

# COLLINS MIDDLE SCHOOL

# FACULTY ROOM & HR RENOVATIONS

## COLLINS MIDDLE SCHOOL

SALEM, MA

100% CD  
JULY 13, 2021

No.	Description	Date
1	Addendum 1	8/27/21

COVER

# G000

Scale 1/8" = 1'-0"

8/26/2021 15:01:34

SHEET LIST		
SHEET NO.	SHEET NAME	
GENERAL		
G000	COVER	•
ARCHITECTURE		
A001	FACULTY ROOM DEMO	
A002	HR DEMO	
A100	FACULTY ROOM	•
A101	HR PLAN & FACULTY ROOM ELEVATIONS	•
MECHANICAL		
M001	MECHANICAL FACULTY ROOM DEMOLITION PLANS	
M100	MECHANICAL FACULTY ROOM PLANS	
M200	MECHANICAL HUMAN RES. PLANS	
M300	MECHANICAL LEGENDS, NOTES, & SPECIFICATIONS	•
PLUMBING		
P100	PLUMBING FACULTY ROOM	
FIRE SUPPRESSION		
F100	FIRE PROTECTION FACULTY ROOM PLAN	
F200	FIRE PROTECTION HUMAN RES. PLAN	
F300	FIRE PROTECTION NOTES & SPECIFICATIONS	
ELECTRICAL		
E000	ELECTRICAL SYMBOLS AND ABBREVIATIONS	
E001	ELECTRICAL FACULTY ROOM DEMOLITION PLANS	
E002	ELECTRICAL HUMAN RES. DEMO. PLANS	
E100	ELECTRICAL FACULTY ROOM PLANS	
E200	ELECTRICAL HUMAN RES. PLANS	
E300	ELECTRICAL SPECIFICATIONS	
E301	ELECTRICAL SPECIFICATIONS	
E302	ELECTRICAL SPECIFICATIONS	
E303	ELECTRICAL SPECIFICATIONS	
E304	ELECTRICAL SPECIFICATIONS	

Legend Title			
&	AND	HM	HOLLOW METAL
<	ANGLE	HORIZ	HORIZONTAL
@	AT	HR	HOUR
CL	CENTERLINE	HGT	HEIGHT
#	POUND OR NUMBER	ID	INSIDE DIMENSION
ACSP	ACCESSIBLE SPACE	INSUL	INSULATION
ACAS	ACCESSIBLE AISLE	INT	INTERIOR
ACOUS	ACOUSTICAL	JAN	JANITOR CLOSET
ACT	ACOUSTICAL CEILING TILE	JT	JOINT
ADJ	ADJUSTABLE	LBE	LOAD BEARING ELEMENT
ADJC	ADJACENT	LOC	LEAD COATED COPPER
AFF	ABOVE FINISHED FLOOR	LH	LEFT HAND
AGGR	AGGREGATE	LKR	LOCKER
ALUM	ALUMINUM	LP	LOW POINT
APPROX	APPROXIMATE	LT	LIGHT
ARCH	ARCHITECTURAL	MATL	MATERIAL
ASPH	ASPHALT	MAX	MAXIMUM
AUD	AUDITORIUM	MECH	MECHANICAL
BD	BOARD	MEMB	MEMBRANE
BITUM	BITUMINOUS	MTL	METAL
BLD	BOLLARD	MFR	MANUFACTURER
BLDG	BUILDING	MIN	MINIMUM
BLK	BLOCK	MISC	MISCELLANEOUS
BLKG	BLOCKING	MO	MASONRY OPENING
BM	BEAM	MR	MOISTURE RESISTANT
BOD	BOTTOM OF ROOF DECK	MTD	MOUNTED
BOT	BOTTOM	MUL	MULLION
CAB	CABINET	N	NORTH
CB	CATCH BASIN	NIC	NOT IN CONTRACT
CEM	CEMENT	NO	NUMBER
CER	CERAMIC	NOM	NOMINAL
CI	CAST IRON	NTS	NOT TO SCALE
CJ	CONTROL JOINT	OC	ON CENTER
CLAD	CLADDING	OD	OUTSIDE DIAMETER
CLG	CEILING	OFF	OFFICE
CLO	CLOSET	OFCI	OWNER FURNISHED
CLR	CLEAR	OFOI	CONTRACTOR INSTALLED
CO	CASED OPENING	OH	OPPOSITE HAND
COL	COLUMN	OPNG	OPENING
COMP	COMPRESSIBLE	OPP	OPPOSITE
CONC	CONCRETE	OVHD	OVERHEAD
CONN	CONNECTION	PART	PARTITION
CONSTR	CONSTRUCTION	PC	PRECAST
CONT	CONTINUOUS	PEP	PORCELAIN ENAMEL PANEL
CORR	CORRIDOR	PERF	PERFORATED
CPT	CARPET	PL	PLATE
CT	CERAMIC TILE	PLAS	PLASTER
CTR	CENTER	PLYWD	PLYWOOD
CTSK	COUNTERSUNK	POL	POLISHED
DBL	DOUBLE	POLY	POLYETHYLENE
DEPT	DEPARTMENT	PR	PAIR
DF	DRINKING FOUNTAIN	PT	PRESSURE TREATED
DET	DETAIL	PTD	PAINTED
DIA	DIAMETER	QT	QUARRY TILE
DIM	DIMENSION	R	RISER
DISP	DISPENSER	RAD	RADIUS
DN	DOWN	RCP	REFLECTED CEILING PLAN
DO	DOOR OPENING	RD	ROOF DRAIN
DR	DOOR	REF	REFERENCE
DWR	DRAWER	REINF	REINFORCED
DS	DOWNSPOUT	REMO	REMOVE
DSP	DRY STANDPIPE	REQ'D	REQUIRED
DWG	DRAWING	RESIL	RESILIENT
E	EAST	REV	REVISION
EA	EACH	RH	RIGHT HAND
EJ	EXPANSION JOINT	RM	ROOM
EL	ELEVATION	RO	ROUGH OPENING
ELEC	ELECTRICAL	ROW	RIGHT OF WAY
ELEV	ELEVATOR	RTU	ROOF TOP UNIT
EMER	EMERGENCY	S	SOUTH
ENCL	ENCLOSURE	SAFB	SOUND ATTENUATION FIRE
EP	ELECTRICAL PANELBOARD	BLANKET	
EQ	EQUAL	SCHED	SCHEDULE
EQPM	EQUIPMENT	SECT	SECTION
ESB	EXTERIOR SOFFIT BOARD	SG	SOUND GASKET
EWIC	ELECTRIC WATER COOLER	SH	SHELF
EXST	EXISTING	SHT	SHEET
EXPO	EXPOSED	SIM	SIMILAR
EXP	EXPANSION	SOH	SIMILAR OPPOSITE HAND
EXT	EXTERIOR	SPEC	SPECIFICATION
FA	FIRE ALARM	SQ	SQUARE
FD	FLOOR DRAIN	SS	STAINLESS STEEL
FDC	FIRE DEP. CONNECTION	STD	STANDARD
FDN	FOUNDATION	STL	STEEL
FE	FIRE EXTINGUISHER	STOR	STORAGE
FEC	FIRE EXTINGUISHER CABINET	STRUC	STRUCTURAL
FHC	FIRE HOSE CABINET	SUSP	SUSPENDED
FF	FINISH FLOOR	SYM	SYMMETRICAL
FIN	FINISH	SYS	SYSTEM
FL	FLOOR	TEL	TELEPHONE
FLSH	FLASHING	TER	TERRAZZO
FLUOR	FLUORESCENT	THK	THICK
FM	FLOOR MAT	TOC	TOP OF CONCRETE
FOC	FACE OF CONCRETE	TOS	TOP OF STEEL
FOF	FACE OF FINISH	TOW	TOP OF WALL
FOS	FACE OF STUD	TYP	TYPICAL
FRPF	FIREPROOF	UNF	UNFINISHED
FR	FIRE RATED	UON	UNLESS OTHERWISE NOTED
FRP	FIBERGLASS REINFORCED PLASTIC	VEN	VENEER
FRT	FIRE RETARDANT TREATED	VB	VAPOR BARRIER
FS	FULL SIZE	VCT	VINYL COMPOSITION TILE
FT	FOOT OR FEET	VERT	VERTICAL
FTG	FOOTING	VEST	VESTIBULE
FUR	FURRING	VIF	VERIFY IN FIELD
FUT	FUTURE	VVC	VINYL WALL COVERING
GC	GENERAL CONTRACTOR	W	WEST
GA	GAUGE	WID	WIDTH
GALV	GALVANIZED	WI	WITH
GL	GLASS	WD	WOOD
GL BLK	GLASS BLOCK	WH	WALL HUNG
GND	GROUND	W/O	WITHOUT
GR	GRADE	WP	WATERPROOF
GRT	GRATE	WT	WEIGHT
GWB	GYPSONUM WALL BOARD		
GYP	GYPSONUM		
HDCP	HANDICAPPED		
HB	HOSE BIB		
HC	HOLLOW CORE		
HDWD	HARDWOOD		
HDWE	HARDWARE		

