORDINARY SPUD WRENCH. THE SNUG TIGHT CONDITION MUST ENSURE THAT THE FULL PL OF THE CONNECTED MATERIALS HAVE BEEN BROUGHT INTO SNUG CONTACT.
 - WELDING ELECTRODES, WELDING PROCESS, MINIMUM PREHEAT, AND INTERPASS TEMPERATURES WILL BE IN ACCORDANCE WITH THE AISC AND AWS SPECIFICATIONS. ANY STRUCTURAL DAMAGE IN WELDING IS TO BE REPLACED OR REINFORCED AS ACCEPTABLE TO THE STRUCTURAL ENGINEER.
 - WELDERS WILL HAVE CURRENT EVIDENCE OF PASSING THE APPROPRIATE AWS QUALIFICATION TESTS. THE ENGINEER MAY REQUEST SUCH EVIDENCE AT ANY TIME DURING THE PROJECT.
- STEEL FINISH:
 - PAINT: SHOP PRIME FOR ALL STEEL NOT ENCASED IN CONCRETE, NOT FIELD WELDED, OR NOT FIREPROOFED. SEE ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR FINISH COAT REQUIREMENTS.
 - FABRICATOR'S STANDARD LEAD- AND CHROMATE-FREE, NONASPHALTIC, RUST-INHIBITING PRIMER COMPLYING WITH MP#79 AND COMPATIBLE WITH INTERMEDIATE AND TOPCOAT. COMPLY WITH DIVISION 09 SPECIFICATIONS.
 - SURFACE PREPARATION: CLEAN SURFACES TO BE PAINTED. REMOVE LOOSE RUST AND MILL SCALE AND SPATTER, SLAG, OR FLUX DEPOSITS. PREPARE SURFACES PER SSPC-SP3 "POWER TOOL CLEANING".
 - IMMEDIATELY AFTER SURFACE PREPARATION, APPLY PRIMER ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS AND AT RATE RECOMMENDED BY SSPC TO PROVIDE A DRY FILM THICKNESS OF NOT LESS THAN 1.5 MILS. USE PRIMING METHODS THAT RESULT IN FULL COVERAGE OF JOINTS, CORNERS, EDGES, AND EXPOSED SURFACES. STRIPE PAINT CORNERS, CREVICES, BOLTS, WELDS, AND SHARP EDGES. PPLY TWO COATS OF SHOP PAINT TO INACCESSIBLE SURFACES AFTER ASSEMBLY OR ERECTION. CHANGE COLOR OF SECOND COAT TO DISTINGUISH IT FROM THE FIRST.
 - AFTER INSTALLATION, PROMPTLY CLEAN, PREPARE, AND PRIME OR REPRIME FIELD CONNECTIONS, RUST SPOTS, AND ABRADED SURFACES OF PRIME-PAINTED JOISTS AND ACCESSORIES, BEARING PLATES, AND ABUTTING STRUCTURAL STEEL. CLEAN AND PREPARE SURFACES BY SSPC-SP 2 HAND-TOOL CLEANING OR SSPC-SP 3 POWER-TOOL CLEANING. APPLY A COMPATIBLE PRIMER OF SAME TYPE AS SHOP PRIMER USED ON ADJACENT SURFACES.
 - ALL STRUCTURAL STEEL THAT IS LOCATED IN EXTERIOR UNHEATED SPACES AND EXPOSED FOR AESTHETICS, INCLUDING STEEL DIRECTLY EXPOSED TO WEATHER, WILL BE POWER-TOOLED CLEANED AND PAINTED OR GALVANIZED ACCORDING TO DETAILS AND ARCHITECT'S SPECIFICATIONS.
 - HOT-DIPPED GALVANIZING: ASTM A123 / ASTM A153
 - GALVANIZING REPAIR/TOUCH-UP: ASTM A780
- INSPECTION AND TESTING:
 - THE OWNER WILL ENGAGE A TESTING AGENCY TO PROVIDE SERVICES AS INDICATED IN THESE DRAWINGS AND SUBMIT REPORTS.



18008

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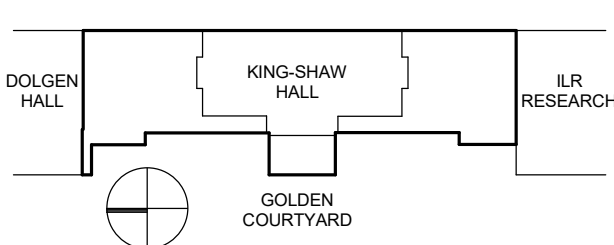


REVISONS

No.	Date	Description
1	04/29/25	ADDENDUM 03

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All dimensions and existing conditions shall be
checked & verified by the contractor before proceeding
with the work.

KEY PLAN



Project:

RENOVATE 2ND - 5TH
FLOOR AT
KING-SHAW HALL

Drawing Title:

GENERAL NOTES

PROJECT NO: 240400.00

DATE: 9/13/2025

PHASE: 100% CD

SCALE: As Indicated

S001R

STATEMENT OF SPECIAL INSPECTIONS	
LOCATION	140 GARDEN AVE, ITHACA, NY 14853
OWNER	CORNELL UNIVERSITY
DESIGN PROFESSIONAL IN CHARGE	MICHAEL TECCI, PE
This Statement of Special Inspections is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the International Building Code 2018 (IBC). It includes a schedule of Special Inspection services applicable to this project as well as the name of the Special Inspection coordinator and the identity of other approved agencies to be retained for conducting these inspections and tests. This Statement of Special Inspections encompasses the following disciplines: STRUCTURAL. The Special Inspection Coordinator shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge (RDP). Discovered discrepancies shall be brought to the immediate attention of the contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the RDP. The Special Inspection program does not relieve the contractor of his or her responsibilities for quality assurance.	
Interim reports shall be submitted to the Building Official and the RDP.	
A Final Report of Special Inspections documenting completion of all required Special Inspections, testing, and correction of any discrepancies noted in the inspections shall be submitted by the Special Inspection Coordinator prior to issuance of a Certificate of Use and Occupancy.	
Job site safety and means and methods of construction are solely the responsibility of the contractor.	
Interim reports shall be submitted monthly.	
In accordance with IBC 2018, the Observations and Inspections listed below are not required.	
**ENGR NOTE: SPECIFIC SECTIONS, AND THEIR SUBSECTIONS, MAY NOT APPLY TO A PROJECT AND MAY BE LISTED IN THE SPACE ABOVE. REVIEW PORTIONS OF SECTIONS 1704.6, 1705.11, 1705.12, AND OTHERS THAT MAY NOT APPLY DUE TO PROJECT WIND SPEED, EXPOSURE CATEGORY, SDC, OR OTHER PROJECT BASED CRITERIA. COORDINATE WITH PIC.	

SCHEDULE OF INSPECTION AND TESTING AGENCIES				
SPECIAL INSPECTION AGENCIES	FIRM	ADDRESS	TELEPHONE #	
Special Inspection Coordinator	TBD			
Inspector	TBD			
Geotechnical Engineer	NA			

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner's Agent in accordance with Section 1704.2 the 2018 International Building Code (IBC 2018), and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official prior to commencing work. ENGR NOTE: Some federal projects require that the special inspector be retained by the contractor. Verify proctect requirements w/ PM & owner

STATEMENT OF CONTRACTOR'S RESPONSIBILITY	
In accordance with IBC 2018 Section 1704.4, each contractor responsible for the construction or fabrication of a main wind-force resisting system or a seismic-force-resisting system or a wind- or seismic-resisting component listed in the statement of special inspections above must submit a Statement of Responsibility to the Structural Engineer of Record, the building official and the owner prior to commencement of work on the system. The contractor's statement of responsibility shall contain acknowledgement of awareness of the special requirements contained in the statement of special inspections.	

QUALIFICATIONS OF INSPECTORS AND TESTING TECHNICIANS	
The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Building Official. The credentials of all inspectors and testing technicians shall be provided.	
Key for Minimum Qualifications of Inspection Agents:	
When the Registered Design Professional in Responsible Charge deems it appropriate that the individual performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the Agency Number on the Schedule.	

PE/SE	Structural Engineer – a licensed PE specializing in the design of building structures
PE/GE	Geotechnical Engineer – a licensed PE specializing in soil mechanics and foundations
EIT	Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination
AMERICAN CONCRETE INSTITUTE (ACI) CERTIFICATION	
ACI-CFTT	Concrete Field Testing Technician – Grade 1
ACI-CCSI	Concrete Construction Special Inspector
ACI-LTT	Laboratory Testing Technician – Grade 1&2
ACI-STT	Strength Testing Technician
AMERICAN WELDING SOCIETY (AWS) CERTIFICATION	
AWS-CWI	Certified Welding Inspector
AWS/AISC-SSI	Certified Structural Steel Inspector
INTERNATIONAL CODE COUNCIL (ICC) CERTIFICATION	
ICC-SMSI	Structural Masonry Special Inspector
ICC-SWSI	Structural Steel and Welding Special Inspector
ICC-SFSI	Spray-Applied Fireproofing Special Inspector
ICC-PCSI	Prestressed Concrete Special Inspector
ICC-RCSI	Reinforced Concrete Special Inspector
NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES (NICET)	
NICET-CT	Concrete Technician – Levels I, II, III & IV
NICET-ST	Soils Technician - Levels I, II, III & IV
NICET-GET	Geotechnical Engineering Technician - Levels I, II, III & IV

REFERENCES	
CODE/STANDARD	TITLE
ACI 301-16	Standard Specifications for Structural Concrete.
ACI 318-14	Building Code Requirements for Structural Concrete
TMS402-16/TMS 602-16	Specifications for Masonry Structures
AISC 360-16	Specification for Structural Steel Buildings
ASTM A6-14	Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use.
ASTM A568-14	Specification for Steel Sheet, Carbon and High-Strength, Low-Alloy, Hot-Rolled and Cold Rolled, General Requirements For
ASTM C31-15	Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C94-15	Specification for Ready-Mixed Concrete
ASTM C109-16	Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50 mm Cube Specimens)
ASTM C138-17	Test Method for Unit Weight, Yield and Air Content (Gravimetric) of Concrete
ASTM C143-17	Test Method for Slump of Hydraulic Cement Concrete.
ASTM C172-14	Practice for Sampling Freshly Mixed Concrete
ASTM C173-16	Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
ASTM C231-17	Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C567-14	Test Method for Unit Weight of Structural Lightweight Concrete
ASTM C1064-17	Test Method for Temperature of Freshly Mixed Portland Cement Concrete
ASTM C1090-15	Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic Cement Grout
ASTM C1314-18	Test Method for Constructing and Testing Masonry Prisms Used to Determine Compliance with Specified Compressive Strength of Masonry
AWS D1.1-2015	Structural Welding Code – Steel.
APPLICABLE BUILDING CODE	
RCSC-2014	Specification for Structural Joints Using High Strength Bolts

IBC 2018 SECTION 1705.2.1, AISC 360-16, CHAPTER N REQUIRED SPECIAL INSPECTIONS AND TESTS OF STRUCTURAL STEEL ELEMENTS				
Structural Steel inspections listed below are based on the requirements of AISC 360-16 Chapter N "Quality Control and Quality Assurance." Quality Assurance inspections of structural steel fabricators are not required if the fabricator is registered and approved in accordance with IBC Section 1704.2.5.1 to perform such work without Special Inspections, provides evidence of approval (such as an appropriate AISC Certification), and submits a certificate of compliance to the owner or the owner's authorized agent for submittal to the building official as specified in Section 1704.5 stating that the work was performed in accordance with the approved construction documents.				
Inspector Qualifications	Welding inspectors shall have the AWS-CWI credential			
	Bolting and Framing inspectors shall have the ICC-SWSI credential or shall provide documented training and experience in structural steel inspection			
Verification and Inspection Tasks		QC	QA	AISC 360-16 Reference
General	Inspection of fabricators & steel fabrication process	-	P	IBC 1704.2.5
	Document acceptance or rejection of inspected items	P	P	N7
	Welder qualification records and continuity records	P	O	Table N5.4-1
	Welding procedure specifications (WPSs) available	P	P	Table N5.4-1
	Manufacturer certifications for welding consumables available	P	P	Table N5.4-1
	Material identification (type/grade)	O	O	Table N5.4-1
	Welder identification system (1)	O	O	Table N5.4-1
Prior to Welding	Fit-up of groove welds (including joint geometry) - Joint preparations - Dimensions (alignment, root opening, root face, bevel) - Cleanliness (condition of steel surfaces) - Tacking (tack weld quality and locations) - Baking type and fit (if applicable)	O	O	Table N5.4-1
	Fit-up of CJP welds groove welds of HSS T-, Y- and K-joints without backing (including joint geometry) - Joint preparations - Dimensions (alignment, root opening, root face, bevel) - Cleanliness (condition of steel surfaces) - Tacking (tack weld quality and locations)	P	O	
	Configuration and finish of access holes	O	O	Table N5.4-1
	Fit-up of fillet welds - Dimensions (alignment, gaps at root) - Cleanliness (condition of steel surfaces) - Tacking (tack weld quality and locations)	O	O	Table N5.4-1
	Check welding equipment	O	-	Table N5.4-1
	Control and handling of welding consumables - Packaging - Exposure control	O	O	Table N5.4-2
	No welding over cracked tack welds	O	O	Table N5.4-2
During Welding	Environmental conditions - Wind speed within limits - Precipitation and temperature	O	O	Table N5.4-2
	WPS Followed - Settings on welding equipment - Travel speed - Selecting welding materials - Shielding gas type/flow rate - Preheat applied - Interpass temperature maintained (min./max) - Proper position (F,V,H,OH)	O	O	Table N5.4-2
	Welding techniques - Interpass and final cleaning - Each pass within profile limitations - Each pass meets quality requirements	O	O	Table N5.4-2
	Placement and installation of steel headed stud anchors	P	P	Table N5.4-2
	Welds cleaned	O	O	Table N5.4-3
	Size, length and location of welds are in compliance with the construction documents	P	P	Table N5.4-3
	Welds meet visual acceptance criteria - Crack prohibition - Weld/base-metal fusion - Crater cross section - Weld profiles - Weld size - Undercut - Porosity	P	P	Table N5.4-3
After Welding	Arc strikes	P	P	Table N5.4-3
	k-area (2)	P	P	Table N5.4-3
	Weld access holes in rolled heavy shapes and built-up heavy shapes (3)			
	Backing removed and weld tabs removed (if required)	P	P	Table N5.4-3
	Repair activities	P	P	Table N5.4-3
	Document acceptance or rejection of welded joint or member	P	P	Table N5.4-3
	No prohibited welds have been added without the approval of the EOR	O	O	
Prior to Bolting	Manufacturer's certifications available for fastener materials	O	P	Table N5.6-1
	Fasteners marked in accordance with ASTM requirements	O	O	Table N5.6-1
	Proper fasteners selected for the joint detail (grade, type, bolt length if threads are to be excluded from shear plane)	O	O	Table N5.6-1
	Correct bolting procedure selected for joint detail	O	O	Table N5.6-1
	Connecting elements, including the appropriate faying surface condition and hole preparation, if specified, meet applicable requirements	O	O	Table N5.6-1
	Pre-installation verification testing by installation personnel observed and documented for fastener assemblies and methods used	P	O	Table N5.6-1
	Proper storage provided for bolts, nuts, washers and other fastener components	O	O	Table N5.6-1
During Bolting	Fastener assemblies placed in all holes and washers and nuts are positioned as required.	O	O	Table N5.6-2
	Joint brought to the snug-tight condition prior to the pretensioning operation	O	O	Table N5.6-2
	Fastener component not turned by the wrench prevented from rotating	O	O	Table N5.6-2
	Fasteners are pretensioned in accordance with the RCSC Specification progressing systematically from the most rigid point to the free edges	O	O	Table N5.6-2
	Document acceptance or rejection of bolted connections	P	P	Table N5.6-3
	Exposed cut surfaces of galvanized structural steel main members and exposed corners of rectangular HSS shall be visually inspected for cracks subsequent to galvanizing. Cracks shall be repaired or the member shall be rejected.	P	-	N5.7
	The fabricator's QCI shall inspect the fabricated steel to verify compliance with the details shown on the shop drawings, such as the proper application of joint details at each connection	P	-	N5.8
Other Inspection Tasks - QCI	The erector's QCI shall inspect the erected steel frame to verify compliance with the details shown on the erection drawings, such as braces, stiffeners, member locations, and proper application of joint details at each connection	P	-	N5.8
	The QAI shall be on the premises for inspection during the placement of anchor rods and other embedments supporting structural steel for compliance with the construction documents. As a minimum, the diameter, grade, type and length of the anchor rod or embedded item, and the extent or depth of embedment into the concrete, shall be verified prior to placement of concrete	-	P	N5.8
	Inspect the fabricated steel or erected steel frame, as applicable, to verify compliance with the details shown on the construction documents, such as braces, stiffeners, member locations, and proper application of joint details at each connection	-	P	N5.8
Welding Inspection	All NDT performed shall be documented. For shop fabrication, the NDT report shall identify the tested weld by piece mark and location in the piece. For field work, the NDT report shall identify the tested weld by location in the structure, piece mark, and location in the piece.			
	When a weld is rejected on the basis of NDT, the NDT record shall indicate the location of the defect and the basis of rejection.	P	P	N5.5
	Where the fabricator's QC staff performs the NDT in the shop, the Special Inspector shall review the reports.			
	Test 100% of complete-joint-penetration (CJP) groove welds, multi-pass fillet welds, and single-pass fillet welds greater than 5/16"	-	P	N5.5
	Test 100% of all re-made welds	-	P	N5.5
Non-Destructive Testing (NDT)				

(1) The fabricator or erector, as applicable, shall maintain a system by which a welder who has welded a joint or member can be identified. Stamps, if used, shall be the low-stress type.
(2) When welding of double flanges, or stiffeners has been performed in the k-area, visually inspect the web k-area for cracks within 3 in. of the weld.
(3) After rolled heavy shapes (see Section A3.3) and built-up heavy shapes (see Section A3.1d) are welded, visually inspect the weld access hole for cracks.