Legend Title	
Room name 150 SF	AREA TAG
Room name 101 150 SF	ROOM TAG
101	DOOR TAG
AA	WINDOW TAG
11	WALL TAG
0.0	GRID LINES AND BUBBLES
1 A101	BUILDING SECTION
1 A101 SIM	WALL SECTION
1 A101 SIM	DETAIL
1 A101 SIM	CALLOUT
1 A101	EXTERIOR ELEVATION
4 A601 2 3	INTERIOR ELEVATION
LEVEL 1 0'-0"	DATUM/SPOT ELEVATION
A1 View Name	TITLE MARK
North Arrow	NORTH ARROW
ALUMINUM	GYPSONUM - PLASTER
BATT INSULATION	PARTICLE BOARD
BRICK, STONE MASONRY	PLASTIC
CONCRETE	PLYWOOD
CONCRETE MASONRY	RIGID INSULATION
EARTH	STEEL
GRAVEL	WOOD FINISH

**COLLINS  
MIDDLE  
SCHOOL**

SALEM, MA

**100% CD**  
JULY 13, 2021

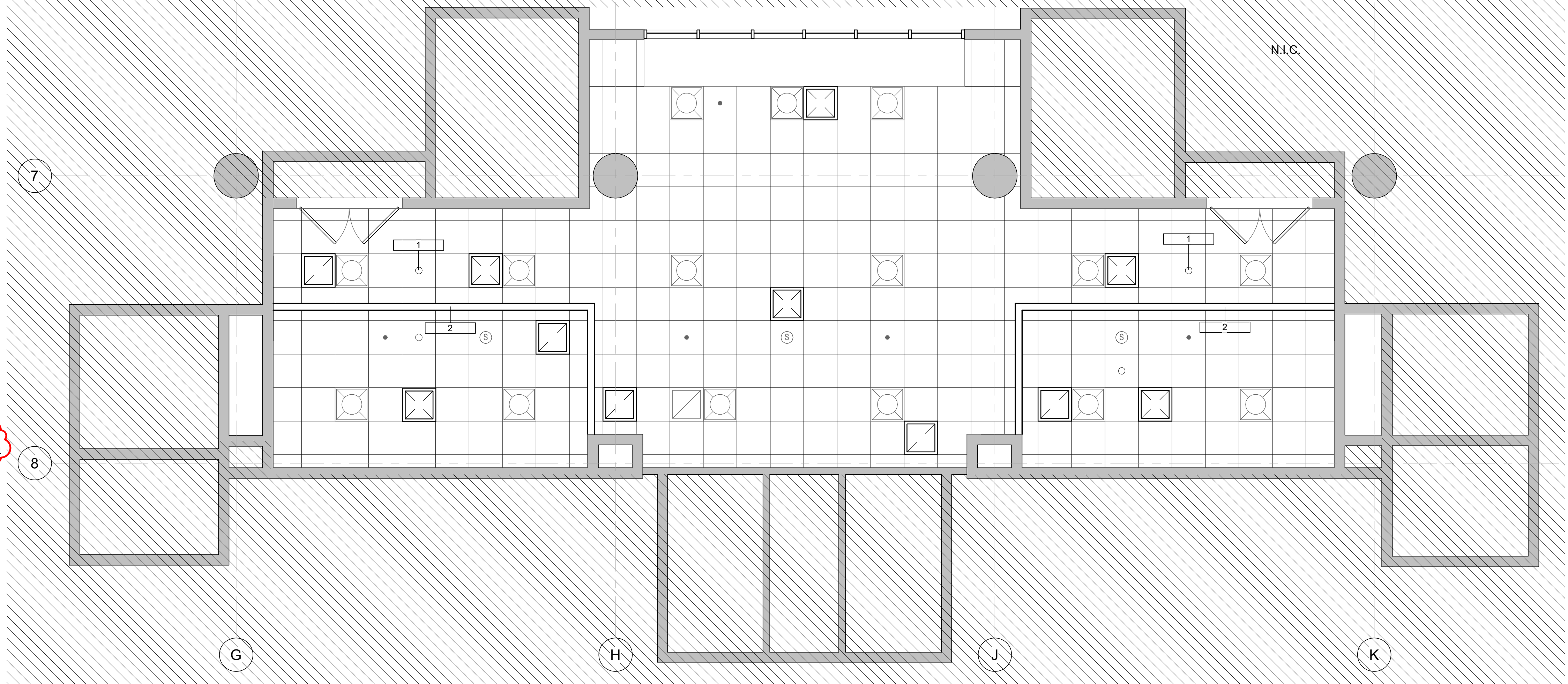
No.	Description	Date
1	Addendum 1	8/27/21

**FACULTY ROOM**

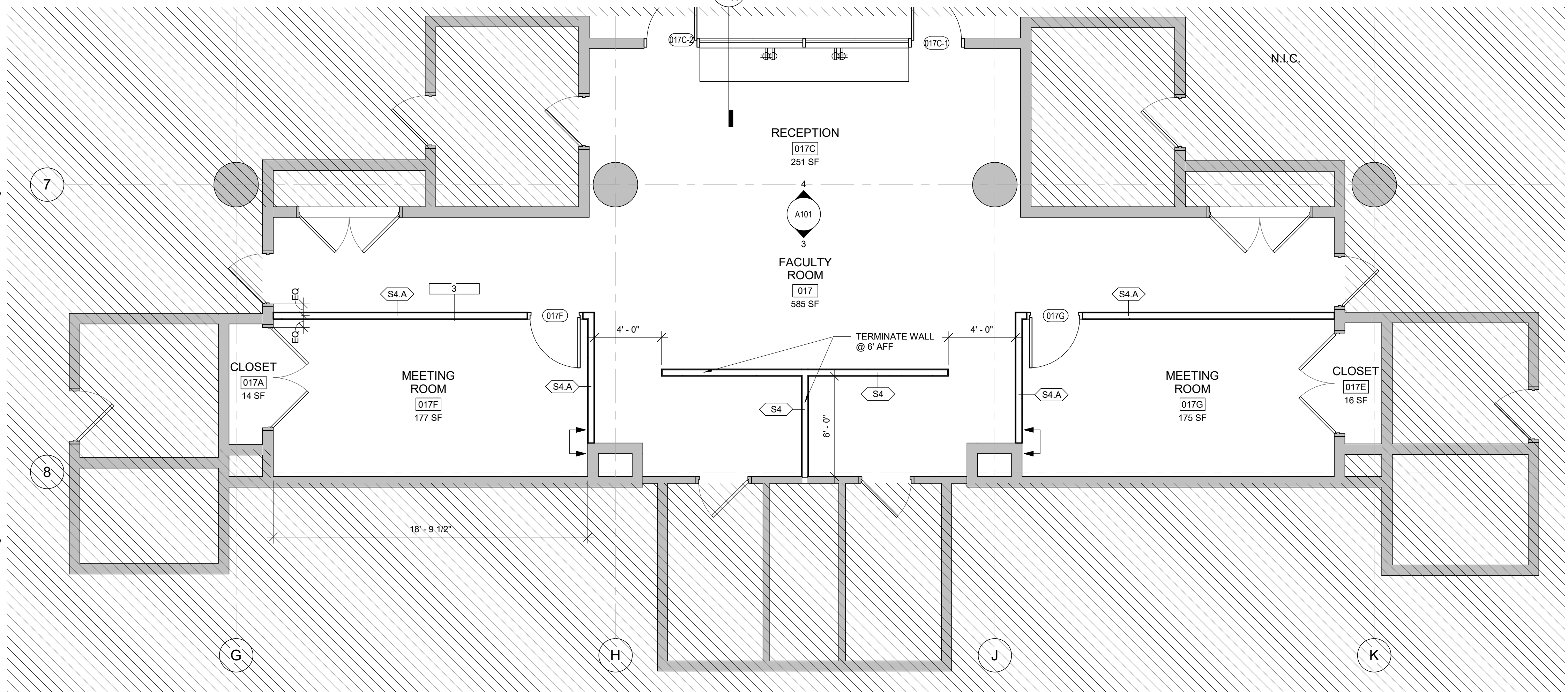
**A100**

Scale As indicated

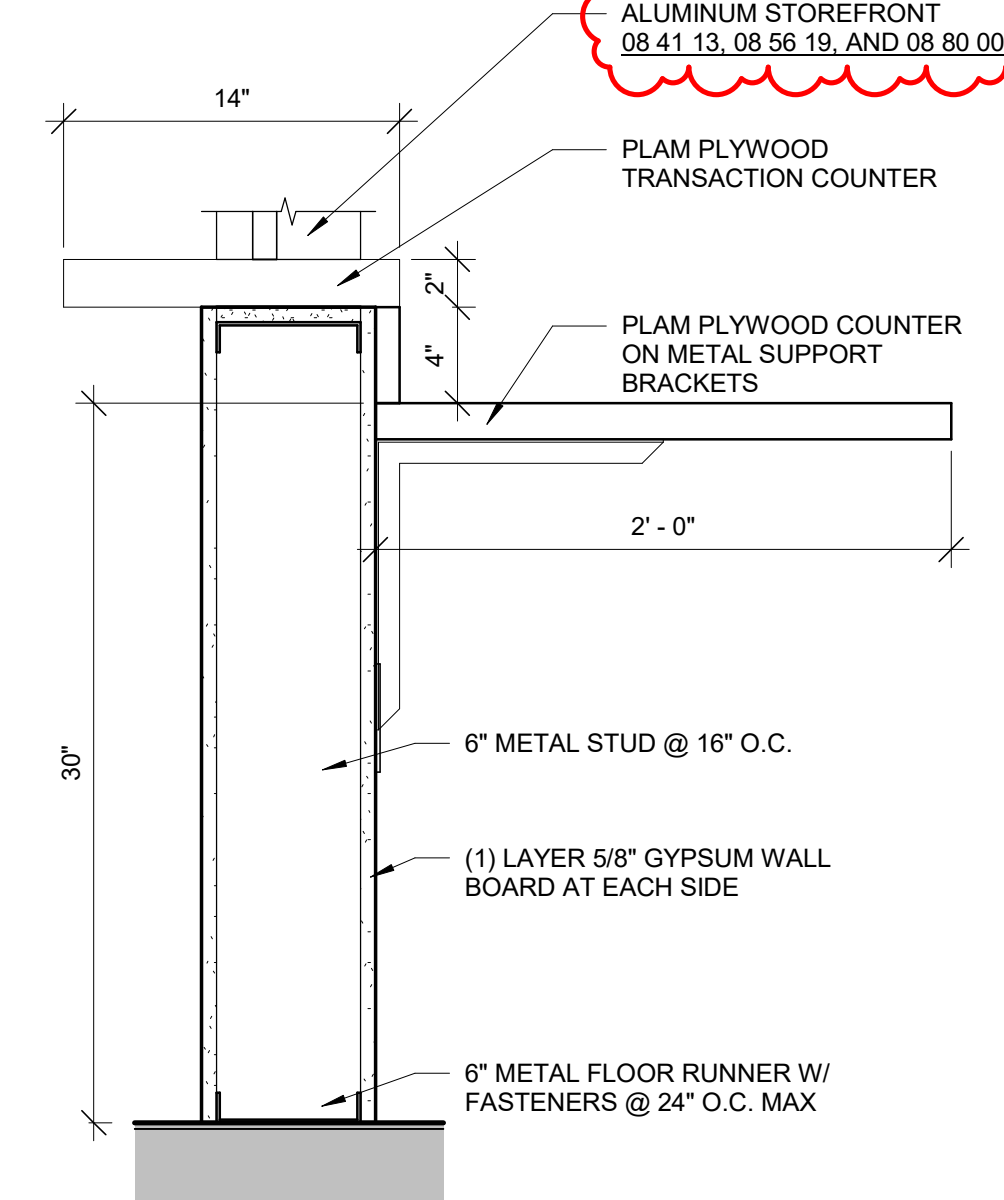
KEYNOTE LEGEND	
#	KEYNOTE
1	PROVIDE NEW OCCUPANCY SENSOR AT LOCATION SHOWN
2	PROVIDE NEW EDGE MOLDING AT CEILING GRID
3	PATCH AND REPAIR DAMAGED FLOORING AS NEEDED AT NEW WALL LOCATIONS



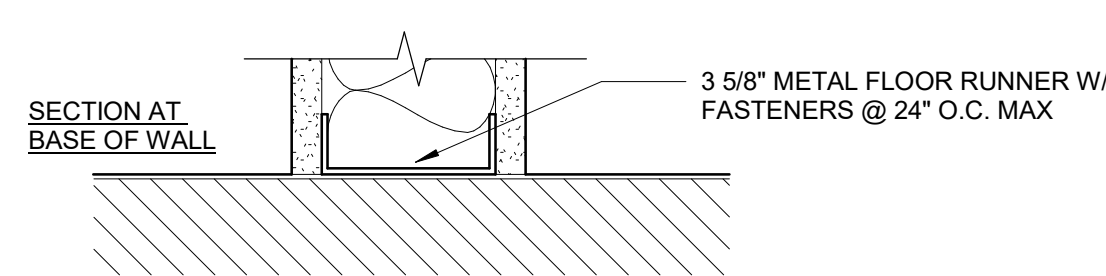
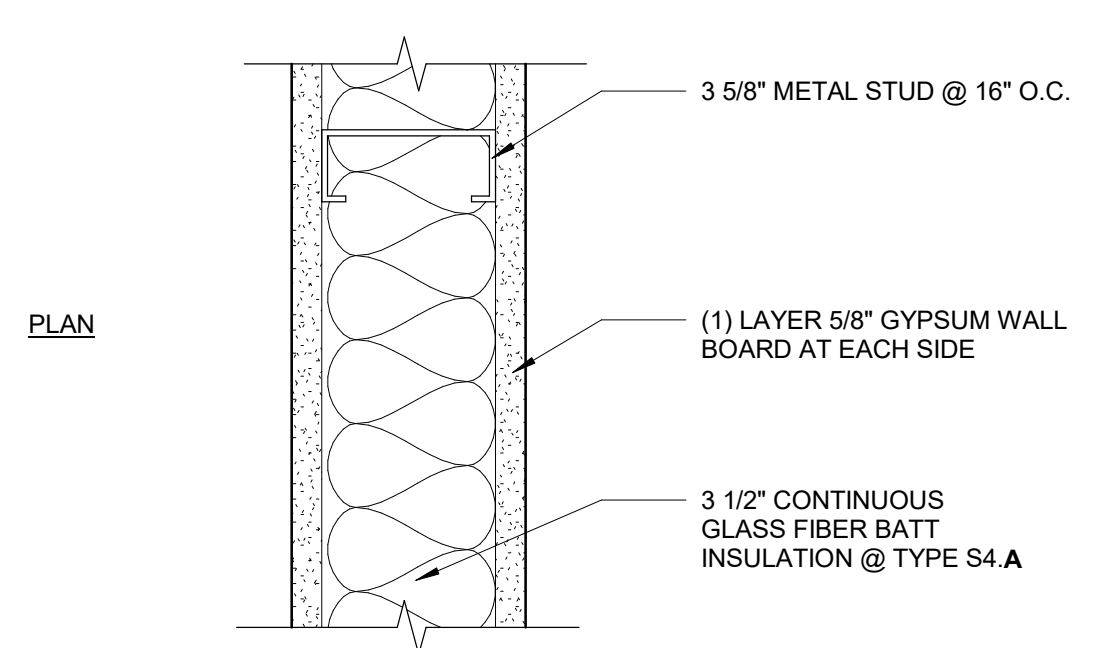
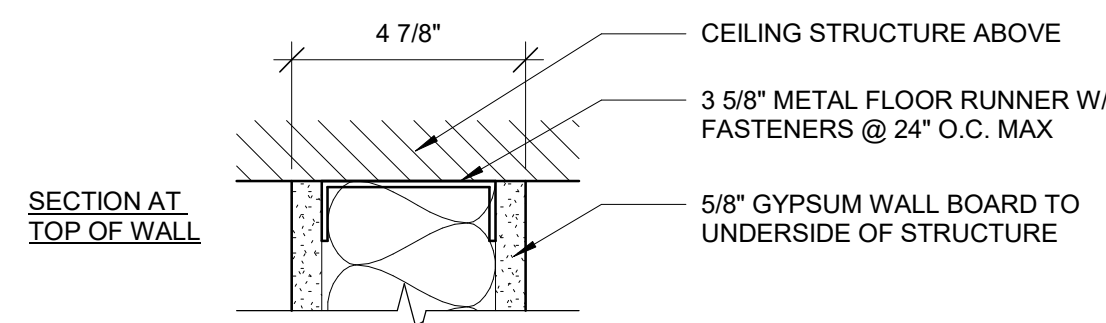
**4 RCP - FACULTY ROOM**  
1/4" = 1'-0"