TMS602-16 TABLE 3 MINIMUM VERIFICATION REQUIREMENTS FOR MASONRY CONSTRUCTION		
MINIMUM SPECIAL INSPECTION		
Minimum Verification	Required for Quality Assurance(a)	Reference for Criteria
	Level 2	TMS 602
Prior to construction, verification of compliance of submittals.	R	Art. 1.5
Prior to construction, verification of fm and fAAC, except where specifically exempted by the Code.	R	Art. 1.4B
During Construction, verification of Slump flow and Visual Stability Index (VSI) when self-consolidating grout is delivered to the project site.	R	Art. 1.5 & 1.6.3
During construction, verification of fm and fAACc for every 5,000 sq. ft. (465 sq. m)	NR	Art. 1.4B
During construction, verification of proportions of materials as delivered to the project site for premixed or preblended mortar, prestressing grout, and grout other than self-consolidating grout.	NR	Art. 1.4B

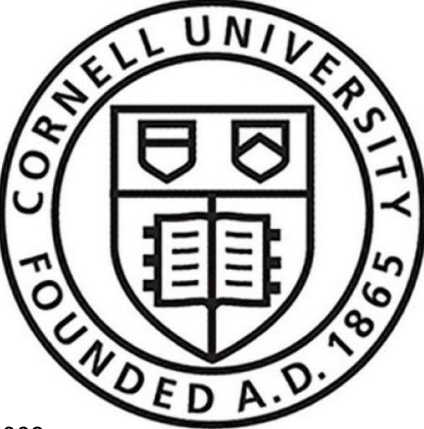
(a.) R=Required, NR=Not Required

TMS602-16 TABLE 4 MINIMUM SPECIAL INSPECTION REQUIREMENTS FOR MASONRY CONSTRUCTION			
MINIMUM SPECIAL INSPECTION			
Inspection Task	Frequency(a.)	Reference for Criteria	
	Level 2	TMS 402	TMS 602
1. As masonry construction begins, verify that the following are in compliance:			
a. Proportions of site-prepared mortar	P	—	Art. 2.1, 2.6 A, 2.6 C
b. Grade and size of prestressing tendons and anchorages	P	—	Art. 2.4 B, 2.4 H
c. Grade, type and size of reinforcement, connectors, anchor bolts, and prestressing tendons and anchorages	P	—	Art. 3.4, 3.6 A
d. Prestressing technique	P	—	Art. 3.6 B
e. Properties of thin-bed mortar for AAC masonry	C(b)/P(c)	—	Art. 2.1 C.1
f. Sample panel construction	P	—	Art. 1.6 D
3. Prior to grouting, verify that the following are in compliance:			
a. Grout space	P	—	Art. 3.2 D, 3.2 F
b. Placement of prestressing tendons and anchorages	P	Sec. 10.8, 10.9	Art. 2.4, 3.6
c. Placement of reinforcement, connectors, and anchor bolts	P	Sec. 6.1, 6.3.1, 6.3.6, 6.3.7	Art. 3.2 E, 3.4
d. Proportions of site-prepared grout and prestressing grout for bonded tendons	P	—	Art. 2.6 B, 2.4 G.1.b
3. Verify compliance of the following during construction:			
a. Materials and procedures with the approved submittals	P		Art. 1.5
b. Placement of masonry units and mortar joint construction	P		Art. 3.3 B
c. Size and location of structural members	P	—	Art. 3.3 F
d. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction.	P	Sec. 1.2.1 (e), 6.2.1, & 6.3.1	—
e. Welding of reinforcement	C	Sec. 6.1.6,1.2	—
f. Preparation, construction, and protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F).	P	—	Art. 1.8 C, 1.8 D
g. Application and measurement of prestressing force.	C	—	Art. 3.6 B
h. Placement of grout and prestressing grout for bonded tendons is in compliance	C	—	Art. 3.5, 3.6 C
i. Placement of AAC masonry units and construction of thin-bed mortar joints	C(b)/P(c)	—	Art. 3.3 B.9, 3.3 F.1.b
4. Observe preparation of grout specimens, mortar specimens, and/or prisms	P	—	Art. 1.4 B.2.a.3, 1.4 B.2.b.3, 1.4 B.2.c.3, 1.4 B.3, 1.4 B.4

(a.) Frequency refers to the frequency of inspection, which may be continuous during the task listed or periodically during the listed task, as defined in the table. NR=Not Required, P=periodic, C=continuous
(b.) Required for the first 5000 square feet of AAC masonry
(c.) Required after the first 5000 square feet of AAC masonry

IBC 2018 TABLE 1705.3 REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION				
TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD (a.)	IBC REFERENCE
1. Inspect reinforcement, including prestressing tendons, and verify placement.	—	X	ACI 318 Ch. 20, 25.2, 25.3, 26.6.1-26.6.3	1908.4
2. Reinforcing bar welding:				
a. Verify weldability of reinforcing bars other than ASTM A 706;	—	X	AWS D1.4, ACI 318: 26.6.4	—
b. Inspect single-pass fillet welds, maximum 5/16"; and	—	X		
c. Inspect all other welds.	X	—		
3. Inspect anchors cast in concrete	—	X	ACI 318: 17.8.2	—
4. Inspect anchors post-installed in hardened concrete members (b.).				
a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads.	X	—	ACI 318: 17.8.2.4	—
b. Mechanical anchors and adhesive anchors not defined in 4.a.	—	X	ACI 318: 17.8.2	—
5. Verify use of required design mix.	—	X	ACI 318: Ch. 19, 26.4.3, 26.4.4	1904.1, 1904.2, 1908.2, 1908.3
6. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	X	—	ASTM C 172, ASTM C 31, ACI 318: 26.5, 26.12	1908.10
7. Inspect concrete and shotcrete placement for proper application techniques.	X	—	ACI 318: 26.5	1908.6, 1908.7, 1908.8
8. Verify maintenance of specified curing temperature and techniques.	—	X	ACI 318: 26.5.3-26.5.5	1908.9
9. Inspect prestressed concrete for:				
a. Application of prestressing forces; and	X	—	ACI 318: 26.10	—
b. Grouting of bonded prestressing tendons.	X	—		
10. Inspect erection of precast concrete members.	—	X	ACI 318: Ch. 26.9	—
11. Verify in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	—	X	ACI 318: 26.11.2	—
12. Inspect formwork for shape, location and dimensions of the concrete member being formed.	—	X	ACI 318: 26.11.1,2(b)	—

(a.) Where applicable, see also Section 1705.12, Special Inspections for seismic Resistance
(b.) Specific Requirements for special inspection shall be included in the research report for the anchor issued by an approved source in accordance with 17.8.2 in ACI 318, or other qualification procedures. Where specific requirements are not provided, special inspection requirements shall be specified by the registered design professional and shall be approved by the building official prior to the commencement of the work.



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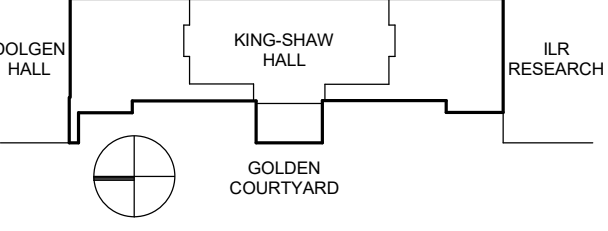
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4/25/25



REVISIONS		
No.	Date	Description
1	04/29/25	ADDENDUM 03

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All dimensions and existing conditions shall be checked & verified by the contractor before proceeding with the work.

KEY PLAN GARDEN AVENUE



Project:

RENOVATE 2ND - 5TH FLOOR AT KING-SHAW HALL

Drawing Title:

SPECIAL INSPECTIONS - IBC 2018

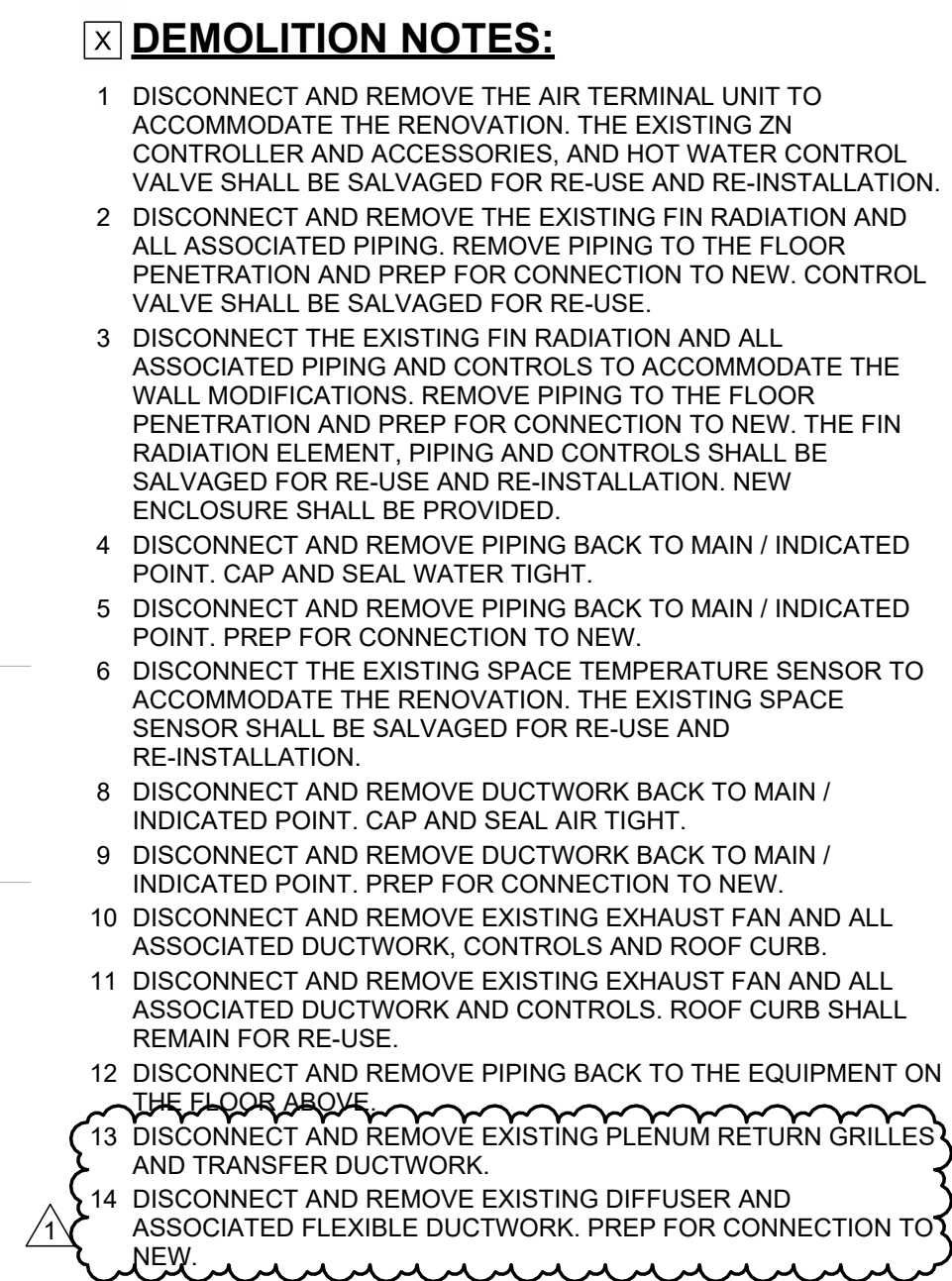
PROJECT NO: 240406.00	DATE: 9/13/2025
PHASE: 100% CD	SCALE: As Indicated

S002R

CONTROLS SCHEMATIC SYMBOL LIST			
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	BINARY INPUT (GENERAL)		SINGLE POINT SENSOR
	BINARY OUTPUT (GENERAL)		CURRENT TRANSDUCER
	ANALOG INPUT (GENERAL)		ELECTRIC/PNEUMATIC TRANSDUCER
	ANALOG OUTPUT (GENERAL)		ELECTRONIC/ELECTRIC TRANSDUCER
	BINARY POINT		ELECTRICAL INTERFACE
	ANALOG POINT		START/STOP
	BINARY VALUE		OPEN/CLOSE
	BINARY INPUT		ENABLE/DISABLE
	BINARY OUTPUT		HARD WIRE INTERFACE
	ANALOG INPUT		ALARM
	ANALOG OUTPUT		ELECTRIC ACTUATOR
	FREEZE-STAT		FREEZE-STAT
	HUMIDIFIER		HUMIDIFIER
	HUMIDIFIER DISPERSION GRID		HUMIDIFIER DISPERSION GRID
	RELAY		RELAY
	STATUS		STATUS
	FLOW METER		FLOW METER
	MOTOR		MOTOR
	BTU ENERGY METER		BTU ENERGY METER
	AIR FLOW MEASURING STATION		AIR FLOW MEASURING STATION
	AVERAGING SENSOR		AVERAGING SENSOR
	HUMIDITY SENSOR (DUCT MOUNTED)		HUMIDITY SENSOR (DUCT MOUNTED)
	TEMPERATURE SENSOR (DUCT OR PIPE MOUNTED)		TEMPERATURE SENSOR (DUCT OR PIPE MOUNTED)
	CARBON DIOXIDE SENSOR (DUCT MOUNTED)		CARBON DIOXIDE SENSOR (DUCT MOUNTED)
	CARBON MONOXIDE SENSOR (DUCT MOUNTED)		CARBON MONOXIDE SENSOR (DUCT MOUNTED)
	SPACE SENSOR WITH SETPOINT ADJUSTMENT		SPACE SENSOR WITH SETPOINT ADJUSTMENT
	SPACE SENSOR WITH OCCUPANCY OVERRIDE		SPACE SENSOR WITH OCCUPANCY OVERRIDE
	SPACE SENSOR WITH VISUAL DISPLAY		SPACE SENSOR WITH VISUAL DISPLAY
	SPACE SENSOR WITH FAN ON/OFF SWITCH		SPACE SENSOR WITH FAN ON/OFF SWITCH
	ROOM TEMPERATURE SENSOR WITH SETPOINT ADJUSTMENT		ROOM TEMPERATURE SENSOR WITH SETPOINT ADJUSTMENT
	ROOM TEMPERATURE SENSOR WITH OCCUPANCY OVERRIDE		ROOM TEMPERATURE SENSOR WITH OCCUPANCY OVERRIDE
	ROOM TEMPERATURE SENSOR WITH VISUAL DISPLAY		ROOM TEMPERATURE SENSOR WITH VISUAL DISPLAY
	ROOM TEMPERATURE SENSOR WITH FAN ON/OFF SWITCH		ROOM TEMPERATURE SENSOR WITH FAN ON/OFF SWITCH
	OCCUPANCY SENSOR		OCCUPANCY SENSOR
	MOISTURE SENSOR		MOISTURE SENSOR
	PROBE SENSOR		PROBE SENSOR
	FLOW SENSOR		FLOW SENSOR
	FLOW SWITCH		FLOW SWITCH
	END SWITCH		END SWITCH
	MANUAL SWITCH		MANUAL SWITCH
	PRESSURE SWITCH		PRESSURE SWITCH
	DIFFERENTIAL STATIC PRESSURE SWITCH		DIFFERENTIAL STATIC PRESSURE SWITCH
	DIFFERENTIAL STATIC PRESSURE TRANSMITTER		DIFFERENTIAL STATIC PRESSURE TRANSMITTER
	ELECTRIC/PNEUMATIC SWITCH OR RELAY		ELECTRIC/PNEUMATIC SWITCH OR RELAY
	PNEUMATIC/ELECTRIC SWITCH OR RELAY		PNEUMATIC/ELECTRIC SWITCH OR RELAY
	FLOW TRANSMITTER		FLOW TRANSMITTER
	PRESSURE TRANSMITTER		PRESSURE TRANSMITTER
	DEWPOINT SENSOR (DUCT MOUNTED)		DEWPOINT SENSOR (DUCT MOUNTED)
	STATIC PRESSURE SENSOR (DUCT MOUNTED)		STATIC PRESSURE SENSOR (DUCT MOUNTED)
	CONDENSATE SENSOR		CONDENSATE SENSOR
	ELECTRIC TO PNEUMATIC TRANSDUCER		ELECTRIC TO PNEUMATIC TRANSDUCER
	ELECTRIC TO PNEUMATIC SWITCH		ELECTRIC TO PNEUMATIC SWITCH

HVAC SYMBOL LIST			
SYMBOL		DESCRIPTION	
		EXISTING WORK TO BE REMOVED	
		POINT OF CONNECTION	
		POINT OF DISCONNECTION	
		DRAWING KEYNOTE	
		DEMOLITION KEYNOTE	
MBH		THOUSAND BTU/HOUR	
NTS		NOT TO SCALE	
(E)		EXISTING	
(L)		DOUBLE WALL LINED DUCT - 1-1/2" THICK	
(2L)		ACOUSTIC THERMAL LINING - 2" THICK	
FPM		FEET PER MINUTE	
CFM		CUBIC FEET PER MINUTE	
AFF		ABOVE FINISHED FLOOR	
AD		ACCESS DOOR	
WWW		WALL TO WALL	
G.C.		GENERAL CONTRACTOR	
M.C.		MECHANICAL CONTRACTOR	
P.C.		PLUMBING CONTRACTOR	
E.C.		ELECTRICAL CONTRACTOR	
N.O.		NORMALLY OPEN	
N.C.		NORMALLY CLOSED	
		FLEXIBLE DUCTWORK	
		DUCT SECTION - FLAT OVAL (FO)	
		ROUND DUCT - IN INCHES	
		DUCT SECTION - SUPPLY	
		DUCT SECTION - RETURN	
		WIDTH A x DEPTH B	
		TRANSITION SQUARE TO ROUND	
		RISE IN DUCT - IN DIRECTION OF AIRFLOW	
		DROP IN DUCT - IN DIRECTION OF AIRFLOW	
		SUPPLY DUCT TURNING UP OR DOWN	
		RETURN DUCT TURNING UP OR DOWN	
		SUPPLY/RETURN RECTANGULAR MAIN RECTANGULAR BRANCH	
		SUPPLY/RETURN RECTANGULAR MAIN ROUND BRANCH	
		SUPPLY/RETURN ROUND MAIN ROUND BRANCH	
		CONICAL TEE	
		LATERAL	
		MITERED ELBOW WITH TURNING VANES	
		SUPPLY DIFFUSER, REGISTER OR GRILLE	
		RETURN REGISTER	
		EXHAUST GRILLE	
		FIN TUBE RADIATION	
		VALANCE	
		REGISTER, GRILLE OR DIFFUSER TAG	
		A = TYPE B = NECK SIZE C = CFM	
		A = TYPE B = NECK SIZE C = DIFFUSER LENGTH D = CFM	
		FIN TUBE RADIATION TAG	
		FT-A = TYPE B = FIN TUBE LENGTH C = ENCLOSURE LENGTH D = GPM	
		RADIANT CEILING PANEL TAG	
		A = TYPE B = LENGTH C = GPM	
		VALANCE TAG	
		A = TYPE B = COIL SIZE C = COOLING GPM D = HEATING GPM	
		AIR TERMINAL UNIT AND TAG (OPTION 1)	
		AIR TERMINAL UNIT TAG (OPTION 2)	
		A = UNIT NO. B = MAXIMUM CFM C = MINIMUM CFM	
		COMPRESSED AIR	
		VENT	
		BOILER BLOW DOWN	
		CONDENSER WATER SUPPLY	
		CONDENSER WATER RETURN	
		CHILLED WATER SUPPLY	
		CHILLED WATER RETURN	
		DRAIN	
		FUEL OIL FILL	
		FUEL OIL GAUGE	
		FUEL OIL SUPPLY	
		FUEL OIL RETURN	
		FUEL OIL TANK VENT	
		GAS	
		GLYCOL SUPPLY	
		GLYCOL RETURN	
		HEAT PUMP WATER SUPPLY	
		HEAT PUMP WATER RETURN	
		HOT WATER SUPPLY	
		HOT WATER RETURN	
		LOW PRESSURE STEAM	
		LOW PRESSURE CONDENSATE	
		MEDIUM PRESSURE STEAM	
		MEDIUM PRESSURE CONDENSATE	
		HIGH PRESSURE STEAM	
		HIGH PRESSURE CONDENSATE	
		PUMPED CONDENSATE	
		REFRIGERANT DISCHARGE	
		REFRIGERANT LIQUID	
		REFRIGERANT SUCTION	
		HOT GAS	
		VACUUM	
		DOMESTIC COLD WATER	
		TRIPLE DUTY VALVE	
		GLOBE VALVE	
		BALL VALVE	
		GATE VALVE	
		CONTROL VALVE	
		THREE WAY CONTROL VALVE	
		CHECK VALVE	
		BALANCING VALVE	
		BUTTERFLY VALVE	
		RELIEF VALVE	
		PRESSURE REDUCING VALVE	
		PRESSURE/TEMPERATURE TEST PLUG	
		SINGLE LINE PIPE CONTINUED	
		DOUBLE LINE PIPE OR ROUND DUCT CONTINUED	
		DOUBLE LINE RECTANGULAR DUCT CONTINUED	
		AIR FLOW	
		PIPE ANCHOR	
		PIPE GUIDE	
		EXPANSION COMPENSATOR WITH GUIDES	
		PRE-FAB EXPANSION LOOP	
		STRAINER	
		PRESSURE GAUGE	
		THERMOMETER	
		UNION	
		AIR VENT	
		THERMOSTATIC TRAP	
		FLOAT & THERMOSTATIC TRAP	
		THERMODYNAMIC TRAP	
		BUCKET TRAP	
		DIRECTION OF FLOW	
		REDUCER	
		CAP OR PLUG	
		ELBOW DOWN	
		ELBOW UP	
		BOTTOM TAP	
		AUTOMATIC AIR DAMPER	
		FIRE DAMPER	
		SMOKE DAMPER	
		COMBINATION FIRE/SMOKE DAMPER	
		BACK DRAFT DAMPER	
		FLEX CONNECTOR - DUCTWORK	
		MOTORIZED DAMPER	
		BLAST GATE	
		VOLUME DAMPER	
		SUCTION DIFFUSER	
		FLEXIBLE CONNECTOR - PIPING	
		DRAIN VALVE WITH HOSE CONNECTION, CAP AND CHAIN	
		WATER FLOW SENSOR	
		WATER TEMPERATURE SENSOR	
		STATIC PRESSURE SENSOR	
		HUMIDISTAT	
		TEMPERATURE SENSOR	
		CARBON DIOXIDE SENSOR	
		CARBON MONOXIDE SENSOR	
		NITROGEN DIOXIDE SENSOR	
		GAS SENSOR	
		PNEUMATIC/ELECTRIC THERMOSTAT	
		THERMOSTAT/SENSOR WITH GUARD	
		DUCT SMOKE DETECTOR	

DM-201R



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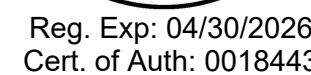
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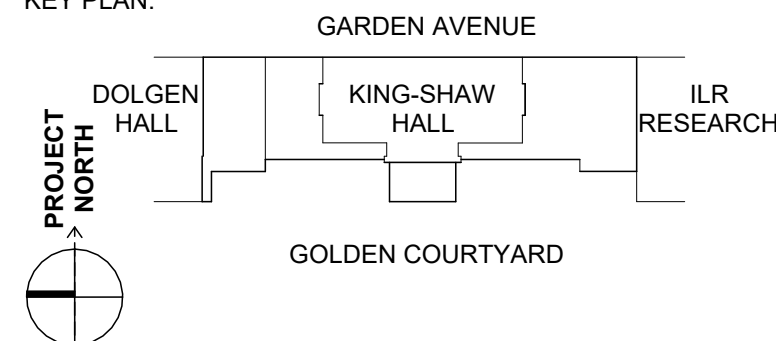
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KEY PLAN:



PROJECT:

RENOVATE 2ND - 5TH FLOOR AT KING SHAW

140 Garden Ave, Ithaca, NY 14853

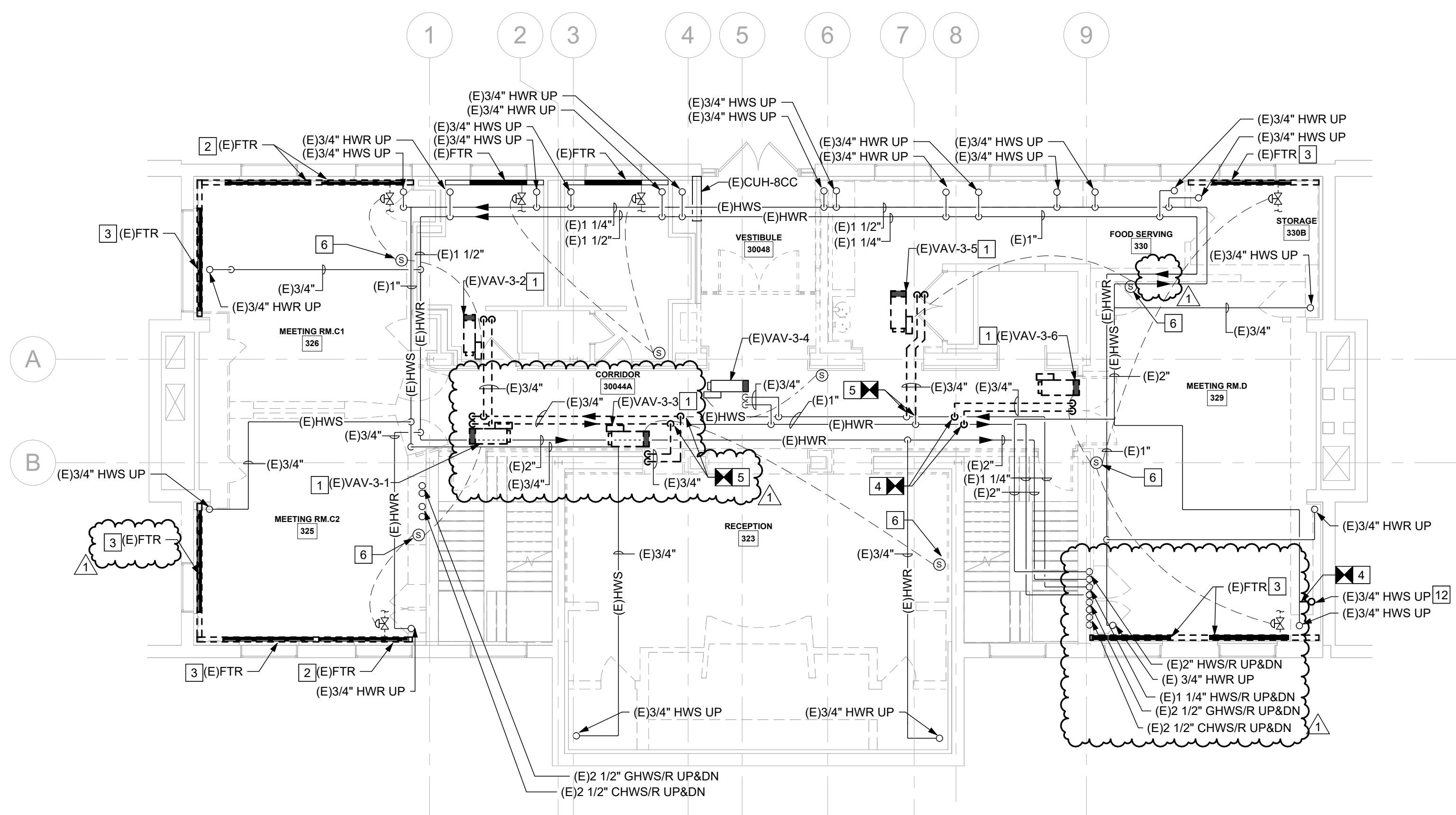
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DEMOLITION PLAN - THIRD
FLOOR - HVAC

PROJECT NO: 240400	DATE: 01/31/2025
PHASE: 100% CD	SCALE: 1/8" = 1'-0"

DM-202R

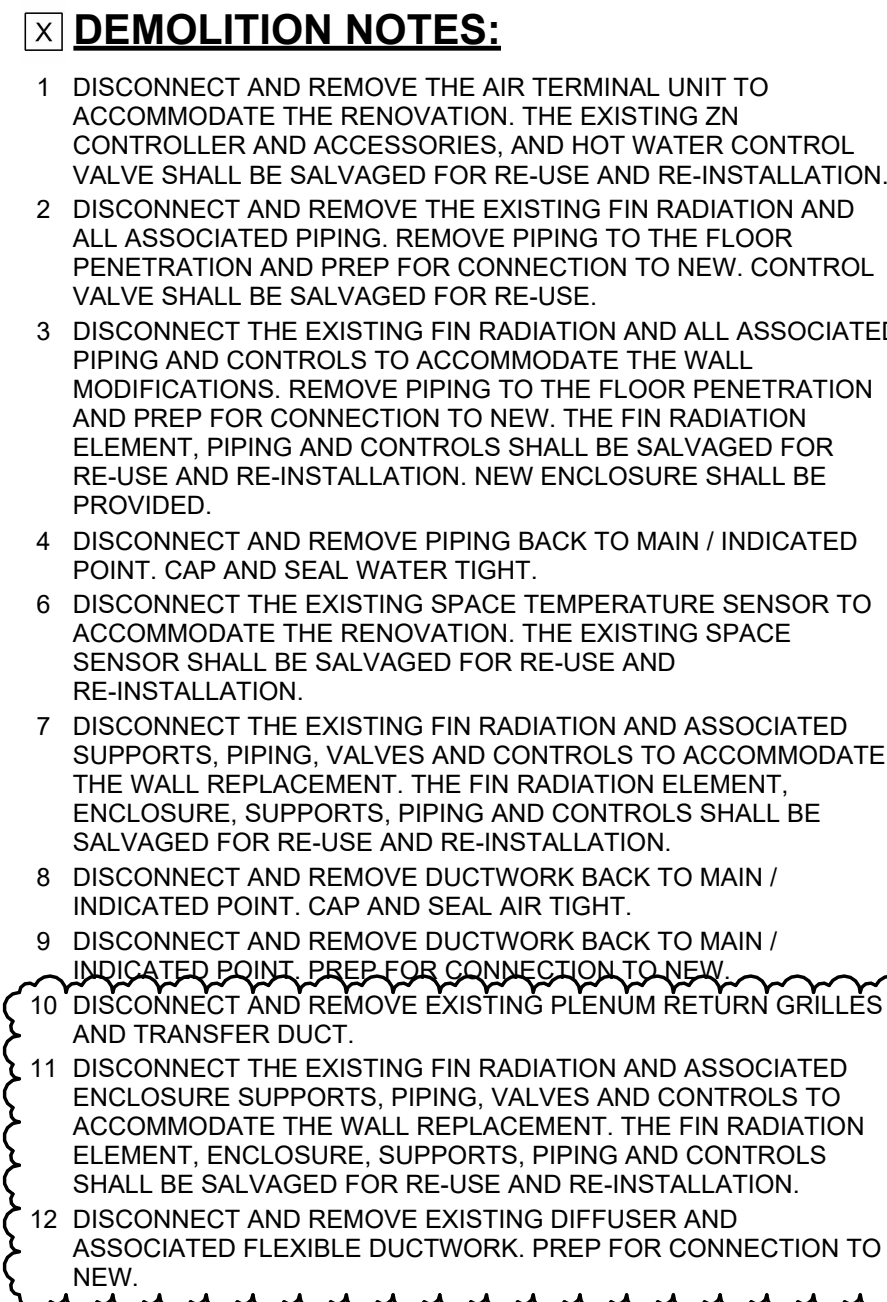
1 THIRD FLOOR PLAN - DUCTWORK DEMOLITION

SCALE: 1/8" = 1'-0"



2 THIRD FLOOR PLAN - PIPING DEMOLITION

SCALE: 1/8" = 1'-0"



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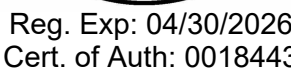
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SEAL:

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KEY PLAN:



RENOVATE 2ND - 5TH FLOOR AT KING SHAW

140 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:
DEMOLITION PLAN -
FOURTH FLOOR - HVAC

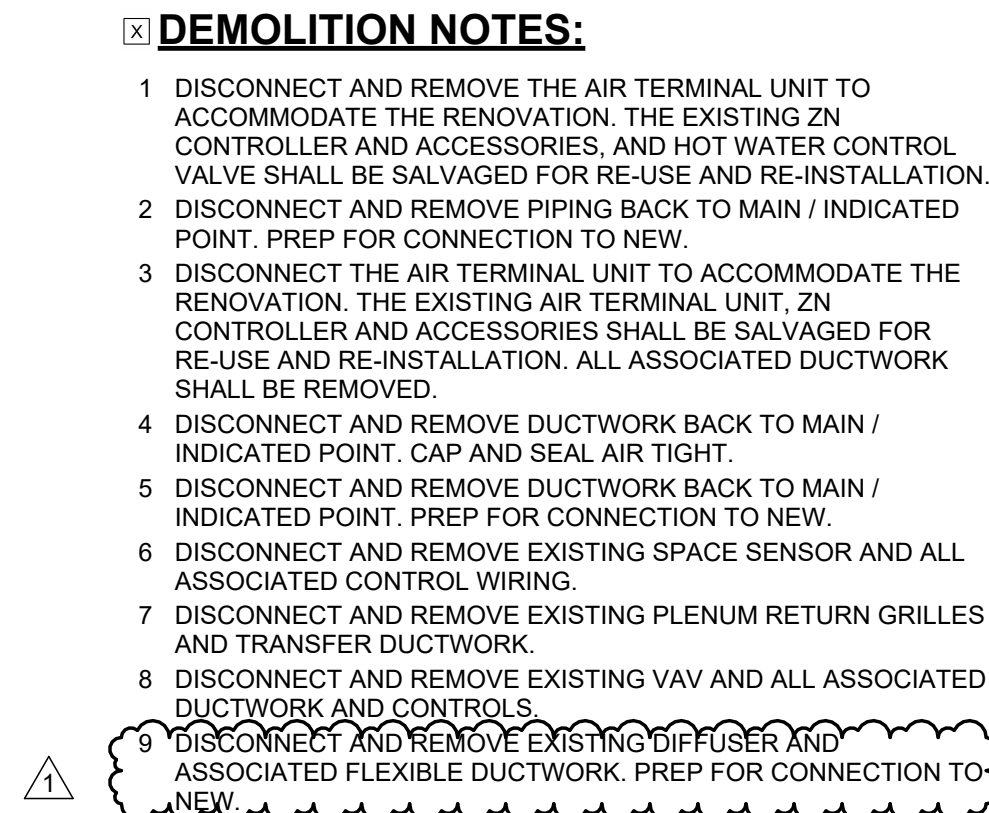
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PHASE: 100% CD	SCALE: 1/8" = 1'-0"

DM-203R

SCALE: 1/8" = 1'-0"



2 SCALE: 1/8" = 1'-0"



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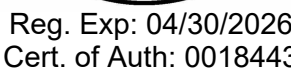
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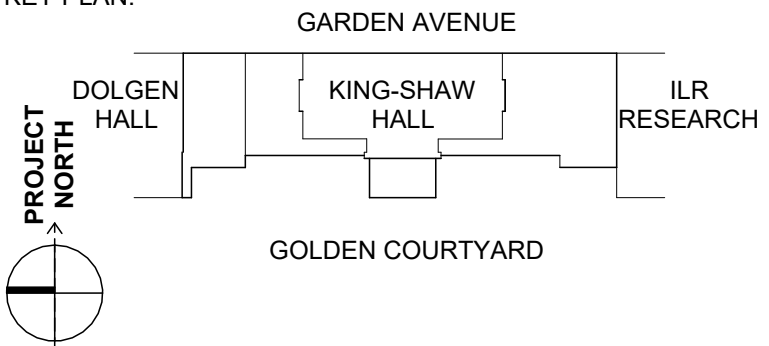
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KEY PLAN:



PROJECT:

RENOVATE 2ND - 5TH FLOOR AT KING SHAW

140 Garden Ave, Ithaca, NY 14853

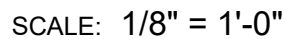
DRAWING TITLE

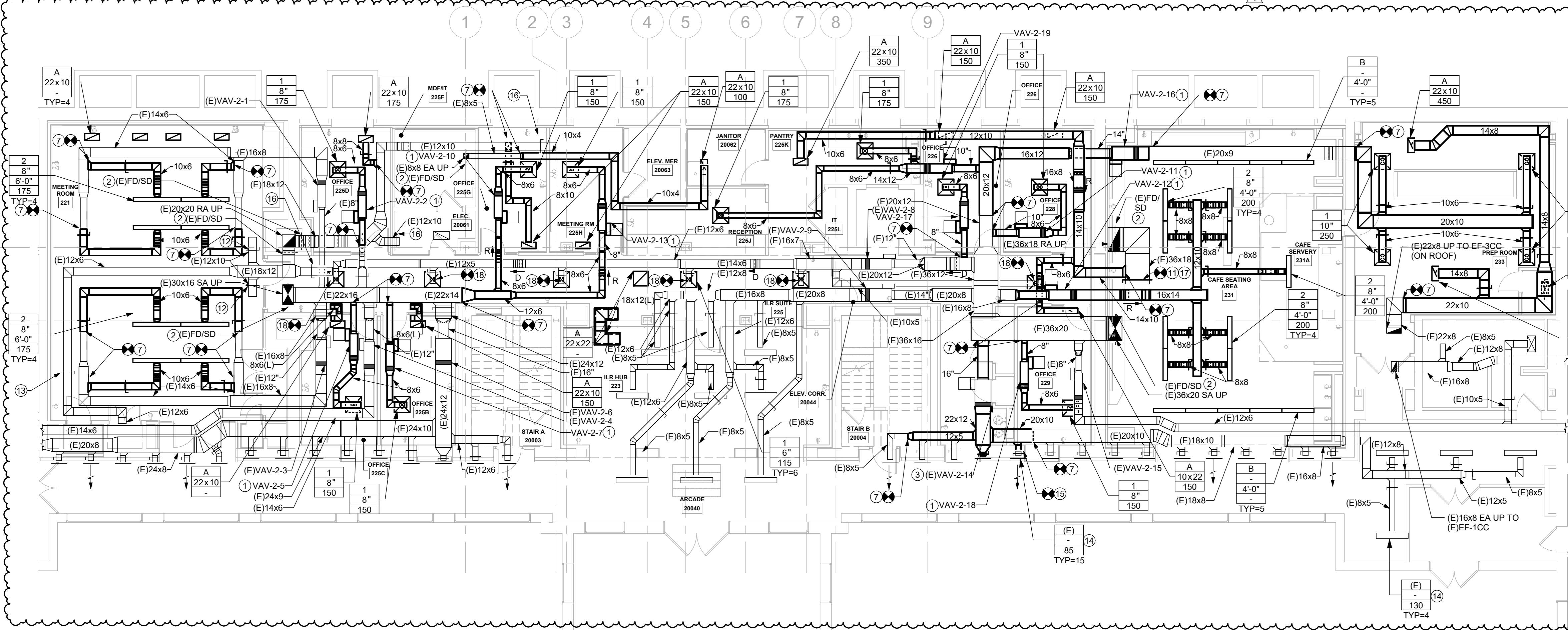
DEMOLITION PLAN - FIFTH FLOOR - HVAC

PROJECT NO: 240400	DATE: 01/31/2025
PHASE: 100% CD	SCALE: 1/8" = 1'-0"

DM-204R

SCALE: 1/8" = 1'-0"



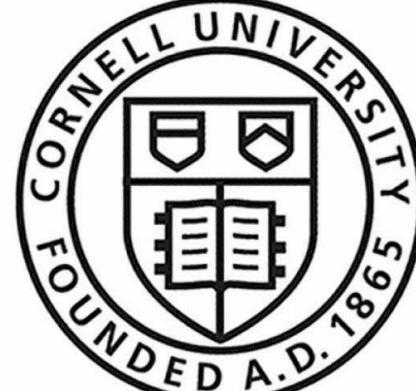


GENERAL NOTES:

- A. ALL NON-DUCT RETURN GRILLES SHALL INCLUDE AN INTERNALLY LINED PLENUM BOX AS NOTED IN THE RETURN GRILLE - NON DUCTED DETAIL, PROVIDE DOUBLE WALL LINED TRANSFER DUCTWORK AS REQUIRED.
- B. UNLESS INDICATED OTHERWISE, THE DUCTWORK AT THE VAV INLET SHALL MATCH THE INLET SIZE SHOWN ON THE EQUIPMENT SCHEDULE

DRAWING NOTES:

- 1 RE-INSTALL THE EXISTING ZN CONTROLLER AND ACCESSORIES, AND HOT WATER CONTROL VALVE FOR THE NEW TERMINAL UNIT. PROVIDE ALL CONTROL WIRING MODIFICATIONS AS REQUIRED FOR RE-INSTALLATION
- 2 EXISTING FIRE / SMOKE DAMPER SHALL BE TESTED AND CERTIFIED. REFER TO FIRE / SMOKE DAMPER SPECIFICATION FOR FURTHER REQUIREMENTS.
- 3 PROVIDE ALL MODIFICATIONS AS REQUIRED TO RE-INSTALL THE EXISTING VARIABLE VOLUME AIR TERMINAL UNIT IN THE LOCATION SHOWN. PROVIDE ALL MODIFICATIONS AS REQUIRED TO RE-INSTALL THE EXISTING VARIABLE VOLUME AIR TERMINAL UNIT IN THE LOCATION SHOWN.
- 4 PROVIDE FIN RADIATION AND ASSOCIATED PIPING AND VALVES. RE-INSTALL THE EXISTING CONTROL VALVE AND PROVIDE ALL CONTROL WIRING MODIFICATIONS AS REQUIRED.
- 5 RE-INSTALL THE EXISTING FIN RADIATION AND ASSOCIATED SUPPORTS, PIPING, VALVES AND CONTROLS AFTER COMPLETION OF THE WALL MODIFICATIONS. PROVIDE ALL MODIFICATIONS AND ADDITIONAL PIPING, INSULATION AND WIRING AS REQUIRED FOR RE-INSTALLATION.
- 6 TIE PIPING INTO EXISTING. PROVIDE ALL PIPING MODIFICATIONS AS REQUIRED TO MAKE THE CONNECTION.
- 7 TIE DUCTWORK INTO EXISTING. TRANSITION AS REQUIRED TO MAKE THE CONNECTION.
- 8 PROVIDE FIN RADIATION. ROUTE PIPING THROUGH THE WALL CAVITY TO THE PIPING IN THE CEILING ABOVE.
- 9 RE-INSTALL THE EXISTING SPACE TEMPERATURE SENSOR. PROVIDE ADDITIONAL CONTROL WIRING AS REQUIRED FOR RE-INSTALLATION.
- 10 LIGHTING CONTROLS SHALL BE TIED INTO THE BACS. ALL CONTROL WIRING AND BACS COMPONENTS FROM THE ELECTRICAL COMPONENTS (LIGHTS, SENSORS, SWITCHES) TO THE BACS CONTROL PANEL SHALL BE BY DIVISION 23. REFER TO E-SERIES DRAWINGS FOR LIGHTING CONTROL REQUIREMENT AND M-SERIES CONTROL SCHEMATICS FOR FURTHER INFORMATION.
- 11 BALANCE TO 4580 CFM.
- 12 BALANCE TO 650 CFM.
- 13 BALANCE TO 100 CFM.
- 14 RE-BALANCE EXISTING DIFFUSER TO AIRFLOW INDICATED.
- 15 TIE DUCTWORK INTO EXISTING. TRANSITION AS REQUIRED TO MAKE THE CONNECTION. DUCTWORK SHALL MATCH THE EXISTING DIFFUSER CONNECTION SIZE.
- 16 BALANCE TO 735 CFM.
- 17 PROVIDE VOLUME DAMPER IN EXISTING DUCTWORK AND PROVIDE ALL MODIFICATIONS AS REQUIRED TO INSTALL.
- 18 TIE DUCTWORK INTO EXISTING. EXTEND EXISTING BRANCH DUCTWORK TO DIFFUSER / GRILLE AS REQUIRED TO ALIGN TO THE NEW CEILING LAYOUT.