**1 FACULTY ROOM**  
1/4" = 1'-0"



**12 SECTION AT RECEPTION COUNTER**  
1 1/2" = 1'-0"

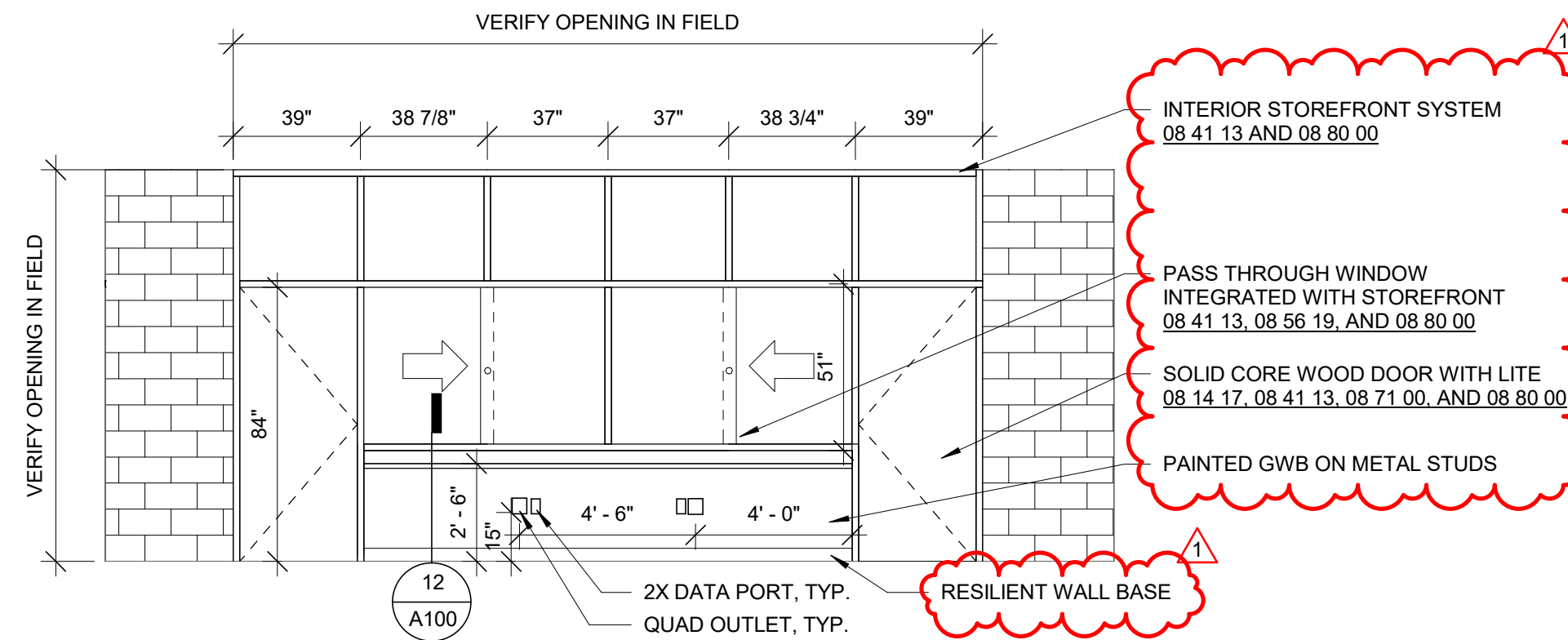
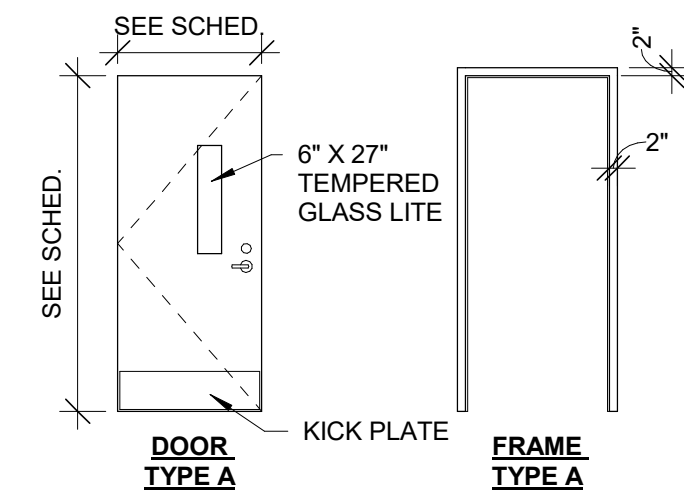


**S4** 4 3/4" / NON-ACOUSTIC  
NO FIRE RATING

**S4.A** 4 3/4" / ACOUSTIC  
NO FIRE RATING  
40-44 STC

8/26/2021 15:01:33

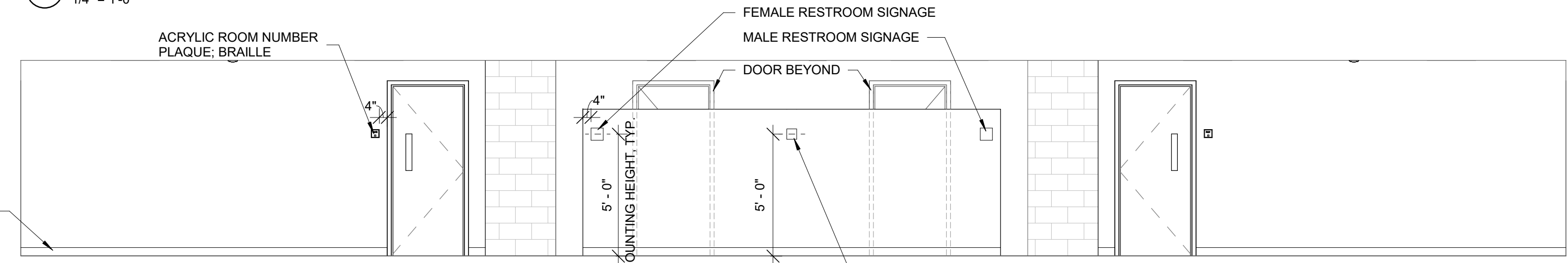
DOOR & FRAME SCHEDULE										
MARK	ROOM	DOOR SIZE			TYPE	DOOR MATL	DOOR RATING	FRAME MATL	FRAME HARDWARE	COMMENTS
		WD	HT	THK						
BASEMENT										
017F	FACULTY ROOM	3'-0"	7'-0"	1 3/4"	A	WOOD	0	MTL	OFFICE	
017G	FACULTY ROOM	3'-0"	7'-0"	1 3/4"	A	WOOD	0	MTL	OFFICE	
017C-2	FACULTY ROOM	3'-0"	7'-0"	1 3/4"	A	WOOD	0	MTL	OFFICE	IN STOREFRONT SYSTEM
017C-1	FACULTY ROOM	3'-0"	7'-0"	1 3/4"	A	WOOD	0	MTL	OFFICE	IN STOREFRONT SYSTEM
078B	HR	3'-0"	7'-0"	1 3/4"	A	WOOD	0	MTL	OFFICE	
079	HR	3'-0"	7'-0"	1 3/4"	A	WOOD	0	MTL	OFFICE	RELOCATED DOOR