OWNER PROJECT NUMBER
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Ithaca, NY 14853

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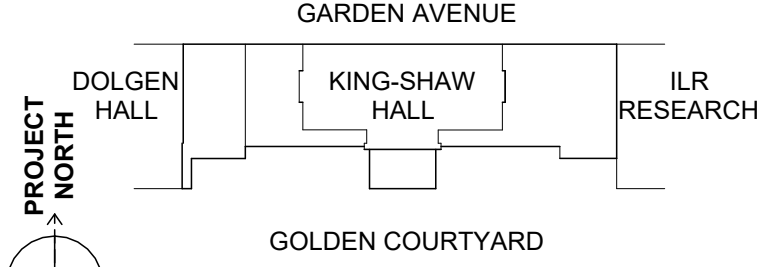
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NO.	DATE	COMMENTS
1	04/29/25	ADDENDUM 03

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KEY PLAN:



PROJECT:

RENOVATE 2ND - 5TH FLOOR
AT KING SHAW

140 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:
**FLOOR PLAN - SECOND
FLOOR - HVAC**

PROJECT NO: 240400

DATE: 01/31/2025

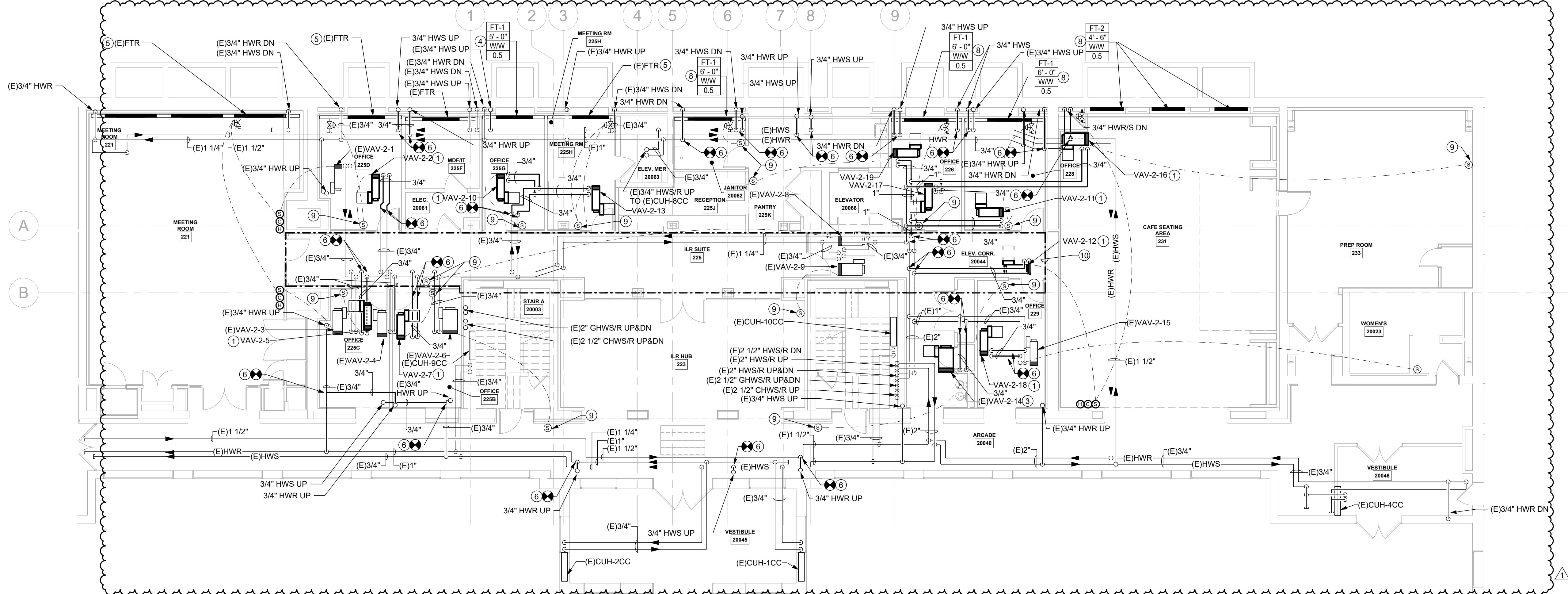
PHASE: 100% CD

SCALE: 1/8" = 1'-0"

M-201R

1 SECOND FLOOR PLAN - DUCTWORK

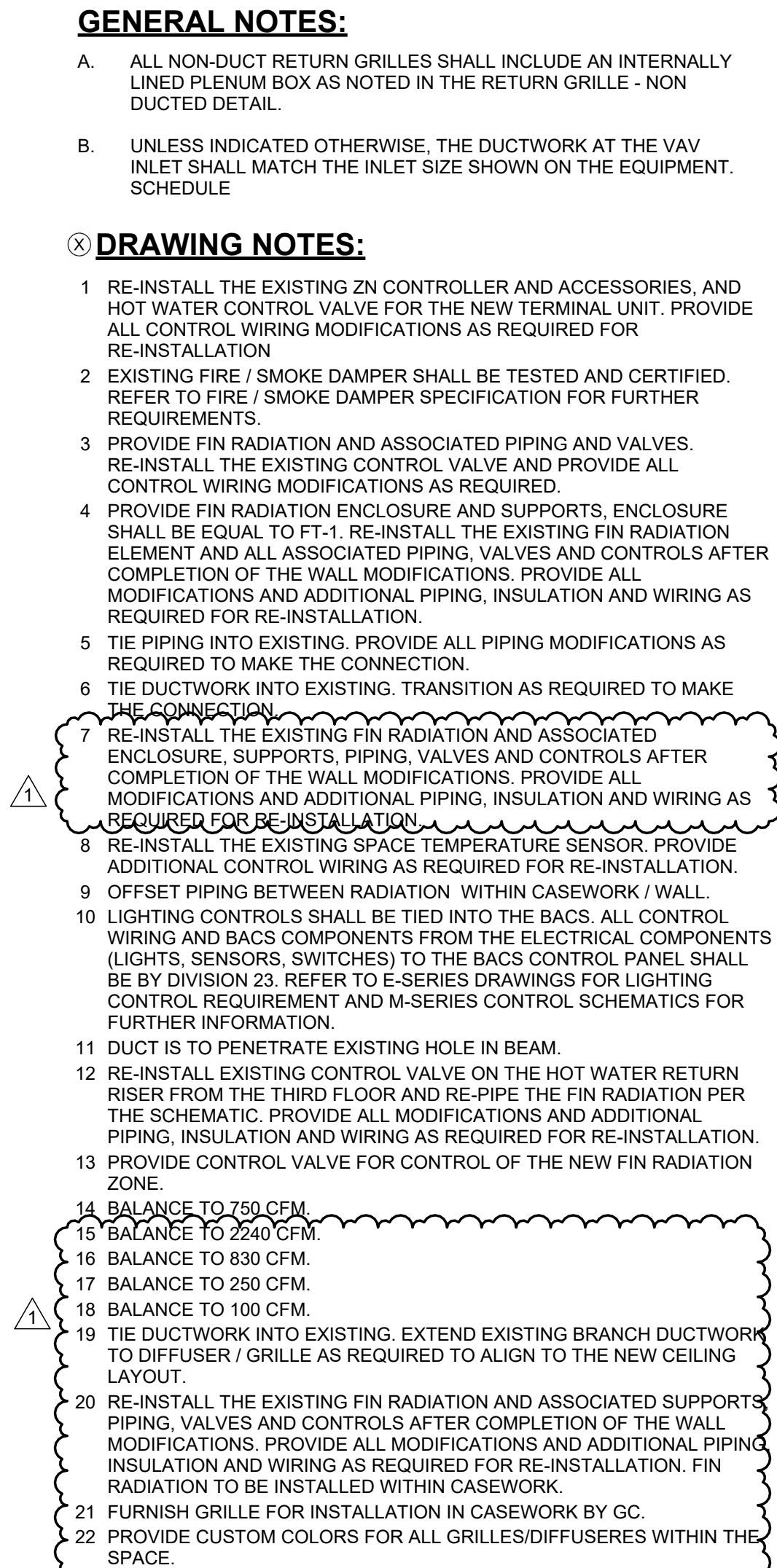
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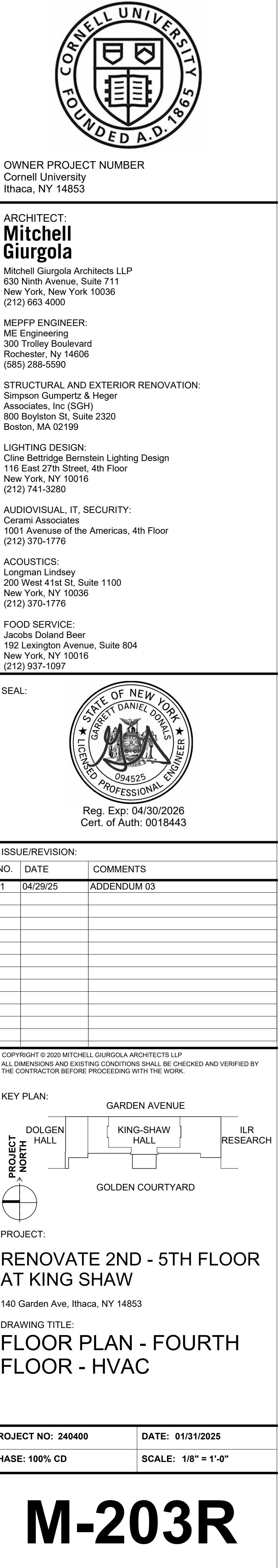
2 SECOND FLOOR PLAN - PIPING

SCALE: 1/8" = 1'-0"

M-202R



2 FOURTH FLOOR PLAN -PIPING





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PROJECT:

140 Garden Ave, Ithaca, NY 14853

PROJECT NO: 240400	DATE: 1/31/2025
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BASE: 100% CD	SCALE: 1/8" = 1'-0"
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This diagram illustrates the sanitary piping system for a building, showing the layout of rooms and the corresponding sewer connections. The system includes various types of piping, valves, and pumps.

Rooms and Areas:

- Top Left: Entry area with a (E)1 1/2" V UP connection.
- Top Center: Multiple rooms with (R)1 1/2" V UP, (R)2" SAN UP, (R)3" SAN UP, and (R)4" SAN UP connections, all with caps below the floor.
- Top Right: Rooms with (R)2" SAN UP and (R)3" SAN UP connections, also with caps below the floor.
- Center: A large central area containing a (E)SUMP PUMP and a (E)SAN line.
- Bottom Left: A room with a (E)2" connection.
- Bottom Center: A room with a (E)3" connection.
- Bottom Right: A room with a (E)2" V UP connection.
- Far Right: A room with a (E)2" SAN UP connection and a (E)3" SAN UP connection.

Piping and Connections:

- (E)1 1/2" V UP:** Vertical pipe from the top left room.
- (E)2":** Horizontal pipe from the bottom left room.
- (E)3":** Horizontal pipe from the bottom center room.
- (E)4":** Horizontal pipe from the top center rooms.
- (E)SAN:** Main sewer line running horizontally through the center.
- (E)SUMP PUMP:** Located in the center area, connected to the (E)SAN line.
- (E)1 1/2" SAN UP:** Vertical pipe from the bottom center room to the (E)SAN line.
- (E)2" SAN UP:** Vertical pipe from the bottom right room to the (E)SAN line.
- (E)3" SAN UP:** Vertical pipe from the bottom right room to the (E)SAN line.
- (E)4" SAN UP:** Vertical pipe from the top right room to the (E)SAN line.
- (E)2" SAN UP TO DPCO:** Vertical pipe from the top right room to the (E)SAN line.
- (E)3" SAN UP TO DPCO:** Vertical pipe from the top right room to the (E)SAN line.

Valves and Caps:

- (R)1 1/2" V UP, (R)2" SAN UP, (R)3" SAN UP, (R)4" SAN UP:** All have caps below the floor.
- (E)2" SAN UP, (E)3" SAN UP, (E)4" SAN UP:** All have caps below the floor.

SCALE: 1/8" = 1'-0"

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KEY PLAN:

GARDEN AVENUE

DOLGEN HALL KING-SHAW HALL ILR RESEARCH

GOLDEN COURTYARD

PROJECT NORTH

RENOVATE 2ND - 5TH FLOOR AT KING-SHAW HALL

DRAWING TITLE:
**DEMOLITION PLAN -
SECOND FLOOR -
PLUMBING**

DP-101R





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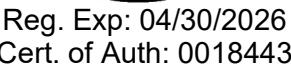
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KEY PLAN:



RENOVATE 2ND - 5TH FLOOR AT KING-SHAW HALL

140 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:
DEMOLITION PLAN - THIRD
FLOOR - PLUMBING

DP-102R





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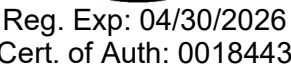
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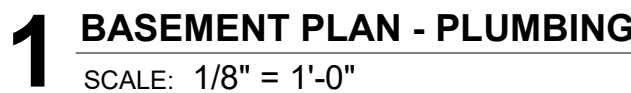
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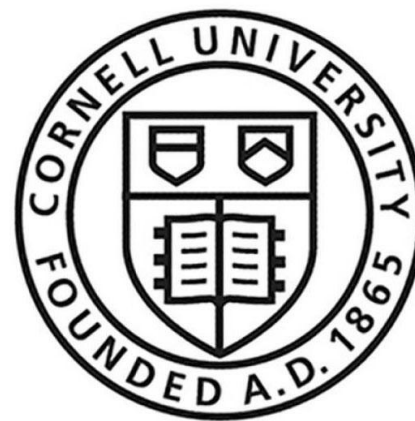
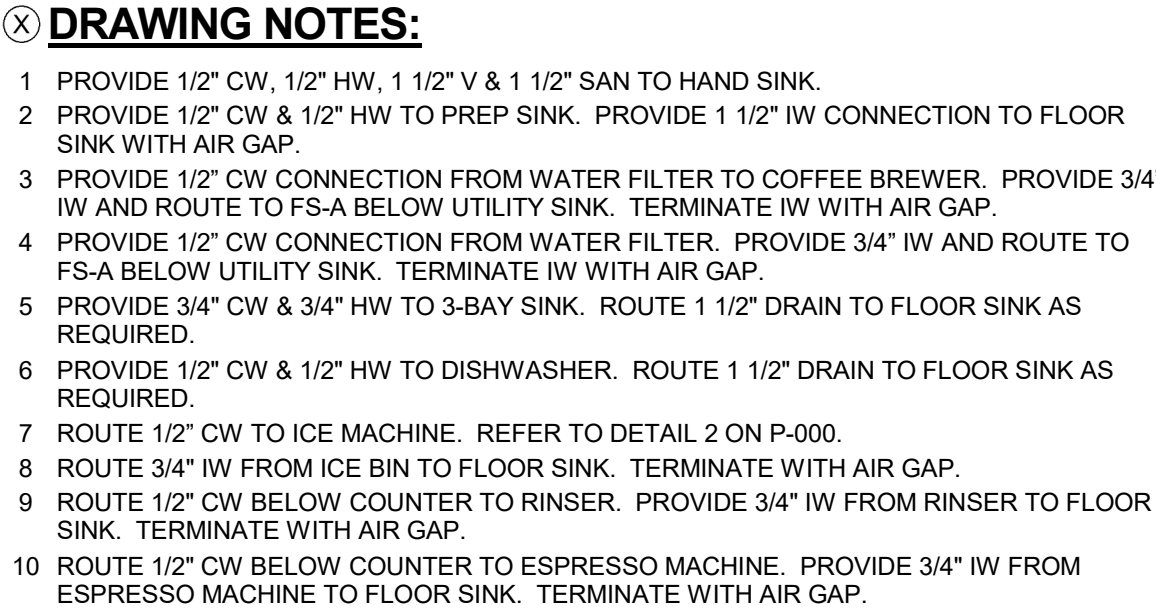


140 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:
**FLOOR PLAN - BASEMENT
- PLUMBING**

P-200R





OWNER PROJECT NUMBER
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Ithaca, NY 14853

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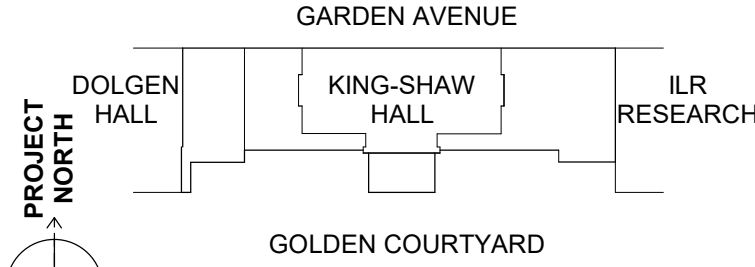


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KEY PLAN:



PROJECT

RENOVATE 2ND - 5TH FLOOR AT KING-SHAW HALL

140 Garden Ave, Ithaca, NY 14853

DRAWING TITLE

FLOOR PLAN - SECOND FLOOR - PLUMBING

PROJECT NO: 240400	DATE: 1/31/2025
PHASE: 100% CD	SCALE: As indicated

P-201R

ENLARGED SECOND FLOOR PLAN - PLUMBING

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



SCALE: 1/8" = 1'-0"



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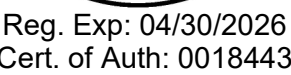
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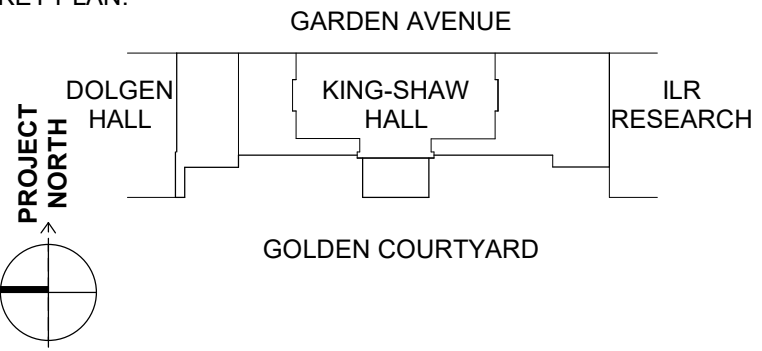
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KEY PLAN:



PROJECT:

RENOVATE 2ND - 5TH FLOOR AT KING-SHAW HALL

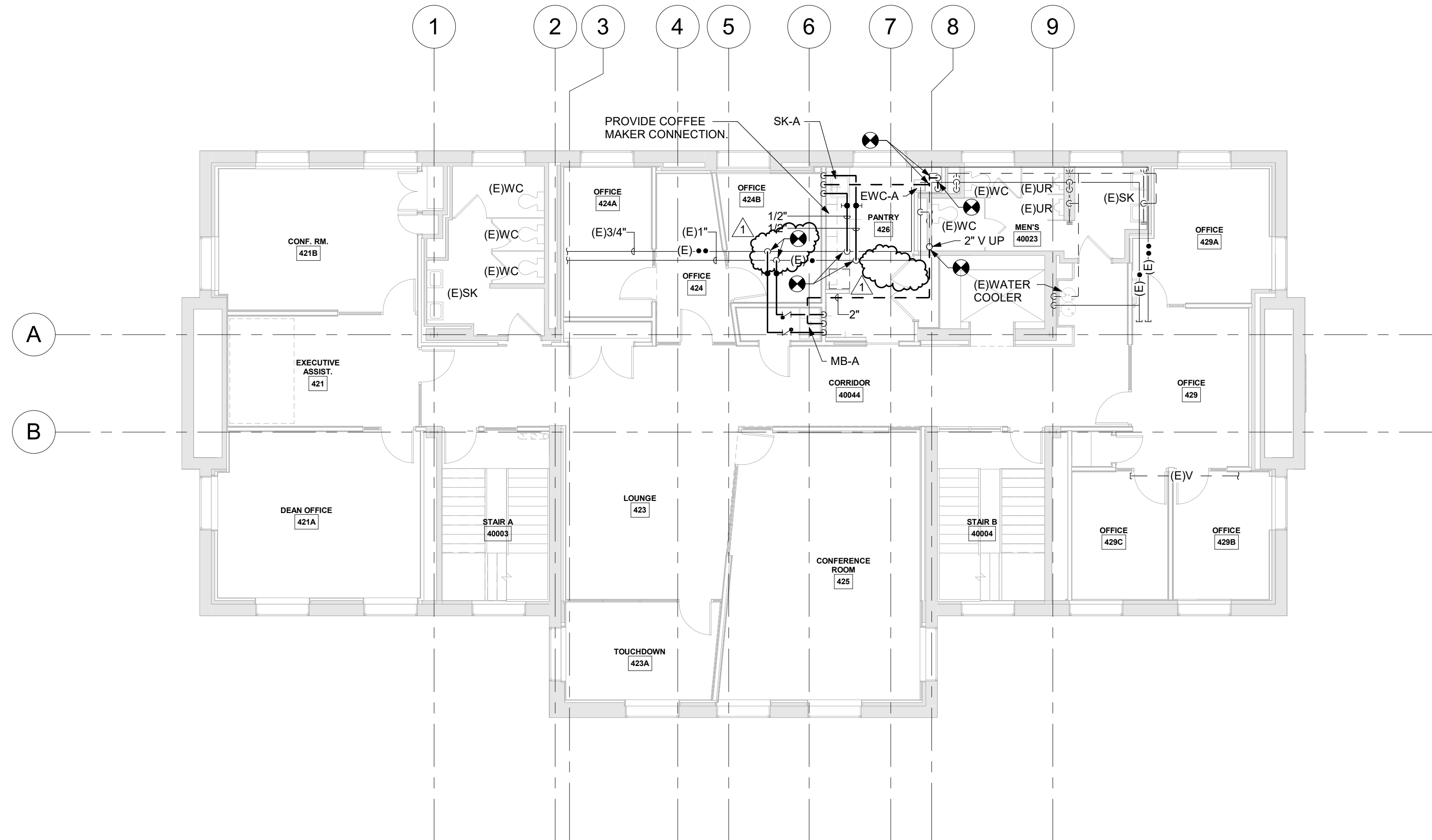
140 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:

FLOOR PLAN - FOURTH
FLOOR - PLUMBING

PROJECT NO: 240400	DATE: 1/31/2025
BASE: 100% CD	SCALE: 1/8" = 1'-0"

P-203R



1 FOURTH FLOOR PLAN - PLUMBING

SCALE: 1/8" = 1'-0"



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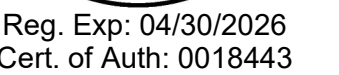
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KEY PLAN:



RENOVATE 2ND - 5TH FLOOR AT KING-SHAW HALL

140 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:
DEMOLITION PLAN -
SECOND FLOOR - FIRE
PROTECTION DEMOLITION

DFP-101R





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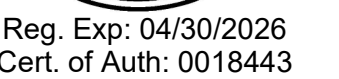
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KEY PLAN:



RENOVATE 2ND - 5TH FLOOR AT KING-SHAW HALL

140 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:
FLOOR PLAN - SECOND
FLOOR - FIRE
PROTECTION

PROJECT NO: 240400	DATE: 1/31/2025
PHASE: 100% CD	SCALE: 1/8" = 1'-0"

FP-201R





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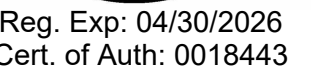
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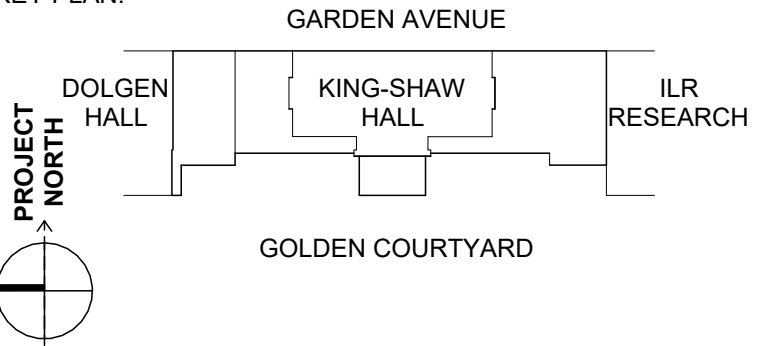
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SEAL:

[illegible]

ALL DIMENSIONS AND EXISTING CONDITIONS SHALL BE CHECKED AND VERIFIED BY THE CONTRACTOR BEFORE PROCEEDING WITH THE WORK.

KEY PLAN:



PROJECT:

RENOVATE 2ND - 5TH FLOOR AT KING-SHAW HALL

40 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:

DEMOLITION PLAN - THIRD FLOOR - ELECTRICAL

PROJECT NO: 240400	DATE: 01/31/2025
BASE: 100% CD	SCALE: As indicated

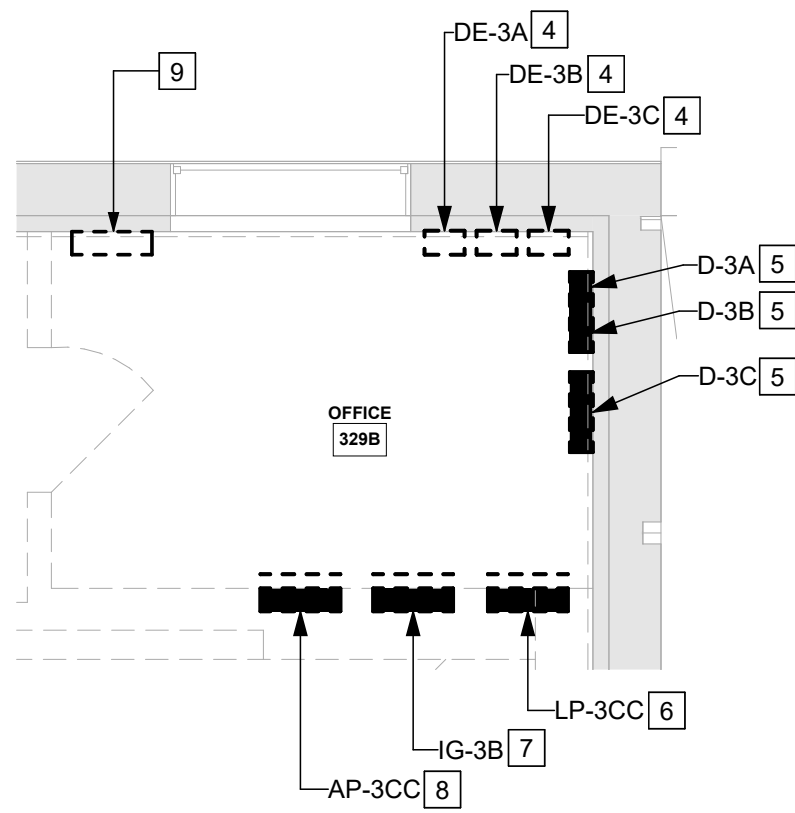
DE-202R

GENERAL NOTES:

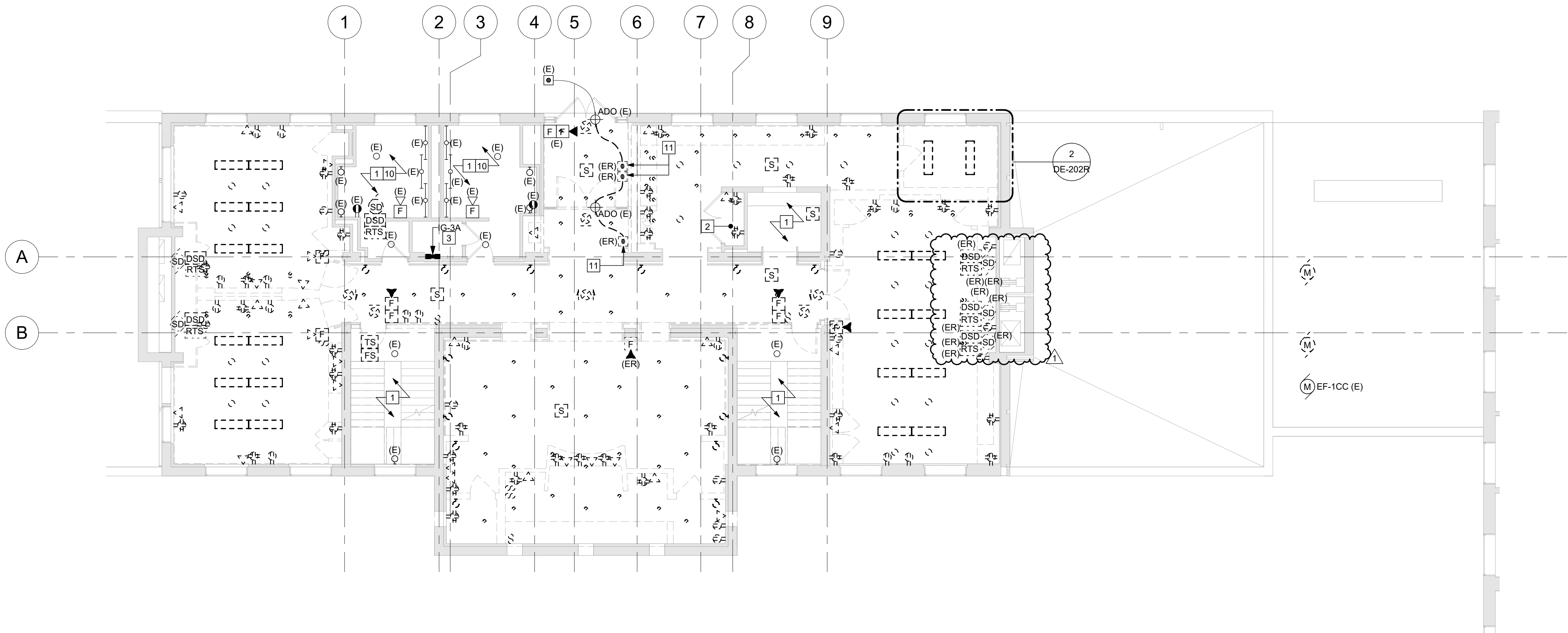
- A ALL EXISTING PANELBOARDS ON THIS LEVEL TO BE DEMOLISHED. EXISTING-TO-REMAIN ELECTRICAL COMPONENTS TO BE REFD FROM PANELS PROVIDED BY CONSTRUCTION PHASE.
- B REFER TO AV DRAWINGS FOR ADDITIONAL AV DEMOLITION. COORDINATE WITH AV CONTRACTOR.
- C RECONNECT EXISTING DUCT SMOKE DETECTORS, SMOKE DAMPERS, AND REMOTE TEST STATIONS AS NEEDED FOR FIRE ALARM AND POWER CHANGEOVERS.

DEMOLITION NOTES:

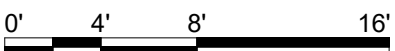
- 1 THIS AREA IS NOT WITHIN THE SCOPE OF THE PROJECT. REFEED CIRCUITS AS NEEDED TO ENABLE OTHER DEMOLITION WORK.
- 2 EXISTING TELECOM CHASE. (4) 4" SLEEVES UP AND (4) 4" SLEEVES DOWN TO REMAIN.
- 3 DEMOLISH PANELBOARD IG-3A AND FEED FROM PANELBOARD LP-3CC.
- 4 DEMOLISH EMERGENCY LIGHTING CONTROL DIMMING PANELBOARD AND FEED FROM PANEL LPE-2CC.
- 5 DEMOLISH LIGHTING CONTROL DIMMING PANELBOARD. DEMOLISH FEED FROM PANEL LP-3CC.
- 6 DEMOLISH FEED-THROUGH PANELBOARD LP-3CC FED FROM PANEL LP-4CC. FEED TO PANEL LP-2CC ON LEVEL BELOW TO BE REWORKED.
- 7 DEMOLISH LIGHTING CONTROL DIMMING PANELBOARD. DEMOLISH FEED FROM PANEL LP-3CC.
- 8 DEMOLISH FEED-THROUGH PANELBOARD AP-3CC FED FROM PANEL AP-4CC. FEED TO PANEL AP-2CC ON FLOOR BELOW TO BE REWORKED.
- 9 DEMOLISH MICROLITE LIGHTING CONTROLLER.
- 10 SALVAGE RESTROOM POWER AND LIGHTING CIRCUITS FOR EXTENSION TO NEW PANELBOARDS IN CONSTRUCTION PHASE.
- 11 REMOVE EXISTING PUSH BUTTON FOR AUTOMATIC DOOR OPERATOR AND SALVAGE IT FOR REINSTALLATION IN CONSTRUCTION PHASE. REWORK AND EXTEND CIRCUITRY AS NECESSARY FOR A COMPLETE INSTALLATION.



2 THIRD FLOOR ELECTRIC ROOM DEMOLITION PLAN



1 THIRD FLOOR DEMOLITION PLAN - ELECTRICAL





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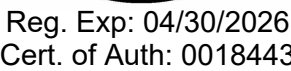
LIGHTING DESIGN:
Cline Bettridge Bernstein Lighting Design
116 East 27th Street, 4th Floor
New York, NY 10016
(212) 741-3280

AUDIOVISUAL, IT, SECURITY:
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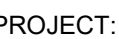
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KEY PLAN



RENOVATE 2ND - 5TH FLOOR AT KING-SHAW HALL

40 Garden Ave, Ithaca, NY 14853

DRAWING TITLE

DEMOLITION PLAN -
FOURTH FLOOR -
ELECTRICAL

PROJECT NO: 240400	DATE: 01/31/2025
BASE: 100% CD	SCALE: As indicated

DE-203R

GENERAL NOTES:

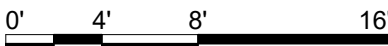
A ALL EXISTING PANELBOARDS ON THIS LEVEL TO BE DEMOLISHED. EXISTIN-TO-REMAIN ELECTRICAL COMPONENTS TO BE REFD FROM PANELS PROVIDED BY CONSTRUCTION PHASE.

B REFER TO AV DRAWINGS FOR ADDITIONAL AV DEMOLITION. COORDINATE WITH AV CONTRACTOR.

C DISCONNECT EXISTING DUCT SMOKE DETECTORS, SMOKE DAMPERS, AND REMOTE TEST STATIONS AS NEEDED FOR FIRE ALARM AND POWER CHANGEOVERS.

X DEMOLITION NOTES:

- 1 THIS AREA IS NOT WITHIN THE SCOPE OF THE PROJECT. REFEED CIRCUITS AS NEEDED TO ENABLE OTHER DEMOLITION WORK.
- 2 EXISTING TELECOM CHASE. (4) 4" SLEEVES UP AND (4) 4" SLEEVES DOWN TO REMAIN.
- 3 DEMOLISH MICROLITE LIGHTING CONTROLLER.
- 4 DEMOLISH LIGHTING CONTROL DIMMING PANELBOARD. DEMOLISH FEED FROM PANEL LP-4CC.
- 5 DEMOLISH EMERGENCY LIGHTING CONTROL DIMMING PANELBOARD. DEMOLISH FEED FROM PANEL LPE-4CC.
- 6 DEMOLISH PANELBOARD IG-4A FED FROM PANEL IN THIS ROOM.
- 7 DEMOLISH FEED-THROUGH PANELBOARD AP-4CC FED FROM PANEL MDPL-5CC. FEED TO PANEL AP-3CC TO BE DEMOLISHED.
- 8 DEMOLISH FEED-THROUGH PANELBOARD LP-4CC FED FROM PANEL MDPL-5CC. FEED TO PANEL LP-3CC TO BE DEMOLISHED.
- 9 DEMOLISH EMERGENCY LIGHTING PANELBOARD LPE-4CC, FED FROM PANELBOARD LPE-2CC.
- 10 SALVAGE RESTROOM POWER AND LIGHTING CIRCUITS FOR EXTENSION TO NEW PANELBOARDS IN CONSTRUCTION PHASE.





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Reg. Exp: 04/30/2026
Cert. of Auth: 0018443

[illegible]

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Site plan showing the layout of the proposed development. The plan includes Dolgen Hall, King-Shaw Hall, and ILR Research building, situated between Garden Avenue and Golden Courtyard. A north arrow is provided for orientation.

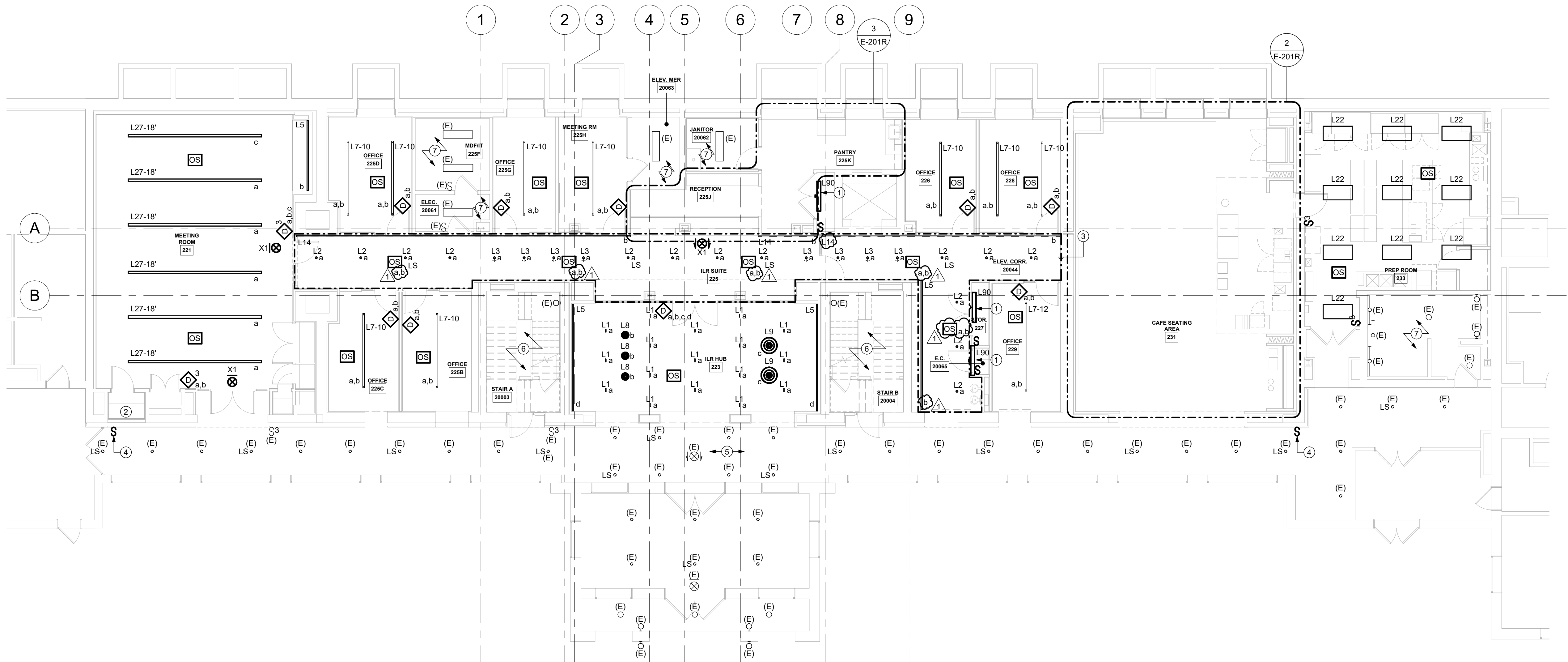
40 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:
FLOOR PLAN - SECOND
FLOOR - LIGHTING

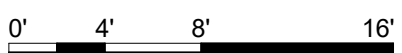
DATE: 01/31/2025

SCALE: As indicated

E-201R



1 SECOND FLOOR PLAN - LIGHTING





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The site plan shows a rectangular area bounded by Garden Avenue to the north and Golden Courtyard to the south. On the left side, Dolgen Hall is located. In the center, King-Shaw Hall is situated. To the right of King-Shaw Hall is the ILR Research building. A compass rose in the bottom-left corner indicates that North is oriented towards the top-left of the page.

RENOVATE 2ND - 5TH FLOOR AT KING-SHAW HALL

40 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:
FLOOR PLAN - THIRD
FLOOR - LIGHTING

OBJECT NO: 240400	DATE: 01/31/2025
BASE: 100% CD	SCALE: 1/8" = 1'-0"

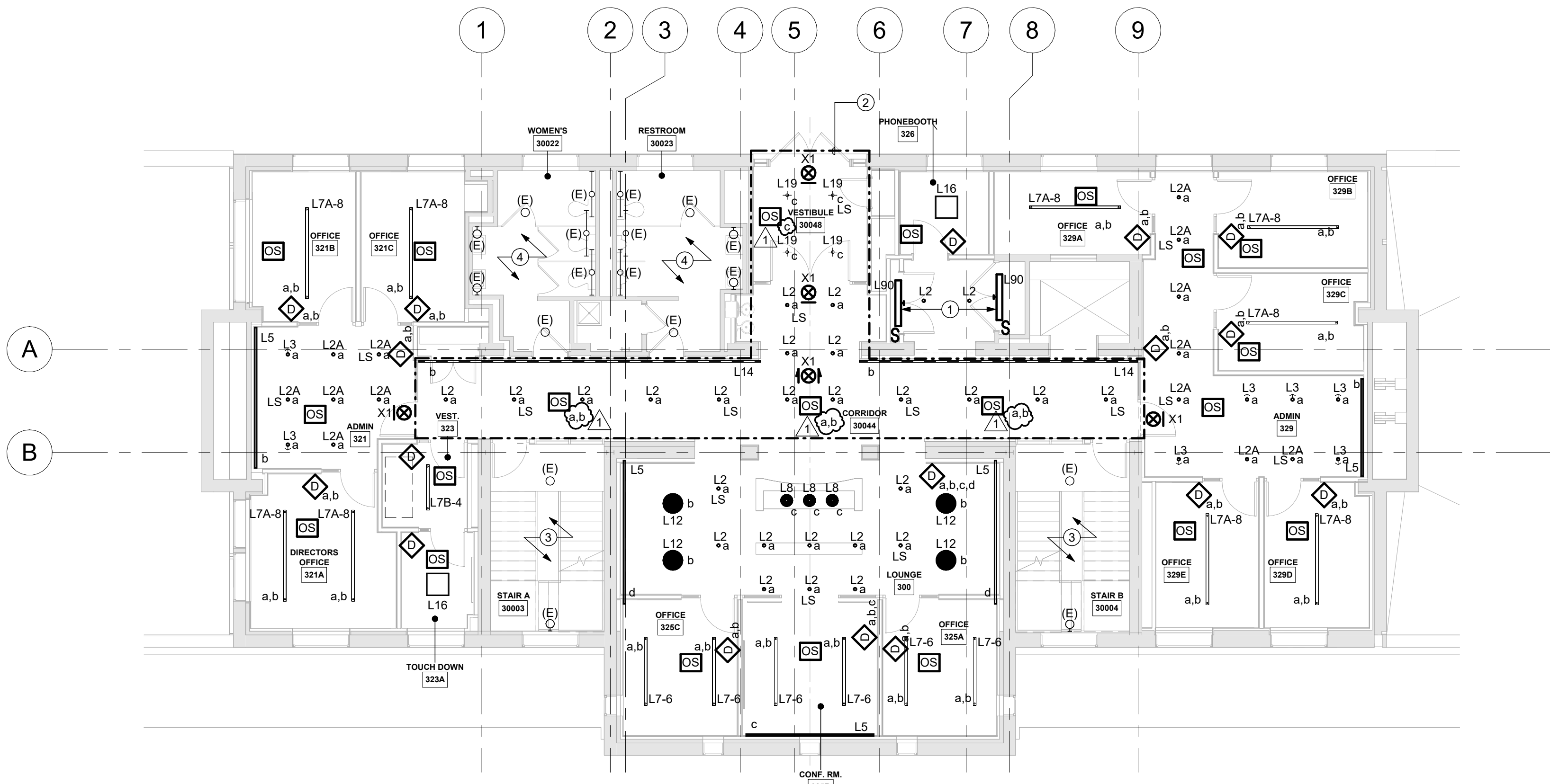
E-202R

GENERAL NOTES:

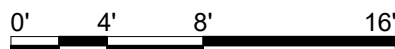
- A CORRIDOR, LOUNGE, AND VESTIBULE LIGHTING SHALL BE CIRCUITED TO PANEL LP-3CC, CIRCUIT 1.
- B ADMIN 305, OFFICES 305A, 305B, AND 305C, COPY ROOM, AND TOUCHDOWN LIGHTING SHALL BE CIRCUITED TO PANEL LP-3CC, CIRCUIT 3.
- C ADMIN 307, OFFICES 307A, 307B, 307C, 307D, AND 307E, AND PHONEBOOTH LIGHTING SHALL BE CIRCUITED TO PANEL LP-3CC CIRCUIT 5.
- D OFFICE 301, OFFICE 303, AND CONFERENCE ROOM LIGHTING SHALL BE CIRCUITED TO PANEL LP-3CC, CIRCUIT 7.
- E ALL EM LIGHTING ON THE THIRD FLOOR SHALL BE CIRCUITED TO PANEL LPE-3CC, CIRCUIT 1 WITH (2)#10AWG & (1)#10EG IN 3/4" CONDUIT.
- F ALL EXIT SIGNS ON THE THIRD FLOOR SHALL BE CIRCUITED TO PANEL LPE-3CC, CIRCUIT 3 WITH (2)#10AWG & (1)#10EG IN 3/4" CONDUIT.