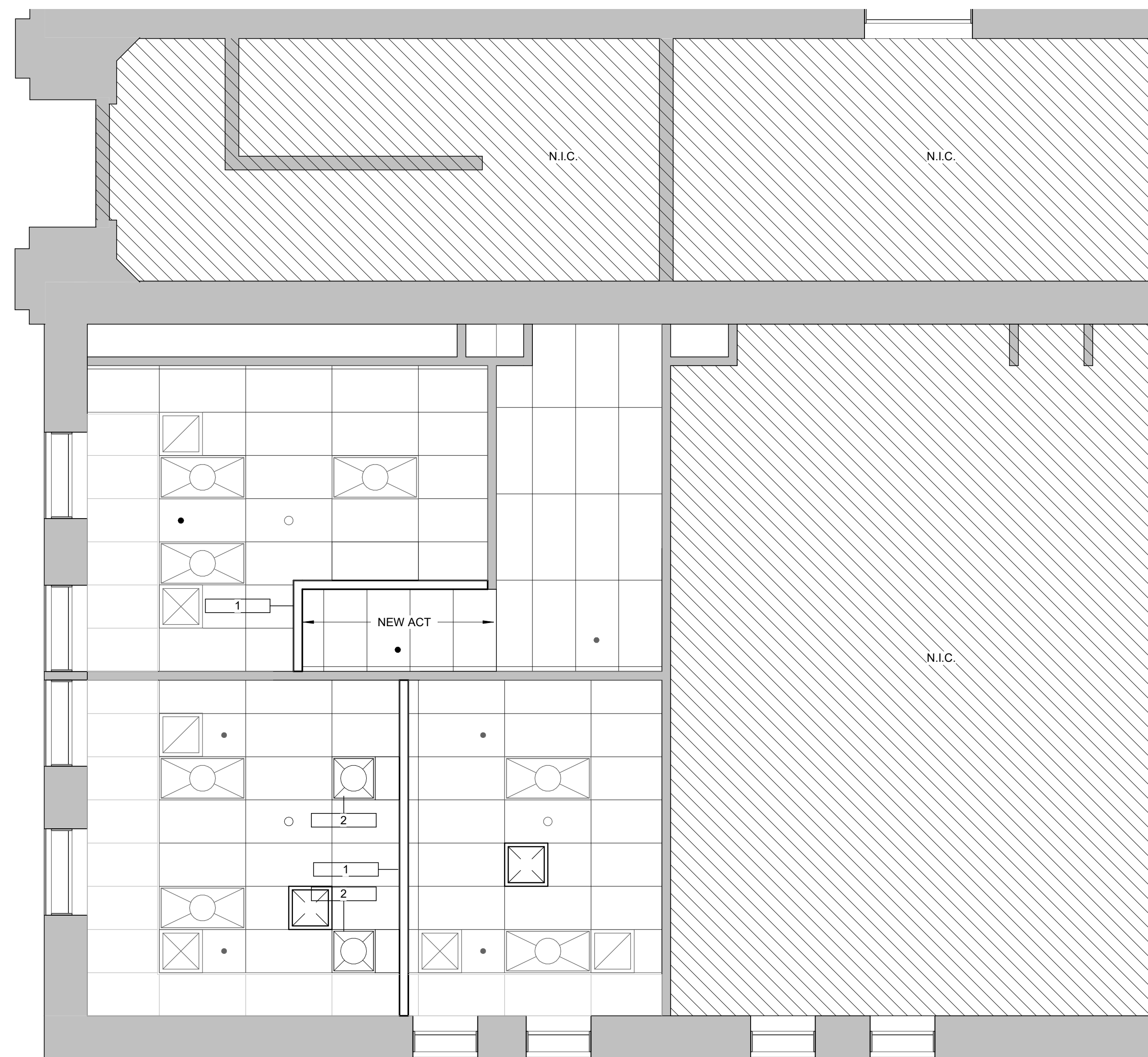
KEYNOTE LEGEND	
#	KEYNOTE
1	PROVIDE NEW EDGE MOLDING AT CEILING GRID
2	PROVIDE NEW 2X2 TROFFER LIGHTS IN EXISTING CEILING GRID
3	PATCH AND REPAIR DAMAGED FLOORING AS NEEDED AT NEW WALL LOCATIONS

**GENERAL NOTES**  
1. NEW CONSTRUCTION RELATED TO ALUMINUM STOREFRONT SHALL BE INCLUDED IN FILED SUB-BID FOR GLAZING.

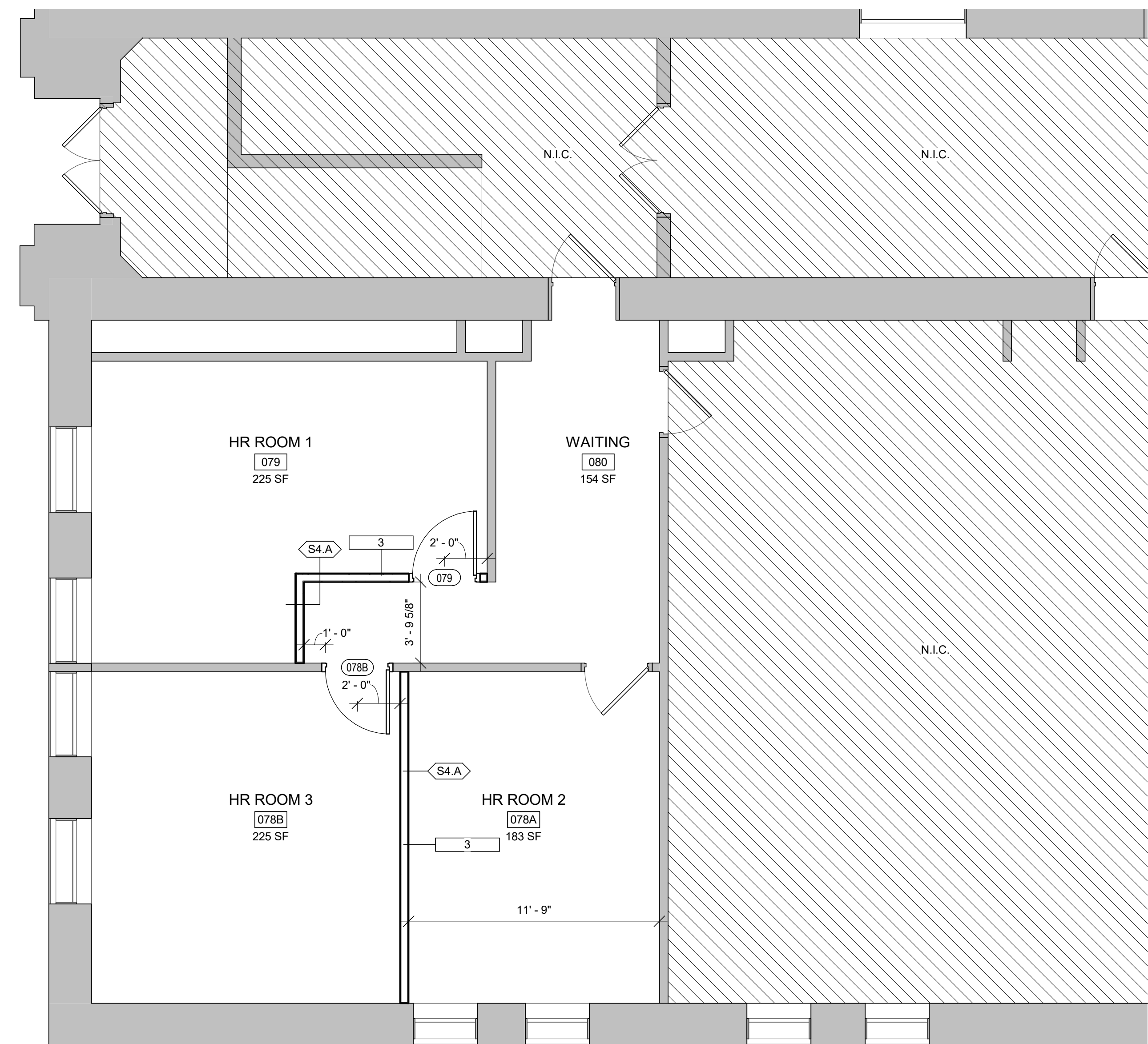
4 ELEVATION AT RECEPTION  
1/4" = 1'-0"