⊗ DRAWING NOTES:

- 1 WALL-MOUNT FIXTURE CENTERED ABOVE DOOR. COORDINATE WITH OTHER SERVICES AS NEEDED.
- 2 LIGHTING TO BE CONTROLLED BY THE BMS IN THIS AREA. PROVIDE UL924 RELAY WITH 0-10V OVERDRIVE FOR LS LIGHTS. MAKE CONNECTIONS AHEAD OF CONTROLS. 0-10V DIMMING OVERRIDE ON UL924 D TO ENSURE LS LIGHTS COME ON TO FULL BRIGHTNESS AT LOSS OF NORMAL POWER.
- 3 STAIR LIGHTING IS EXISTING-TO-REMAIN. PROVIDE TEMPORARY SERVICES AS NEEDED DURING CONSTRUCTION. REFEED EXISTING CIRCUITRY AS NECESSARY.
- 4 REWORK AND EXTEND EXISTING LIGHTS IN THESE ROOMS TO NEW PANELBOARDS ON THIS FLOOR.



1 THIRD FLOOR PLAN - LIGHTING





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The site plan shows a rectangular area bounded by Garden Avenue to the north and Golden Courtyard to the south. On the left side, Dolgen Hall is located. In the center, King-Shaw Hall is situated. To the right of King-Shaw Hall is the ILR Research building. A compass rose in the bottom-left corner indicates that North is oriented towards the top-left of the page.

40 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:
FLOOR PLAN - FOURTH
FLOOR - LIGHTING

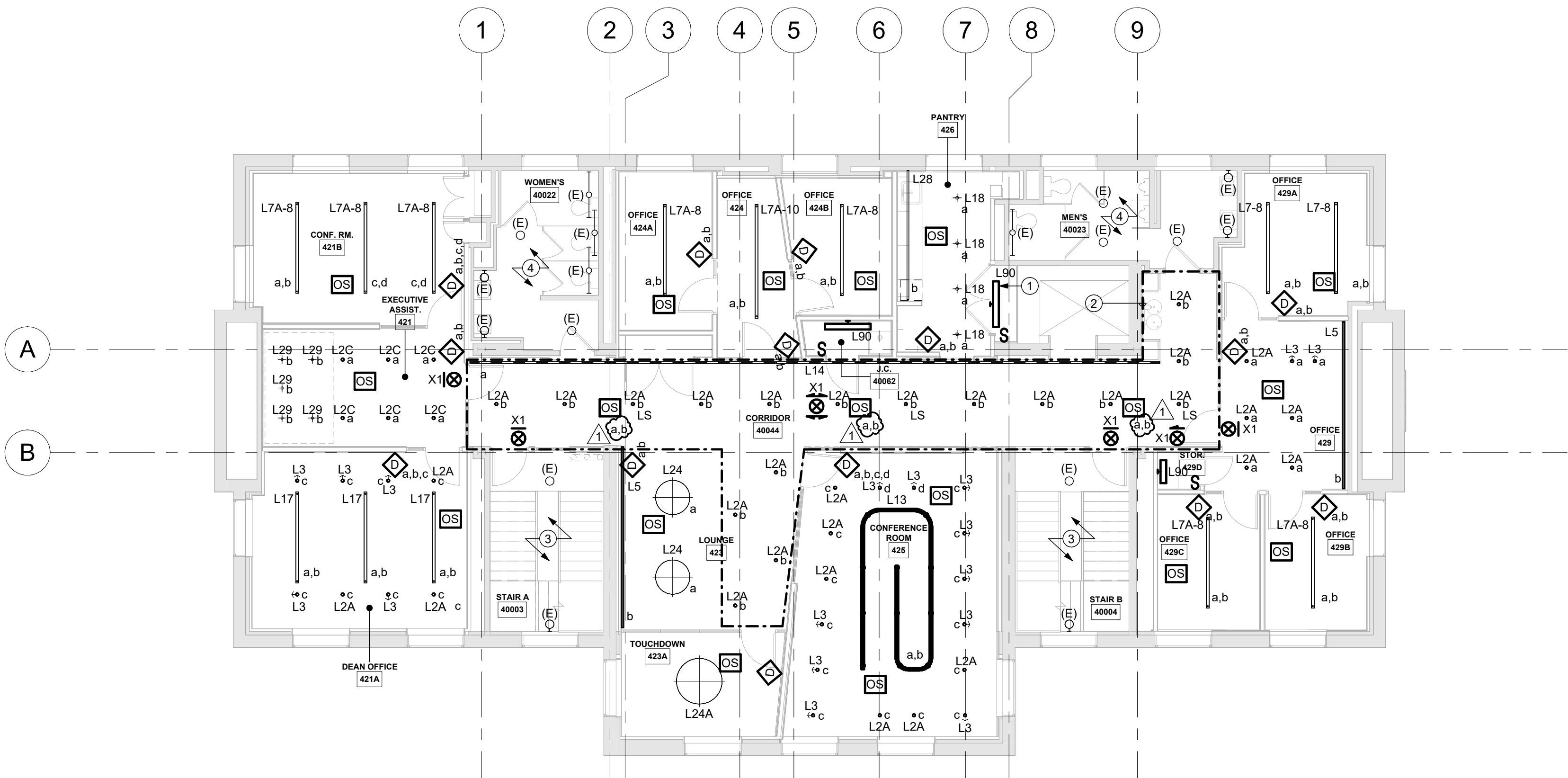
E-203R

GENERAL NOTES:

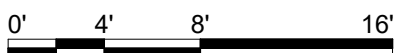
- A. COORIDOR AND LOUNGE LIGHTING SHALL BE CIRCUITED TO PANEL LP-3CC, CIRCUIT 2.
- B. EXECUTIVE ASSISTANT, DEAN OFFICE, AND CONFERENCE ROOM LIGHTING SHALL BE CIRCUITED TO PANEL LP-3CC, CIRCUIT 4.
- C. OFFICES 406, 406A, 406B, AND 406C LIGHTING SHALL BE CIRCUITED TO PANEL LP-3CC, CIRCUIT 6.
- D. PANTRY, OFFICES 404, 404A, AND 404B, TOUCHDOWN, AND CONFERENCE ROOM LIGHTING SHALL BE CIRCUITED TO PANEL LP-3CC, CIRCUIT 8.
- E. ALL EM LIGHTING ON THE FOURTH FLOOR SHALL BE CIRCUITED TO PANEL LPE-3CC, CIRCUIT 10 WITH (2)#10AWG & (1)#10EG IN 3/4" CONDUIT.
- F. ALL EXIT SIGNS ON THE FOURTH FLOOR SHALL BE CIRCUITED TO PANEL LPE-3CC, CIRCUIT 12 WITH (2)#10AWG & (1)#10EG IN 3/4" CONDUIT.

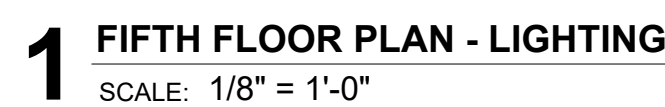
⊗ DRAWING NOTES:

1. WALL-MOUNT FIXTURE CENTERED ABOVE DOOR. COORDINATE WITH OTHER SERVICES AS NEEDED.
2. LIGHTING TO BE CONTROLLED BY THE BMS IN THIS AREA. PROVIDE UL924 RELAY WITH 0-10V OVERDRIVE FOR LS LIGHTS. MAKE CONNECTIONS AHEAD OF THE BMS. 0-10V DIMMING OVERRIDE ON UL924 RELAY TO ENSURE LS LIGHTS COME ON TO FULL BRIGHTNESS AT LOSS OF NORMAL POWER.
3. STAIR LIGHTING IS EXISTING-TO-REMAIN. PROVIDE TEMPORARY SERVICES AS NEEDED DURING CONSTRUCTION. REFEED EXISTING CIRCUITRY AS NECESSARY.
4. REWORK AND EXTEND EXISTING LIGHTS IN THESE ROOMS TO NEW PANELBOARDS ON THIS FLOOR.



1 FOURTH FLOOR PLAN - LIGHTING





E-204R



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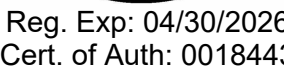
LIGHTING DESIGN:
Cline Bettridge Bernstein Lighting Design
116 East 27th Street, 4th Floor
New York, NY 10016
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AUDIOVISUAL, IT, SECURITY:
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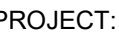
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SEAL:



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KEY PLAN



40 Garden Ave, Ithaca, NY 14853

DRAWING TITLE

FLOOR PLAN - THIRD FLOOR - POWER & SPECIAL SYSTEMS

OBJECT NO: 240400	DATE: 01/31/2025
BASE: 100% CD	SCALE: 1/8" = 1'-0"

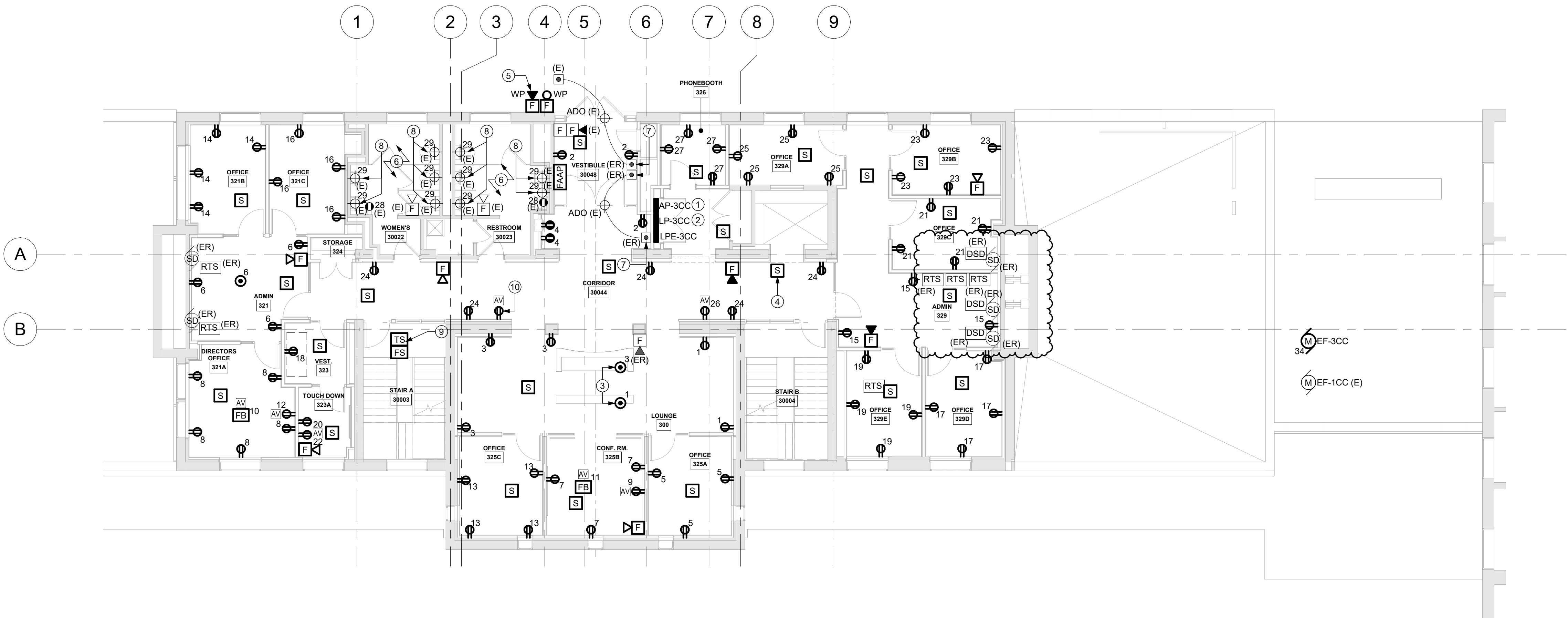
E-212R

GENERAL NOTES:

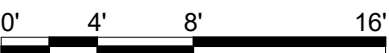
- A UNLESS OTHERWISE INDICATED, DEVICES ON THIS FLOOR SHALL BE CIRCUITED TO EXISTING PANEL AP-3CC.
- B CIRCUIT ALL SMOKE DAMPERS ON THIS FLOOR TO PANELBOARD LPE-3CC, CIRCUIT NUMBER 5. EXTEND CIRCUIT TO COVER EXISTING-TO-REMAIN SMOKE DAMPERS.
- C RECONNECT EXISTING DUCT SMOKE DETECTORS, SMOKE DAMPERS, AND REMOTE STATIONS AS NEEDED FOR FIRE ALARM AND POWER CHANGEOVERS.

⊗ DRAWING NOTES:

1. PROVIDE 100A FEED-THROUGH PANELBOARD. TO BE FED FROM PANEL AP-4CC, TO FEED AP-2CC. COORDINATE FINAL LOCATION WITH ARCHITECTURAL DRAWINGS.
2. PROVIDE 100A FEED-THROUGH PANELBOARD. TO BE FED FROM PANEL LP-4CC, TO FEED LP-2CC. COORDINATE FINAL LOCATION WITH ARCHITECTURAL DRAWINGS.
3. POWER AND POKE-THRU AT THIS DESK TO BE FED FROM BELOW.
4. SMOKE DETECTOR SHALL BE USED FOR ELEVATOR RECALL.
5. DEVICES TO BE INSTALLED ADJACENT TO FIRE DEPARTMENT CONNECTION. PROVIDE CONNECTION TO EXISTING FLOOR SWITCHES FOR ALARM BELL FUNCTIONALITY. PROVIDE CIRCUIT FROM EMERGENCY PANELBOARD.
6. REWORK AND EXTEND CIRCUITRY FOR DEVICES IN THIS ROOM TO NEW PANELBOARD AP-3CC ON THIS FLOOR, CIRCUIT NUMBER AS SHOWN.
7. REINSTALL PUSH BUTTON FOR AUTOMATIC DOOR OPERATOR SALVAGED FROM DEMOLITION PHASE. REWORK AND EXTEND CIRCUITRY AS NECESSARY FOR A COMPLETE INSTALLATION.
8. EXISTING LOW VOLTAGE TRANSFORMER FOR AUTOMATIC FLUSH AND AUTOMATIC FAUCETS.
9. PROVIDE MODULES FOR EXISTING TAMPER AND FLOW SWITCHES.
10. PROVIDE BACKBOX FOR INSTALLATION OF FUTURE AV COMPONENTS.



1 THIRD FLOOR PLAN - POWER & SPECIAL SYSTEMS





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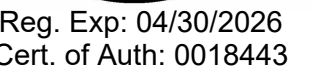
LIGHTING DESIGN:
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SEAL:



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KEY PLAN:



RENOVATE 2ND - 5TH FLOOR AT KING-SHAW HALL

40 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:
FLOOR PLAN - FOURTH
FLOOR - POWER &
SPECIAL SYSTEMS

PROJECT NO: 240400	DATE: 01/31/2025
BASE: 100% CD	SCALE: 1/8" = 1'-0"

E-213R

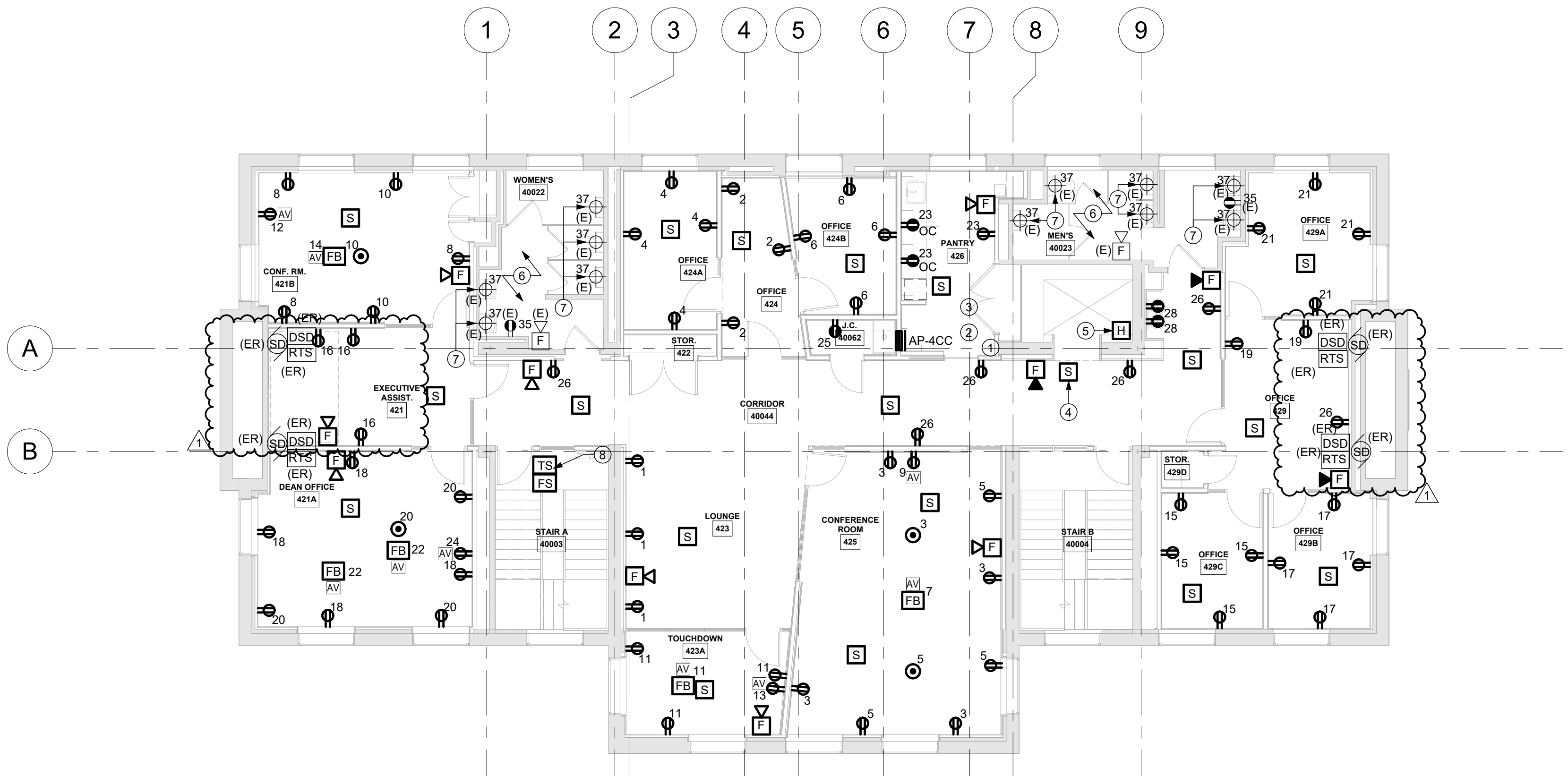
GENERAL NOTES:

A UNLESS OTHERWISE INDICATED, DEVICES ON THIS FLOOR SHALL BE CIRCUITED TO EXISTING PANEL AP-4CC.