3 ELEVATION AT FACULTY ROOM RESTROOM  
1/4" = 1'-0"



2 RCP - HR ROOMS  
1/4" = 1'-0"



1 HR ROOMS  
1/4" = 1'-0"

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JULY 13, 2021

No.	Description	Date
1	Addendum 1	8/27/21

**HR PLAN &  
FACULTY ROOM  
ELEVATIONS**

**A101**

Scale 1/4" = 1'-0"

DIVISION 23 MECHANICAL (HEATING, VENTILATING, & AIR CONDITIONING)

- 23 04 00 GENERAL CONDITIONS FOR MECHANICAL TRADES
- 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC
- 23 07 00 HVAC INSULATION
- 23 31 00 HVAC DUCTS AND CASINGS
- 23 37 00 AIR OUTLETS AND INLETS

SECTION 23 04 00 - GENERAL CONDITIONS FOR MECHANICAL TRADES

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. DRAWINGS AND GENERAL PROVISIONS OF CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.
- B. THIS SECTION APPLIES TO ALL DIVISION 23 SPECIFICATION SECTIONS (23 ## #), WHERE THERE ARE DIFFERENCES OR DISCREPANCIES BETWEEN THIS SPECIFICATION SECTION AND OTHER DIVISION 23 SPECIFICATION SECTIONS OR SPECIFICATION SECTIONS OF OTHER DIVISIONS WHICH ARE REFERENCED HEREIN OR WHICH REFERENCE THIS SPECIFICATION SECTION, THE MORE STRINGENT REQUIREMENT(S) SHALL APPLY.

1.2 INTENT

- A. PROVIDE COMPLETE, TESTED, AND OPERABLE SYSTEMS, AS INDICATED AND AS REQUIRED.
- B. PROVIDE PRODUCTS AND WORK NOT INDICATED BUT NECESSARY FOR COMPLETE AND OPERABLE SYSTEMS AND AS REQUIRED.

1.3 DEFINITIONS

- A. "DEMOLISH" - REMOVE.
- B. "FURNISH": PURCHASE, DELIVER TO, AND OFF-LOAD AT THE JOB SITE, READY TO BE INSTALLED, INCLUDING WHERE APPROPRIATE ALL NECESSARY INTERIM STORAGE AND PROTECTION.
- C. "INDICATED": INDICATED IN THE CONTRACT DOCUMENTS.
- D. "INSTALL": SET IN PLACE COMPLETE WITH ALL MOUNTING FACILITIES AND CONNECTIONS NECESSARY FOR NORMAL USE OR SERVICE, IN ACCORDANCE WITH THE INDICATED MEANS AND METHODS OF CONSTRUCTION, AND IN ACCORDANCE TO THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
- E. "PROVIDE": FURNISH AND INSTALL.
- F. "REQUIRED": REQUIRED BY THE CONSTRUCTION DOCUMENTS, BY CODE, BY FEDERAL, STATE, AND LOCAL JURISDICTION LAWS, REGULATIONS, ORDINANCES, STATUTES, ADOPTED STANDARDS, AND ADOPTED GUIDELINES, BY THE AUTHORITY(IES) HAVING JURISDICTION (AHJ), BY UTILITY COMPANY(IES) SERVICING THE FACILITY(IES), BY INDICATED STANDARDS AND GUIDELINES, AND AS NECESSARY TO PROVIDE COMPLETE AND OPERABLE SYSTEMS, AS APPLICABLE.
- G. "REMOVE": DISCONNECT FROM PRESENT POSITION, REMOVE FROM PREMISES, AND DISPOSE OF LEGALLY.
- H. "SUBSTITUTION": A REQUEST TO PROVIDE PRODUCTS OR TO USE MEANS AND METHODS OF CONSTRUCTION NOT INCLUDED IN THE CONTRACT DOCUMENTS.

1.4 DRAWINGS

- A. THE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS AND WORK INCLUDED IN THE CONTRACT. PRODUCTS INSTALLED AND WORK INDICATED SHALL BE LOCATED AND ADJUSTED IN ACCORDANCE WITH THE INTENT OF THE CONTRACT DOCUMENTS.

1.5 SURVEYS AND MEASUREMENTS

- A. VISIT THE SITE PRIOR TO SUBMITTING BID FOR THE PURPOSES OF BECOMING FAMILIAR WITH THE EXISTING CONDITIONS, AND FOR VERIFICATION OF LOCATIONS AND SIZES OF EXISTING EQUIPMENT AND SYSTEMS. INCLUDE IN BID MODIFICATIONS AND ADAPTIONS OF EXISTING CONDITIONS, EQUIPMENT, AND SYSTEMS, AS NECESSARY TO PROVIDE WORK IN ACCORDANCE TO THE INTENT OF THE CONTRACT DOCUMENTS AND AS REQUIRED.

1.6 CODES AND STANDARDS

- A. WORK SHALL BE IN ACCORDANCE TO THE MASSACHUSETTS BUILDING CODE AND ALL CODES, STANDARDS, AND SIMILAR REFERENCED THEREIN.

1.7 PERMITS AND FEES

- A. GIVE NECESSARY NOTICES, OBTAIN PERMITS, PAY GOVERNMENT AND STATE SALES TAXES AND FEES WHERE APPLICABLE, AND OTHER COSTS, INCLUDING UTILITY CONNECTIONS OR EXTENSIONS IN CONNECTION WITH THE WORK, FILE NECESSARY DRAWINGS AND OTHER DOCUMENTS, PREPARE DOCUMENTS AND OBTAIN NECESSARY APPROVALS OF AUTHORITIES HAVING JURISDICTION, OBTAIN REQUIRED CERTIFICATES OF INSPECTION, AND PROVIDE COPIES OF SUCH DOCUMENTS TO THE OWNER.

1.8 SUBMITTALS

A. GENERAL

- 1. SUBMITTALS SHALL INCLUDE A COVER SHEET WITH PERTINENT INFORMATION AND WITH A SUBMITTAL NUMBER, AND THE SUBMITTAL NUMBER SHALL INCLUDE THE NUMBER OF THE SPECIFICATION SECTION. SUBMITTAL NUMBERS FOR RESUBMITTALS SHALL BE SIMILAR TO THE ORIGINAL SUBMITTAL NUMBER, BUT WITH AN IDENTIFIER THAT INDICATES THE ORDER OF THE RESUBMITTALS.
  - 2. SUBMIT IN A TIMELY MANNER, WITH ALLOWANCE FOR RESUBMITTALS, SUCH THAT PROCUREMENT OF PRODUCTS WILL NOT ADVERSELY IMPACT THE PROJECT SCHEDULE. ALLOW TWO WEEKS OF FOR PROCESSING OF EACH SUBMITTAL. FOR COMPLEX SUBMITTALS, SUCH AS BUILDING AUTOMATION SYSTEMS, SHOP DRAWINGS, AND COORDINATION DRAWINGS, ALLOW SUFFICIENT TIME FOR PREPARATION AND REVIEW OF MULTIPLE RESUBMITTALS.
  - 3. SUBMITTALS ARE REVIEWED FOR GENERAL CONFORMANCE TO THE CONTRACT DOCUMENTS ONLY. FAILURE BY THE REVIEWER TO NOTE DISCREPANCIES BETWEEN SUBMITTED INFORMATION AND THE CONTRACT DOCUMENTS DOES NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY OF COMPLYING WITH THE CONTRACT DOCUMENTS.
- B. PRODUCT SUBMITTALS
- 1. SHALL BE PREPARED BY SPECIFICATION SECTION, AND EACH SUBMITTAL SHALL BE OF A SINGLE SPECIFICATION SECTION AND SHALL BE COMPREHENSIVE; ALL PRODUCTS FROM EACH SPECIFICATION SECTION SHALL BE INCLUDED IN THE SUBMITTAL FOR THAT SPECIFICATION SECTION.
  - 2. RESUBMITTALS SHALL INCLUDE ALL PRODUCTS PREVIOUSLY REVIEWED.
  - 3. TAGS FOR SCHEDULED PRODUCTS SHALL BE NOTED AS APPLICABLE ON THE SUBMITTALS.
  - 4. DO NOT ORDER PRODUCTS UNTIL A REVIEW COMMENT OF EITHER NO EXCEPTIONS TAKEN (NET) OR FURNISH AS CORRECTED (FAC) IS ISSUED FOR THE PRODUCTS.

1.9 COORDINATION WITH OTHER DIVISIONS

- A. COORDINATE THE WORK OF THIS DIVISION WITH THE WORK OF OTHER DIVISIONS, SUCH THAT THE WORK OF ALL DIVISIONS IS PROVIDED IN ACCORDANCE WITH THE INTENT OF THE CONSTRUCTION DOCUMENTS, SUCH THAT ADEQUATE AND REQUIRED ACCESS TO EQUIPMENT REQUIRING ACCESS IS PROVIDED, AND SUCH THAT THE SCHEDULE OF THE PROJECT IS MAINTAINED.

1.10 WORKMANSHIP

- A. WORK SHALL BE PERFORMED BY SKILLED TRADESMEN, LICENSED WHERE REQUIRED, AND EXPERIENCED IN THE INSTALLATION OF PRODUCTS AND SYSTEMS OF THIS DIVISION. WORK SHALL BE OF A QUALITY CONSISTENT WITH GOOD TRADE PRACTICE, AND SHALL BE INSTALLED IN A NEAT, WORKMANLIKE MANNER.
- B. WORK PROVIDED IN A SUBSTANDARD, POTENTIALLY DANGEROUS, OR NOT SERVICEABLE MANNER, IN THE OPINION OF THE ENGINEER OF RECORD, MAY BE REJECTED, IN WHICH CASE SUCH WORK SHALL BE REPLACED WITH DUE CORRECTION TO THE REASON FOR THE REJECTION.

1.11 SHUTDOWNS

- A. WORK SHALL BE COORDINATED TO MINIMIZE THE SHUTDOWN TIME OF BUILDING SYSTEMS AND UTILITIES.
- B. SHUTDOWNS OF BUILDING SYSTEMS AND UTILITIES SHALL BE COORDINATED WITH THE OWNER MINIMUM TEN DAYS BEFORE THE SHUTDOWN.

1.12 PROTECTION OF WORK

- A. PRODUCTS DAMAGED DURING CONSTRUCTION SHALL BE REPLACED WITH NEW PRODUCTS, EXCEPT THAT PRODUCTS DAMAGED DURING CONSTRUCTION MAY ATTEMPT TO BE REPAIRED WHERE APPROVED BY THE OWNER'S REPRESENTATIVE, AND WHERE SUCH REPAIRS ARE INSPECTED AND APPROVED BY THE OWNER'S REPRESENTATIVE. WHERE REPAIR OF A WARRANTED PRODUCT IS APPROVED BY THE OWNER'S REPRESENTATIVE, A MANUFACTURER'S AUTHORIZED REPRESENTATIVE SHALL VISIT THE SITE TO VERIFY THE PROPER REPAIR OF THE PRODUCT, AND THE MANUFACTURER SHALL ISSUE A WRITTEN STATEMENT THAT THE WARRANTY WILL BE VALID FOR THE REPAIRED PRODUCT.
- B. CLOSE OPEN ENDS OF WORK WITH TEMPORARY COVERS, CAPS, OR PLUGS DURING CONSTRUCTION TO PREVENT ENTRY OF FOREIGN MATERIAL.
- C. PRODUCTS STORED ON SITE SHALL REMAIN IN ORIGINAL PACKAGING UNTIL JUST PRIOR TO INSTALLATION. PRODUCTS STORED ON SITE SHALL BE STORED AT LOCATIONS THAT ARE LEAST SUBJECT TO DAMAGE, AND SHALL BE COVERED AND OTHERWISE PROTECTED FROM THE WEATHER, MOISTURE, DIRT, AND SIMILAR.

1.13 CLEANING

- A. CLEAN MATERIALS OF FOREIGN SUBSTANCES, OILS, BURRS, SOLDER, FLUX, ETC., INSIDE AND OUT BEFORE BEING PLACED IN OPERATION.
- B. REMOVE FROM THE PREMISES PACKAGING MATERIALS, RUBBISH, DEBRIS, AND EXCESS MATERIALS LEFT OVER FROM CONSTRUCTION.
- C. REMOVE NON-PERMANENT LABELS AND OTHER MARKINGS.

1.14 RECORD DRAWINGS

- A. MAINTAIN A CLEAN, UNDAMAGED COMPLETE SET OF FULL SIZE DRAWINGS ON SITE. MARK THE SET APPROPRIATELY WHERE THE INSTALLED WORK DIFFERS FROM THE WORK SHOWN ON THE CONTRACT DOCUMENT DRAWINGS.

1.15 GUARANTEE

- A. GUARANTEE PRODUCTS AND WORKMANSHIP PROVIDED UNDER THIS CONTRACT FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE. DURING THIS GUARANTEE PERIOD, DEFECTS DEVELOPING THROUGH FAULTY PRODUCTS OR WORKMANSHIP SHALL BE CORRECTED OR REPLACED AT NO COST TO THE OWNER.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. TESTING, ADJUSTMENT, AND BALANCING OF AIR SYSTEMS.
- 1.2 TAB AGENCY QUALIFICATIONS:
  - A. COMPANY SPECIALIZING IN THE TESTING, ADJUSTING, AND BALANCING OF SYSTEMS SPECIFIED IN THIS SECTION.
  - B. HAVING MINIMUM OF THREE YEARS DOCUMENTED EXPERIENCE.
  - C. CERTIFIED BY ONE OF THE FOLLOWING:
    - 1. AABC, ASSOCIATED AIR BALANCE COUNCIL COMPLETION SUBMIT AABC NATIONAL PERFORMANCE GUARANTY.
    - 2. NEBB, NATIONAL ENVIRONMENTAL BALANCING BUREAU
    - 3. TABB, THE TESTING, ADJUSTING, AND BALANCING BUREAU OF NATIONAL ENERGY MANAGEMENT INSTITUTE

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. PERFORM BALANCING AS INDICATED, IN ACCORDANCE WITH ONE OF THE FOLLOWING:
  - 1. AABC NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE.
  - 2. ASHRAE STANDARD 111, PRACTICES FOR MEASUREMENT, TESTING, ADJUSTING AND BALANCING OF BUILDING HEATING, VENTILATION, AIR-CONDITIONING, AND REFRIGERATION SYSTEMS.
  - 3. NEBB PROCEDURAL STANDARDS FOR TESTING ADJUSTING BALANCING OF ENVIRONMENTAL SYSTEMS.