B RECONNECT EXISTING DUCT SMOKE DETECTORS, SMOKE DAMPERS, AND REMOTE TEST STATIONS AS NEEDED FOR FIRE ALARM AND POWER CHANGEOVERS.

⊗ DRAWING NOTES:

1. PROVIDE 100A FEED-THROUGH PANELBOARD. TO BE FED FROM PANEL MDPL-5CC, TO FEED AP-3CC. COORDINATE FINAL LOCATION WITH ARCHITECTURAL DRAWINGS.
2. PROVIDE 100A FEED-THROUGH PANELBOARD. TO BE FED FROM PANEL MDPL-5CC, TO FEED LP-3CC. COORDINATE FINAL LOCATION WITH ARCHITECTURAL DRAWINGS.
3. PROVIDE 100A MLO PANELBOARD FOR EMERGENCY LIGHTING LOADS. TO BE FED FROM PANEL LPE-2CC.
4. SMOKE DETECTOR SHALL BE USED FOR ELEVATOR RECALL.
5. HEAT DETECTOR SHALL BE INSTALLED WITHIN 2'-0" OF SPRINKLER HEAD.
6. REWORK AND EXTEND CIRCUITRY FOR DEVICES IN THIS ROOM TO NEW PANELBOARD AP-4CC ON THIS FLOOR. CIRCUIT NUMBER AS SHOWN.
7. EXISTING LOW VOLTAGE TRANSFORMER FOR AUTOMATIC FLUSH AND AUTOMATIC FAUCETS.
8. PROVIDE MODULES FOR EXISTING TAMPER AND FLOW SWITCHES.



1 FOURTH FLOOR PLAN - POWER & SPECIAL SYSTEMS

SCALE: 1/8" = 1'-0"





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The site plan shows a rectangular building complex. At the top is a horizontal line labeled 'GARDEN AVENUE'. Below it are three main building sections: 'DOLGEN HALL' on the left, 'KING-SHAW HALL' in the center, and 'ILR RESEARCH' on the right. A bracket groups 'DOLGEN HALL' and 'KING-SHAW HALL'. Below these buildings is a horizontal line labeled 'GOLDEN COURTYARD'. To the left of the buildings is a vertical line labeled 'PROJECT NORTH' with an arrow pointing upwards. A compass rose is located at the bottom left of the page, showing North (N) at the top, South (S) at the bottom, East (E) to the right, and West (W) to the left.

RENOVATE 2ND - 5TH FLOOR AT KING-SHAW HALL

40 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:

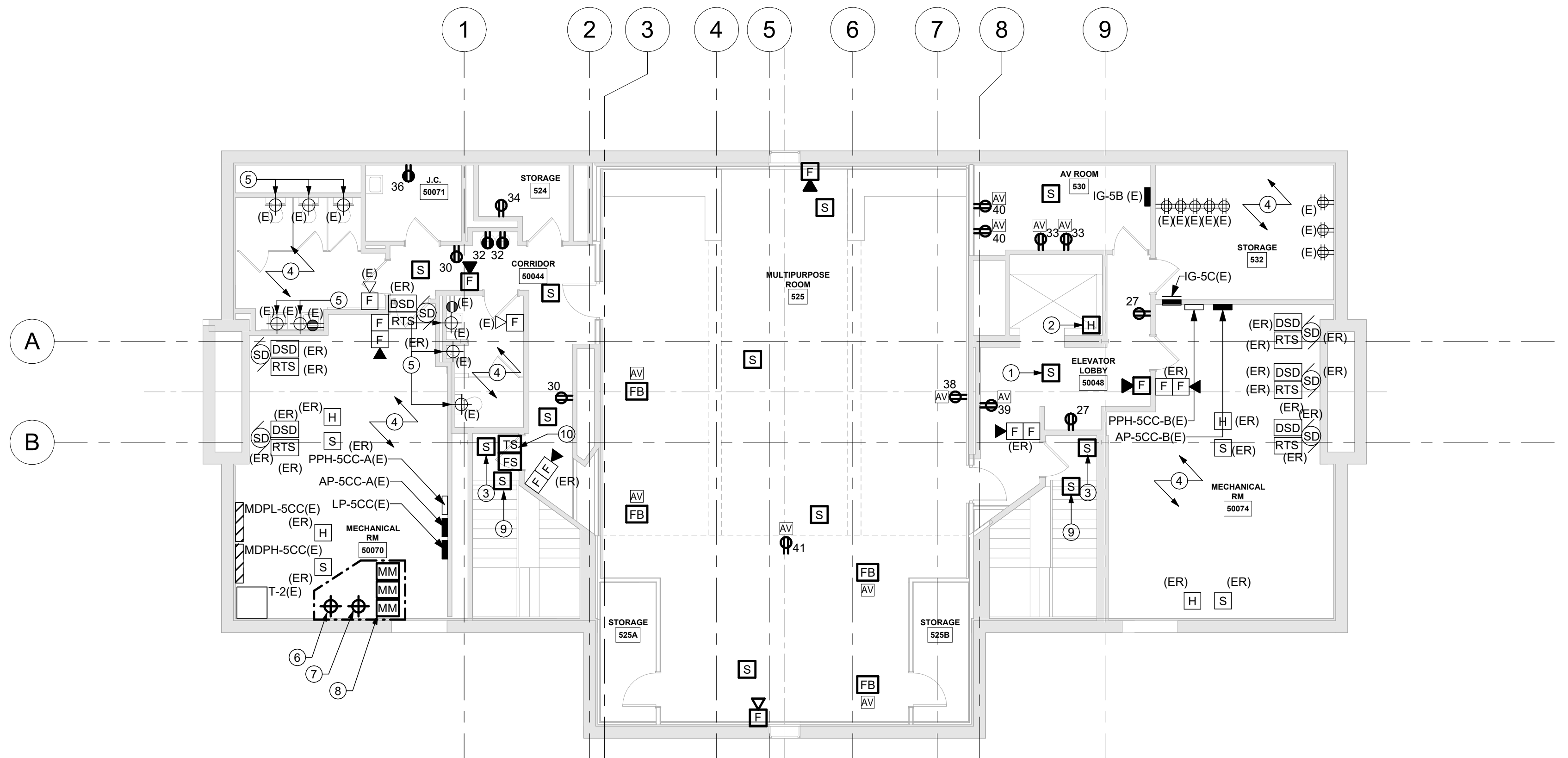
FLOOR PLAN - FIFTH FLOOR - POWER & SPECIAL SYSTEMS

E-214R

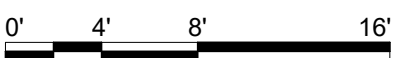
A UNLESS OTHERWISE INDICATED, DEVICES ON THIS FLOOR SHALL BE CIRCUITED TO EXISTING PANEL AP-4CC.

B DISCONNECT EXISTING DUCT SMOKE DETECTORS, SMOKE DAMPERS, AND REMOTE TEST STATIONS AS NEEDED FOR FIRE ALARM AND POWER CHANGEOVERS.

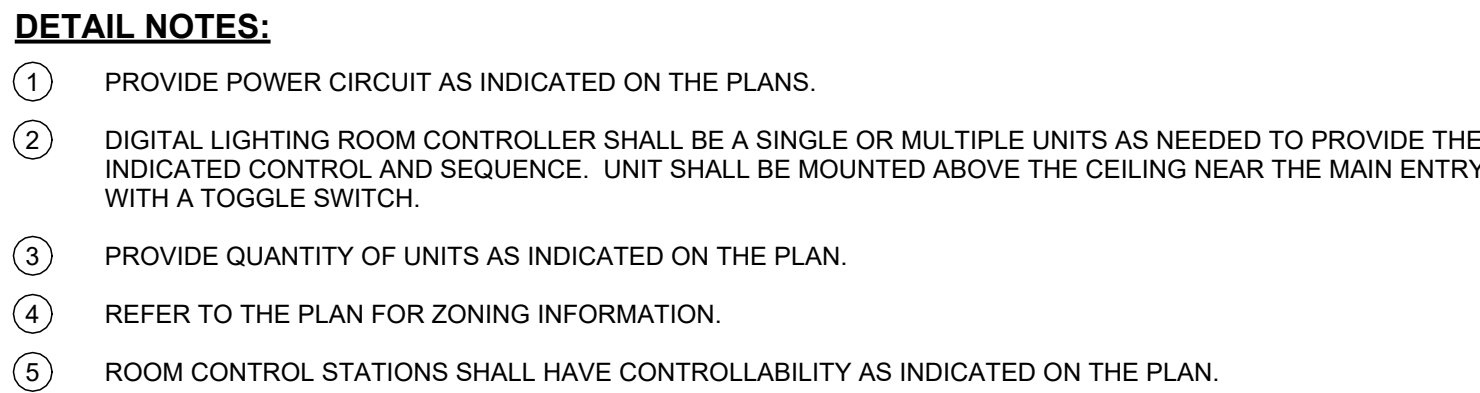
1. SMOKE DETECTOR SHALL BE USED FOR ELEVATOR RECALL.
2. HEAT DETECTOR SHALL BE INSTALLED WITHIN 2'-0" OF SPRINKLER HEAD.
3. PROVIDE REMOTE TEST STATION FOR SMOKE DETECTORS AT TOP OF DECOMMISSIONED SMOKE HATCH.
4. DEVICES IN THIS AREA ARE EXISTING-TO-REMAIN. REFEED CIRCUITS AS NECESSARY.
5. EXISTING LOW VOLTAGE TRANSFORMER FOR AUTOMATIC FLUSH AND AUTOMATIC FAUCETS.
6. PROVIDE (1) 20A, 1P CIRCUIT FOR NITROGEN GENERATOR AT DRY SPRINKLER SYSTEM. CIRCUIT TO EXISTING PANELBOARD AP-SCC-A WITH (2)#12AWG & (1)#12 EG IN 3/4".
7. PROVIDE (1) 20A, 1P CIRCUIT FOR AIR COMPRESSOR AT DRY SPRINKLER SYSTEM. CIRCUIT TO EXISTING PANELBOARD AP-SCC-A WITH (2)#12AWG & (1)#12 EG IN 3/4". COORDINATE FINAL CIRCUIT REQUIREMENTS WITH FIRE PROTECTION SUBMITTALS.
8. PROVIDE FIRE ALARM CONNECTIONS FOR THE FOLLOWING COMPONENTS:
DRY PILOT LINE SUPERVISORY/ALARM SWITCH
WATER FLOW ALARM PRESSURE SWITCH
TAMPER SWITCH ON MAIN WATER SUPPLY CONTROL VALVE
9. DEVICE TO BE INSTALLED AT LOCATION OF DEVICE REMOVED DURING DEMOLITION.
10. PROVIDE MODULES FOR EXISTING TAMPER AND FLOW SWITCHES.



1 FIFTH FLOOR PLAN - POWER & SPECIAL SYSTEMS



6 BACS LIGHTING CONTROLS SCHEDULE



1. ROOM UNOCCUPIED: LIGHTING TO BE OFF AFTER TIME DELAY FROM LAST MOTION SENSING.
2. ROOM OCCUPIED: UPON SENSING OF MOTION IN THE SPACE, THE SENSOR SHALL ENABLE THE ROOM CONTROLLER BUT NOT ENERGIZE THE LIGHTING (LOAD) UNTIL MANUAL OPERATION OF THE DIGITAL WALL CONTROLLER. LIGHTING SHALL REMAIN ENERGIZED UNTIL MOTION IS NOT SENSED (INITIATE TIME DELAY, SET FOR 30 MINUTES) OR ANOTHER OPERATION OF THE DIGITAL WALL CONTROLLER AND THEN DE-ENERGIZE.
3. DAYLIGHT SENSOR TO PROVIDE A SIGNAL TO THE INDICATED LUMINAIRES (ZONE #) TO MAINTAIN XX FC IN THE SPACE AS THE DAYLIGHT CONTRIBUTION CHANGES.
4. MANUAL DIMMING/SCENE SELECTION OF THE DIGITAL WALL CONTROLLER(S) SHALL OVER RIDE THE DAYLIGHT SENSOR DIMMING CONTROL OF THE LUMINAIRES BUT SHALL NOT EXCEED THE FC SETTING - LIGHTING LEVEL CAN GO BELOW BUT NOT ABOVE.

DETAIL NOTES:

1. PROVIDE CUSTOM NAMEPLATE AS INDICATED FOR ALL PANELBOARDS, MCC'S, SWITCHBOARDS, SWITCHGEAR, TRANSFER SWITCHES, GENERATORS ETC.
2. NAMEPLATE SHALL BE ENGRAVED (WHITE LETTERING, BLACK BACKGROUND) AND ATTACHED TO THE EQUIPMENT WITH SCREWS. LETTERING SHALL BE 1/4" HIGH WITH SPACE BETWEEN LINES 1/8" MINIMUM. MINIMUM SHALL BE 8"H x 8"W.
3. PROVIDE SAMPLE NAMEPLATE FOR REVIEW.
4. THE AVAILABLE SHORT CIRCUIT AND OCPD CLEARING TIME SHOULD BE PROVIDED AT THE SERVICE ENTRANCE IF GREATER THAN OR EQUAL TO 1000A.

NOTES:

- A. WHERE MULTIPLE SETS ARE SPECIFIED, PROVIDE PHASE, NEUTRAL (IF REQUIRED), AND EGC OF WIRE SIZE INDICATED IN EACH CONDUIT. CONDUCTORS AND CONDUITS SHALL BE EQUAL IN LENGTH AND EACH BE OF SAME MANUFACTURER.
- B. MINIMUM EMT CONDUIT SIZE IS BASED ON 40% FILL.
- C. A 3-WIRE FEEDER IS (3) PHASE CONDUCTORS WHEN PROTECTED BY A 3-POLE OCPD. A 3-WIRE FEEDER IS (2) PHASE CONDUCTORS AND (1) NEUTRAL CONDUCTOR WHEN PROTECTED BY A 2-POLE OCPD.
- D. A 4-WIRE FEEDER IS (3) PHASE CONDUCTORS & (1) NEUTRAL CONDUCTOR.
- E. A 5-WIRE FEEDER IS (3) PHASE CONDUCTORS & (2) NEUTRAL CONDUCTORS.

SCALE: NTS

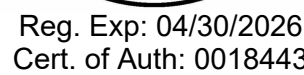


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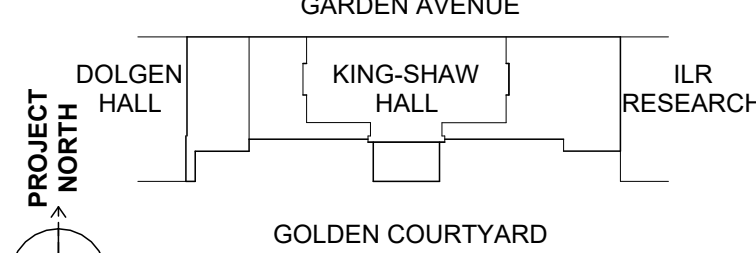
- A. PROVIDE GREEN GROUND WIRE IN ALL RECEPTACLE CIRCUITS. CONNECT TO GROUND BUS IN PANEL.
- B. DO NOT INSTALL RECEPTACLES, COMPUTER OR TELEPHONE OUTLETS BACK TO BACK. INSTALL IN ADJACENT STUD CAVITIES, TO REDUCE SOUND INTERFERENCE.

SCALE: NTS

[illegible]

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KEY PLAN



PROJECT:

140 Garden Ave, Ithaca, NY 14853

DRAWING TITLE:

DETAILS - ELECTRICAL

E-400R



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New York, New York 10036
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SEAL:

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KEY PLAN:



RENOVATE 2ND - 5TH
FLOOR AT KING-SHAW
HALL
DRAWING TITLE:
TELECOMMUNICATIONS
PLAN - SECOND FLOOR

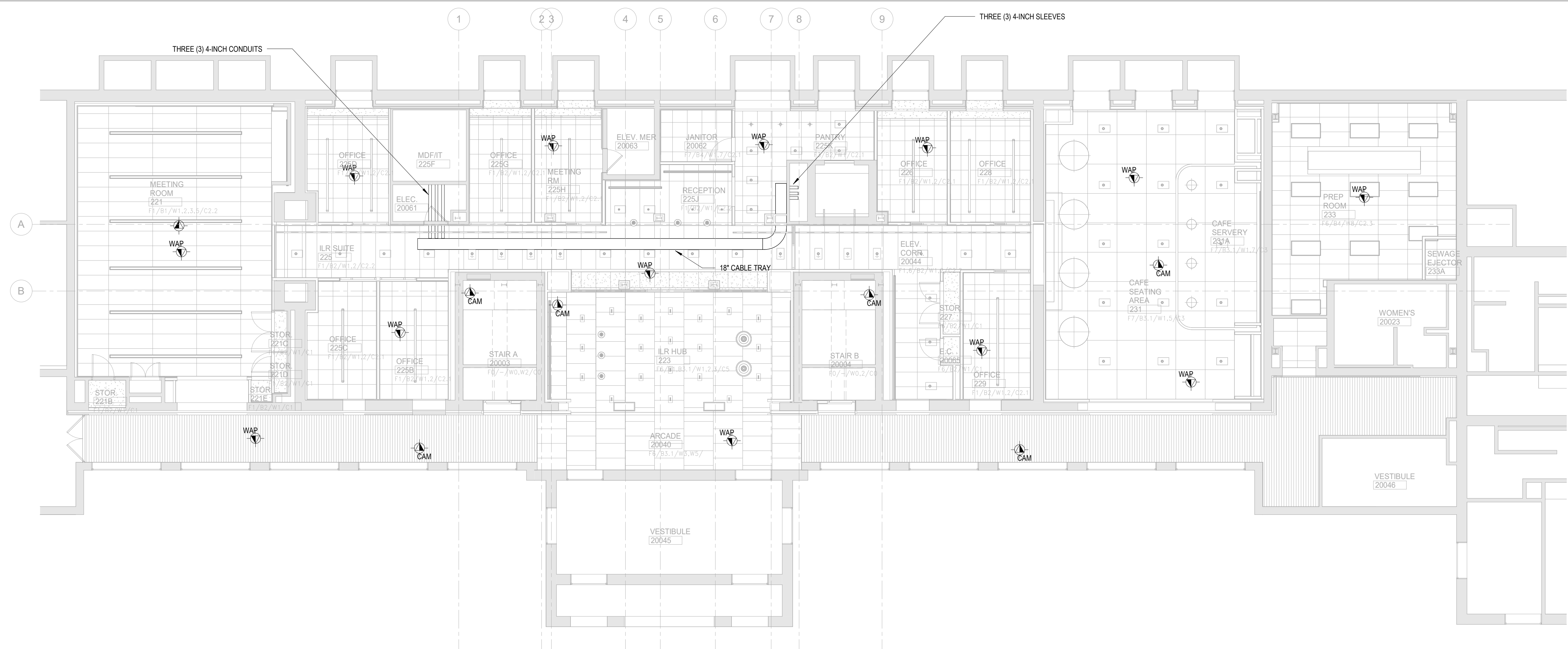
PROJECT NO: 243310.0129

DATE: 01/31/2025

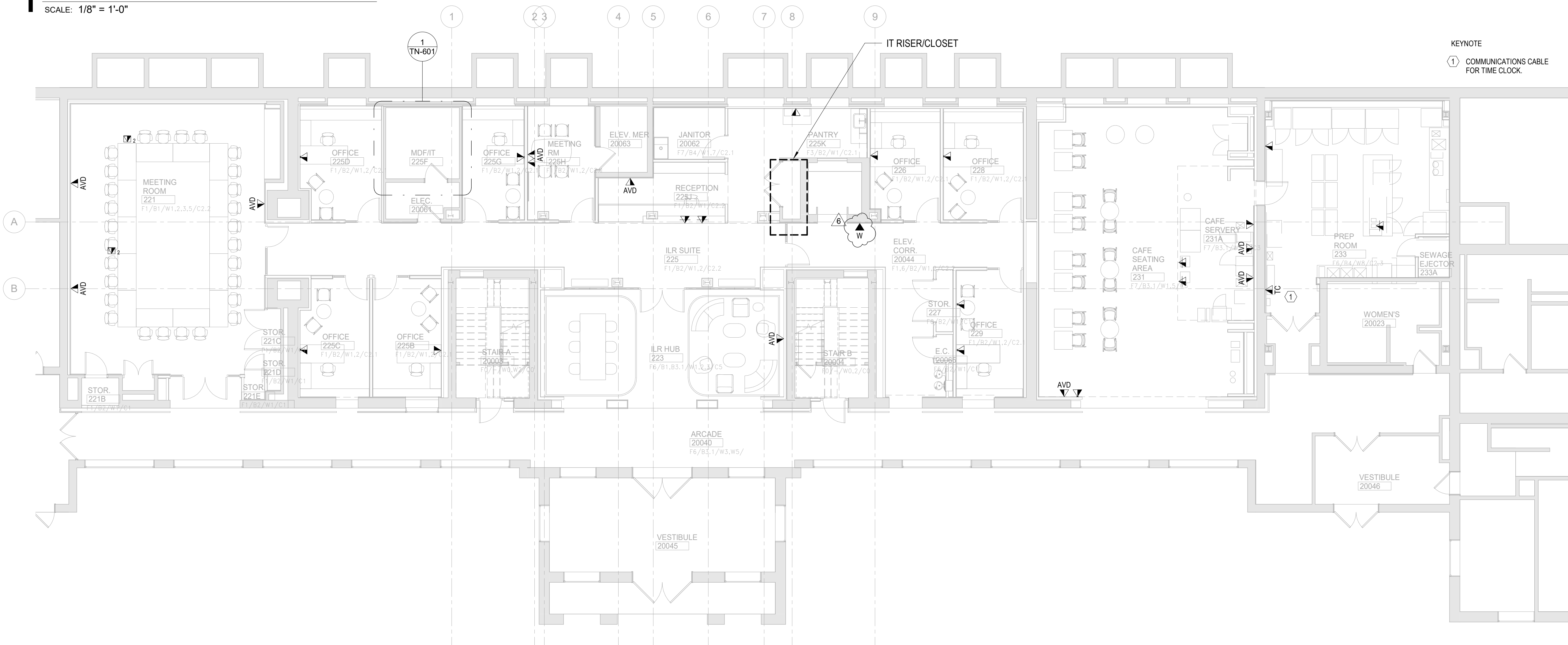
CHASE: 100% CD

SCALE: 1/8" = 1'-0"

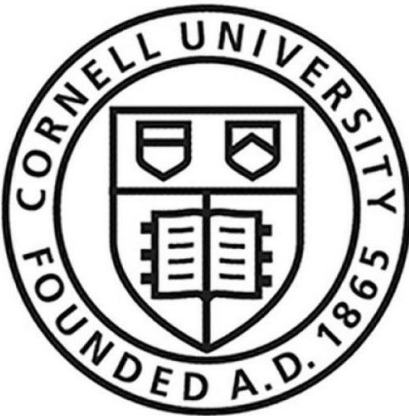
TN-201R



SCALE: 1/8" = 1'-0"



SCALE: 1/8" = 1'-0"



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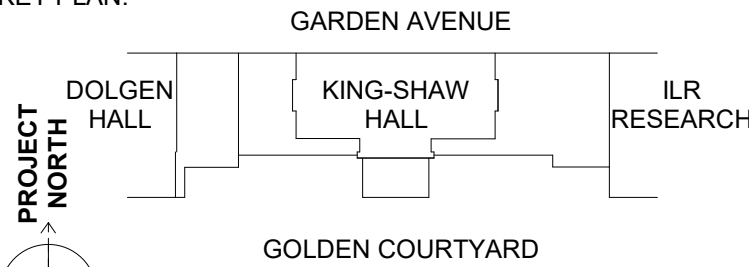
SEAL:

ISSUE/REVISION:

NO.	DATE	COMMENTS
1	2024-08-27	PROGRESS SET
2	2024-09-04	PRICING SET
3	2024-09-27	DESIGN DEVELOPMENT
4	2024-12-18	90% CD
5	2025-01-31	100% CD
6	2025-04-29	ADDENDUM 03

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KEY PLAN:



PROJECT:

**RENOVATE 2ND - 5TH
FLOOR AT KING-SHAW
HALL**
DRAWING TITLE:
**TELECOMMUNICATIONS
PLAN - THIRD & FOURTH
FLOOR**

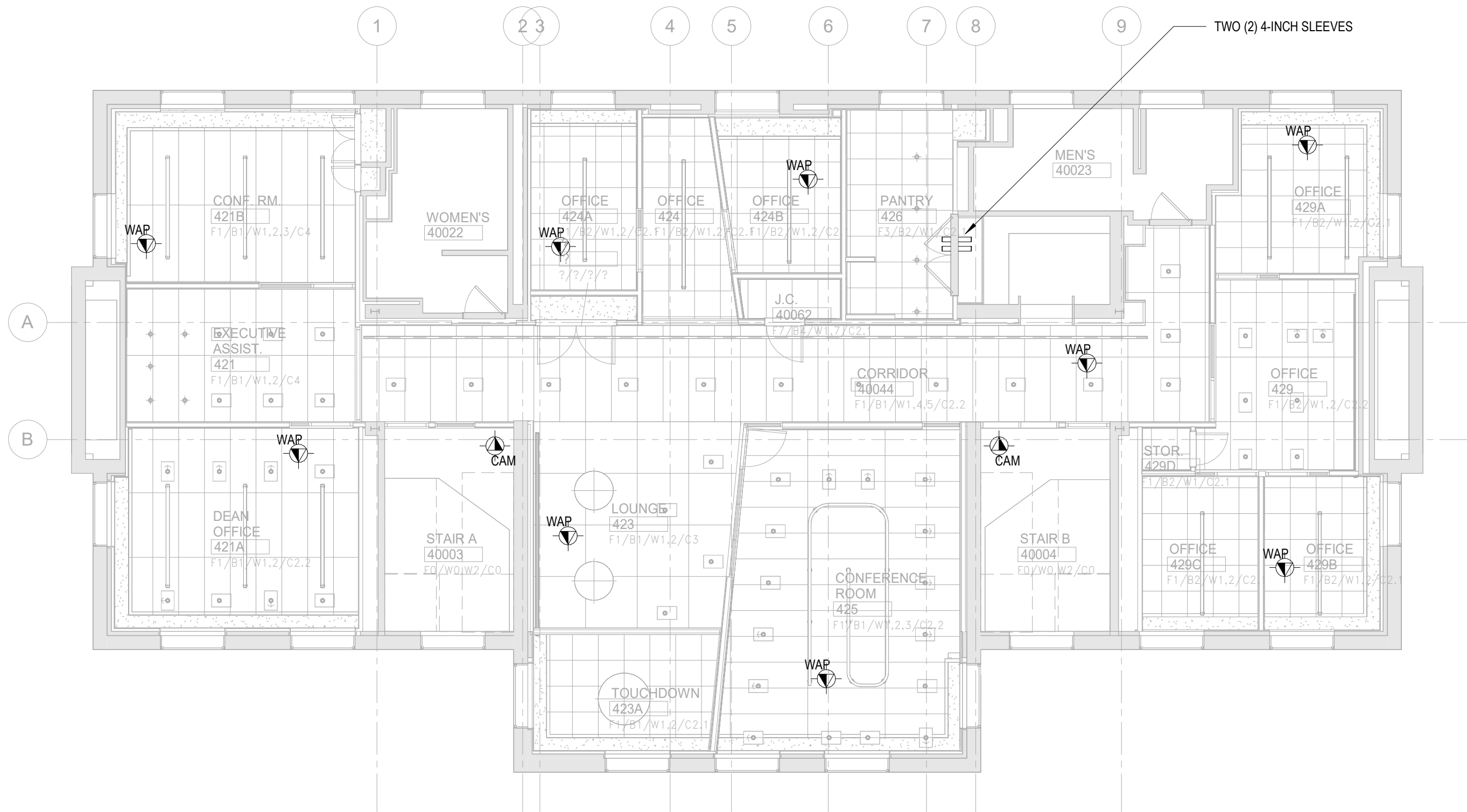
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DATE: 01/31/2025

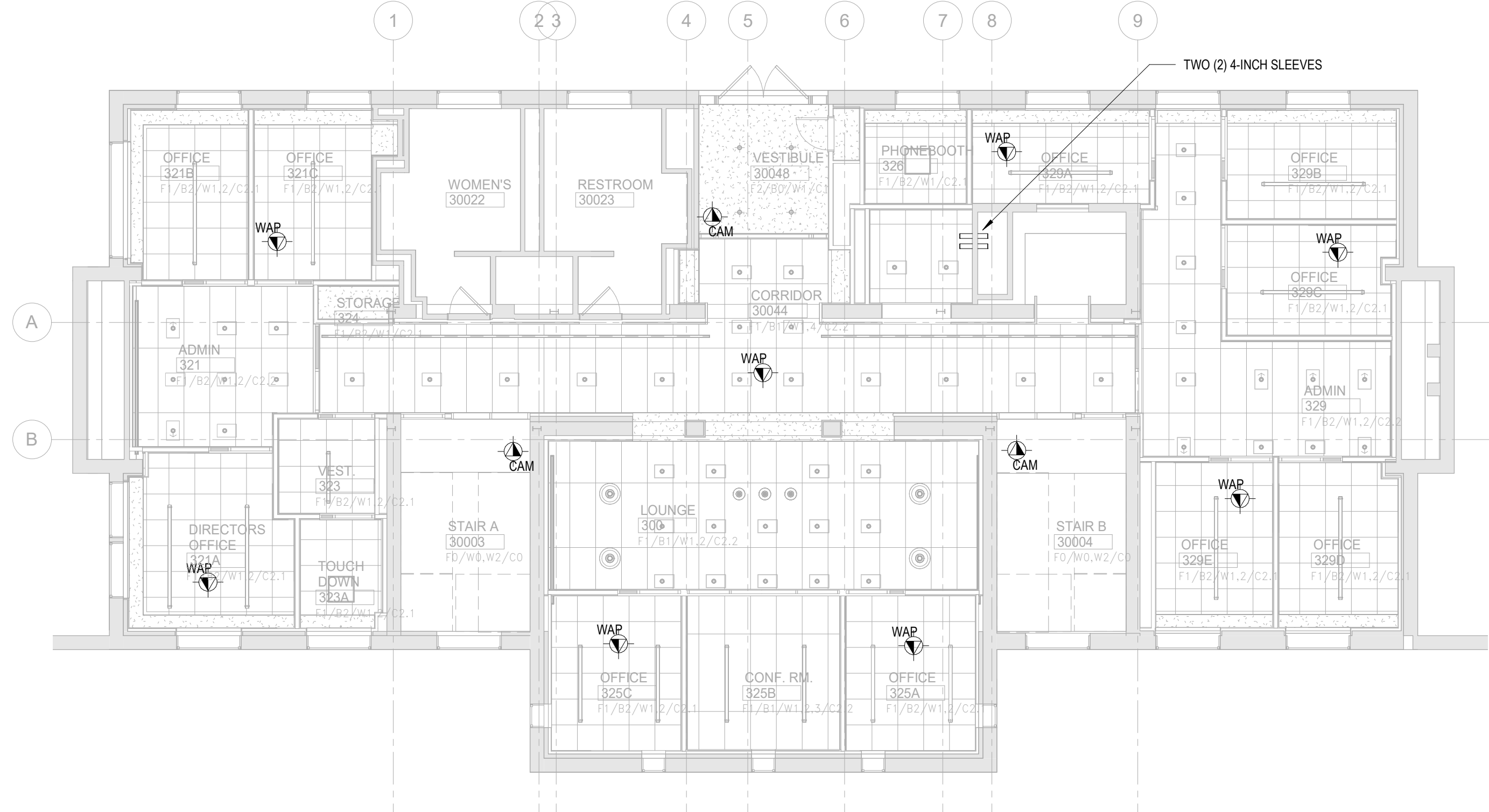
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SCALE: 1/8" = 1'-0"

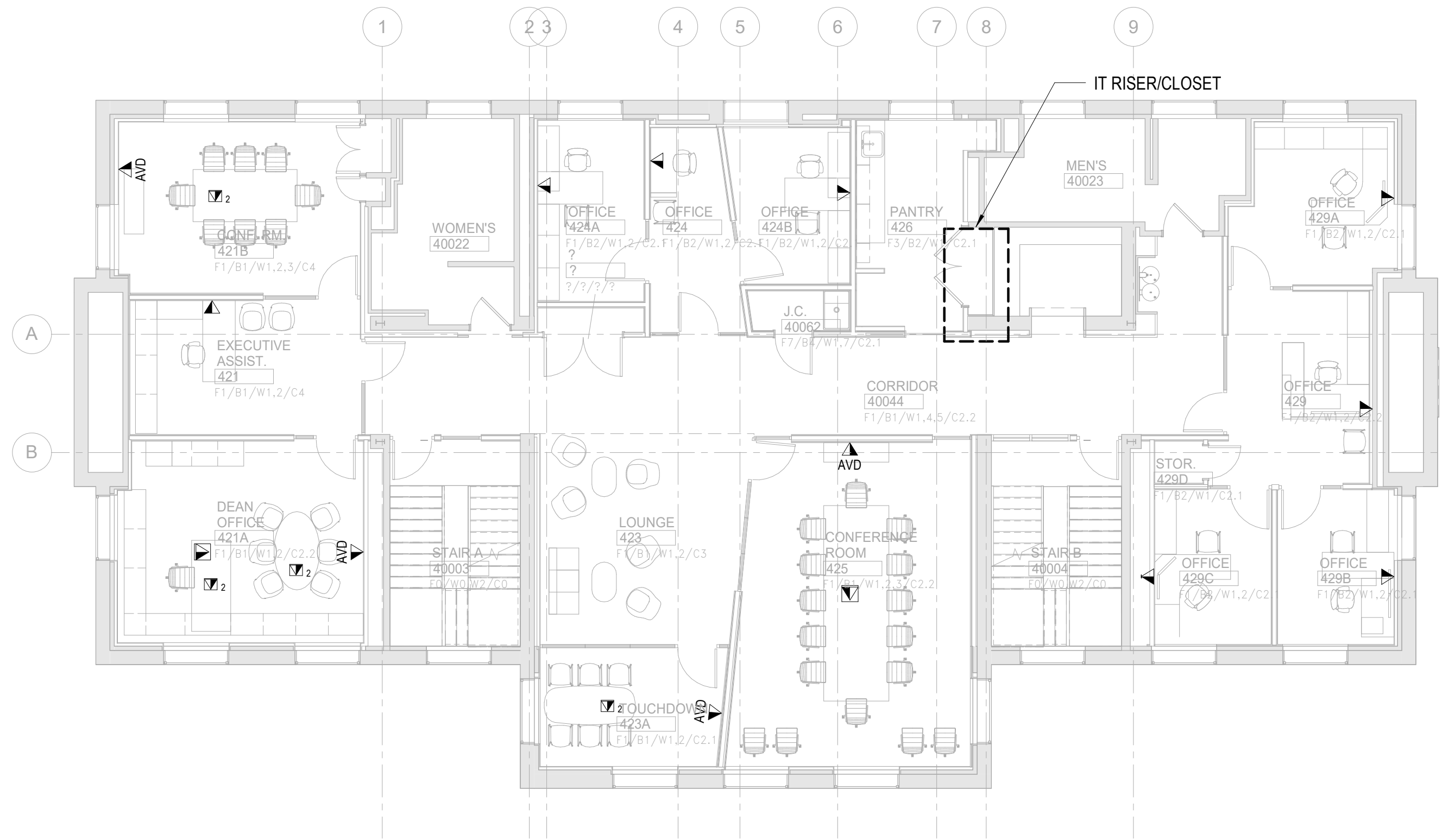
TN-202R



4 TELECOMMUNICATIONS CEILING PLAN - FOURTH FLOOR
SCALE: 1/8" = 1'-0"



2 TELECOMMUNICATIONS CEILING PLAN - THIRD FLOOR
SCALE: 1/8" = 1'-0"



RFI Form

RFI/ Response Index	Page/ Dwg./Spec./Rep. Number	Section/ Paragraph/Topic	RFI	Design Team Response
1			Due to local bid market feedback and upcoming holiday, we respectfully request a two-week bid extension.	The bid deadline will not be extended as discussed during the Pre-bid Meeting.
2			Is it possible to either schedule a tour of the building or to receive pictures of the existing interior conditions?	See Addendum No. 1, Item 1.
3	TA-000	AV Scope	Audiovisual Cover Sheet TA-000 has a responsibility matrix which identifies the front projection screens are supplied by the AV Division. Installed by the GC including the necessary blocking. Could not find where it is identified the AV Division is NOT part of this contract. Please clarify.	Where noted 'AV DIVISION', all equipment, materials, and labor shall be outside of the General Contractor's contract.
4	A-200, A-201, A-203	Corner Guards	Corner Guards, CG1 & GC 2, are shown on A-200, A-201 & A-203. They are not described on the finish schedule on A-740. Please supply a specification for them.	See Drawing A-720, details 07 and 08.
5	102219	Demountable Partitions	There is a specification for Demountable Partitions (102219). Could not find them on the drawings. Please clarify.	Demountable Partitions are identified as Glazed Metal Partitions on Floor Plans (Key note #2) and Elevations.
6	S-004	Concrete Specs	Drawing S-004, Detail 5 & 6 identifies some concrete slab on grade replacement. There is no specification on S-001 for Concrete. Please clarify.	See Addendum 3, Items 22 and 23 for concrete specifications and testing.
7	General Conditions	Builder's Risk	It was mentioned in the pre bid meeting that builder's risk is required. Could not find it in Section 10.06 of the general conditions. Please clarify.	See General Conditions, Section 10.08 - Owner's and Contractor's Responsibilities for Fire and Extended Coverage Insurance Hazards
8		Data Infrastructure	During the walkthrough, it was mentioned that some of the data infrastructure for the ILR complex originates in King Shaw Hall, but this is not indicated on the drawings. Please clarify what, if any, teledata infrastructure there may be in King Shaw that feeds other buildings.	We are not aware of any existing backbone. Contractor will need to confirm with Cornell IT, then trace and tag, if required.
9		Security	Please clarify if there are any existing access control provisions in King Shaw that may feed/connect to other buildings in the ILR complex.	The security system will be connected to the main security which will communicate to the main security command center.
10		Cupola Electrical	Please confirm that there is no existing electrical in the cupola.	Electrical not currently included in cupola per existing documentation.
11		Fire Alarm Infrastructure	Please provide a labor allowance for investigating/tracing existing feeders, fire alarm infrastructure, etc. that is to be protected during demolition.	See General Requirements Section 01 21 00 - Allowance No. 2 on page 01 21 00-4. Also, see Addendum No. 3, Item 1.
12	068300	Composite Paneling	Composite Paneling 068300 is supplied by the Owner. Please identify where it is installed on the project. It does not show up on the Finish Schedule on A-201, A-202 & A-203.	Composite Paneling is identified as 3 Dimensional Texture Panel; see elevations details 02, 03, 04 on Drawing A-707.
13	A-704	Wood Wall Paneling	Elevations 01/A-704 & 01?A704 show wood wall paneling "WD-X". This type is not identified on A-740. Please clarify.	See Drawing A-704, Interior Finish legend.
14		Stone Base	Rooms 223, 231 & 20040 identify stone base to match existing. There is no specification for the stone base. Should we assume there will be enough from the select demo to complete the new work.	Yes, see details 02 and 03 on Drawing DA-201 and note stone base to be salvaged for reuse.

RFI/ Response Index	Page/ Dwg./Spec./Rep. Number	Section/ Paragraph/Topic	RFI	Design Team Response
15	A-702, A-724, A-719	Door 221B.1	Please reference detail 8/A-702. Door 221B.1 is noted as a repurposed door. Detail 5/A-724 notes the door as refurbished. The door schedule on A-719 lists this opening as having door type A. It is not noted as repurposed or refurbished. Please clarify whether or not a new door is desired here. There are also no specifications for any restoration work outside of the cupola alternate. Please provide.	Door is modified and repurposed existing door. See details 01 and 05 on Drawing A-724, demo drawings, and wood doors and hardware to be reused (key note #17).
16		Corner Guards	The floor plans call for corner guards CG1 & CG2. Please provide a specification for these items.	See response to RFI #4 above.
17	A-705	Plastic Laminate Sills	Detail 13/A-705 notes PLAM Sill Typical. This is an existing window. Please confirm that there are no new sills required at existing windows.	Sills required at all existing windows. See Addendum No. 3, details 07 and 08.
18	A-202, A-704	Windows	Please reference detail 1/A-202, Rooms 325A and 325C both call for new windows and shades. However the elevations that are called out in those rooms (8 & 9/A-704) show fabric wrapped panels covering the windows. Please advise.	See Addendum No. 3, Item 17. Elevations details 08 and 09 have been revised to include new windows and revised panel layouts.
19	A-706, A-719	Door 426.1	Door 426.1 is noted as a Wood Pocket Door on 1/A-706. The door schedule on A-719 notes this as a hollow metal door in a hollow metal frame. Please advise.	See Addendum No. 3, Item 20. Door is to be wood.
20	A-717	Wood Blocking	Detail 7/A-717 tells us to provide wood blocking. Please detail the layout and sizing of the desired wood blocking.	Blocking is indicated by hatched area; size as noted.
21	A-203	Section Tags	Detail 1/A-203 has section cuts for 1/A-710 and 2/A-710. Drawing A-710 was not included in the drawing set.	Disregard section references.
22	102219	Demountable Partitions	The project manual includes specification 102219 Demountable Partitions. However they are not clearly called out on the drawings. There are all glass partition systems throughout the project but we cannot determine what would fall under 084113 Aluminum Entrances And Storefronts or 102219 Demountable Partitions. The demountable partition specification also provides hardware sets, we tried to use those to determine which openings may be demountable but the 087100 Finish Hardware specification shares hardware set names with 102219. Please provide clarification on which set is required on the door schedule.	See response to RFI #5 above. See Addendum No. 3, Item 3 and 4. Both Sections to be reference for demountable partition door hardware. Aluminum Storefront identified on plans (key note #5) and Drawing A-711 elevations.
23		Bid Extension	We are requesting a bid date extension of a least one week.	See Addendum No. 2, Item 1. The Bid date was extended to May 13.