3.2 ADJUSTMENT TOLERANCES

- 1. AIR HANDLING SYSTEMS: ADJUST TO WITHIN PLUS OR MINUS 10 PERCENT OF DESIGN FOR SUPPLY SYSTEMS AND PLUS OR MINUS 10 PERCENT OF DESIGN FOR RETURN AND EXHAUST SYSTEMS.
- 2. AIR OUTLETS AND INLETS: ADJUST TOTAL TO WITHIN PLUS 10 PERCENT AND MINUS 5 PERCENT OF DESIGN TO SPACE. ADJUST OUTLETS AND INLETS IN SPACE TO WITHIN PLUS OR MINUS 10 PERCENT OF DESIGN 23 07 00 - HVAC INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. DUCT INSULATION

PART 2 PRODUCTS

2.1 GENERAL

- A. INSULATION PRODUCTS SHALL HAVE A MAXIMUM FLAME SPREAD OF 25 AND A MAXIMUM SMOKE DEVELOPED OF 50 PER ASTM E 84
- 2.2 DUCT INSULATION - FLEXIBLE GLASS FIBER
  - A. MANUFACTURERS: CERTAINTEED SOFTTOUCH, JOHNS MANVILLE MICROLITE XG, KNAUF FRIENDLY FEEL, OWENS CORNING SOFTR DUCT WRAP. SUBSTITUTIONS: ALLOWED.
  - B. GENERAL: GLASS FIBER BLANKET, ASTM C 553 TYPE I, II, OR III, ASTM C 1290 TYPE III, IN ACCORDANCE TO NFPA 90A AND NFPA 90B FOR DUCT COVERINGS, WITH ASTM C 1136 FOIL REINFORCED KRAFT (FRK) OR POLY SCRIM KRAFT (PSK) FACING.
  - C. TECHNICAL DATA: 1.0 LB/FT<sup>3</sup>, 7.4 FT<sup>2</sup>/HR °F/BTU MINIMUM R-VALUE FOR 2" THICK AT 75°F MEAN TEMPERATURE PER ASTM C 177 AND ASTM 158, 40°F TO 250°F OPERATING TEMPERATURE RANGE, 0.02 PERMS MAXIMUM FACING WATER VAPOR PERMEANCE PER ASTM E 96, 5% BY WEIGHT MAXIMUM WATER VAPOR SORPTION PER ASTM C 1104, DOES NOT ACCELERATE CORROSIVENESS PER ASTM C 665, NO FUNGI GROWTH PER ASTM C 1338.

PART 3 EXECUTION

3.1 GENERAL

- A. VERIFY SURFACES ARE CLEAN AND DRY, WITH FOREIGN MATERIAL REMOVED.
- 3.2 DUCTWORK INSULATION
- A. GENERAL: WHEN APPLICATION REQUIRES MULTIPLE LAYERS, APPLY WITH JOINTS STAGGERED. CONTINUE INSULATION THROUGH WALLS, SLEEVES, HANGERS, AND OTHER DUCT PENETRATIONS. SEAL VAPOR RETARDER PENETRATIONS BY MECHANICAL FASTENERS WITH VAPOR RETARDER ADHESIVE.
  - B. SUPPLY DUCTWORK FROM AIR HANDLERS AND FAN COIL UNITS WITH CHILLED WATER AND REFRIGERANT COILS WITHIN BUILDING: INSULATE ENTIRE SYSTEM, INCLUDING FITTINGS, JOINTS, FLANGES, DAMPERS, AND FLEXIBLE CONNECTIONS.
  - C. OTHER DUCTWORK WITHIN BUILDING: INSULATE FITTINGS AND JOINTS. WHERE SERVICE ACCESS IS REQUIRED, BEVEL AND SEAL ENDS OF INSULATION.
  - D. SECURE INSULATION WITH WIRES, AND SEAL JACKET JOINTS WITH VAPOR RETARDER ADHESIVE OR TAPE TO MATCH JACKET. INSTALL WITHOUT SAG ON UNDERSIDE OF DUCTWORK. USE ADHESIVE OR MECHANICAL FASTENERS WHERE NECESSARY TO PREVENT SAGGING. LIFT DUCTWORK OFF TRAPEZE HANGERS AND INSERT SPACERS. STOP AND POINT INSULATION AROUND ACCESS DOORS AND DAMPER ACTUATORS TO ALLOW OPERATION WITHOUT DISTURBING WRAPPING.
  - E. PROVIDE INSULATION ON NEW DUCTWORK - SUPPLY AIR, RETURN AIR, EXHAUST AIR, AND TRANSFER AIR DUCTWORK, EXCEPT THAT ACOUSTICALLY LINED DUCTWORK NEED NOT BE INSULATED.
  - F. UNLESS OTHERWISE INDICATED, INSULATION SHALL BE 1" THICK.

23 31 00 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. DUCT MATERIALS
- B. FLEXIBLE DUCTS
- C. DUCT LINER

1.2 QUALITY ASSURANCE

- A. DUCT CONSTRUCTION: DUCTWORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE THIRD EDITION (2005) OF SMACNA - HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE (REFERRED TO HEREIN AS THE SMACNA STANDARD), EXCEPT THAT WHERE REQUIREMENTS HEREIN EXCEED THE REQUIREMENTS OF THE SMACNA STANDARD, THE REQUIREMENTS HEREIN SHALL TAKE PRECEDENT. DUCTWORK SHALL ALSO BE CONSTRUCTED IN ACCORDANCE WITH NFPA 90A & NFPA 90B.
- B. WELDING: SHALL BE IN ACCORDANCE TO AWS D1.1, AWS D1.2, AND AWS D9.1.

PART 2 PRODUCTS

2.1 GENERAL

- A. UNLESS OTHERWISE INDICATED, DUCTWORK PRODUCTS SHALL HAVE A MAXIMUM FLAME SPREAD OF 25 AND A MAXIMUM SMOKE DEVELOPED OF 50 PER ASTM E 84.

2.2 DUCT MATERIALS

- A. GALVANIZED STEEL: ASTM A653/A653M GALVANIZED STEEL SHEET, LOCK-FORMING QUALITY, HAVING G60 ZINC COATING OF IN CONFORMANCE WITH ASTM A90/A90M.
- B. HANGER ROD: ASTM A36 STEEL, THREADED BOTH ENDS, THREADED ONE END, OR CONTINUOUSLY THREADED. HANGER ROD EXPOSED OUTDOORS OR IN CRAWL SPACES SHALL BE GALVANIZED.

2.3 FLEXIBLE DUCTS

- A. GENERAL: CLASS I AIR DUCT PER UL 181, NFPA 90A AND NFPA 90B COMPLIANT, MAXIMUM 25 SMOKE DEVELOPED AND MAXIMUM 50 SMOKE DEVELOPED PER ASTM E84.
- B. NON-INSULATED
  - 1. MANUFACTURERS: FLEXMASTER MODEL 5N1 AND MODEL 8N1. SUBSTITUTIONS: ALLOWED.
  - 2. GENERAL: CHLORINATED POLYETHYLENE (CPE) FABRIC, MECHANICAL BONDED TO A GALVANIZED SPRING STEEL WIRE HELIX.
  - 3. OPERATING PRESSURE: 10" WG POSITIVE, 5" WG NEGATIVE UP TO 16", 1" NEGATIVE OVER 16".
  - 4. OPERATING TEMPERATURE: -20°F TO 250°F.
  - 5. MAXIMUM VELOCITY: 5,500 FPM.
  - 6. VAPOR BARRIER PERMEANCE: 0.05 PER ASTM E96, PROCEDURE A.

C. INSULATED

- 1. MANUFACTURERS: FLEXMASTER MODEL 5M AND MODEL 8M. SUBSTITUTIONS: ALLOWED.
- 2. CORE: TRILAMINATE OF ALUMINUM FOIL, FIBERGLASS AND ALUMINIZED POLYESTER OR

CHLORINATED POLYETHYLENE (CPE) FABRIC, MECHANICAL BONDED TO A GALVANIZED SPRING STEEL WIRE HELIX.

- 3. INSULATION: FIBERGLASS. (SEE PART 3 EXECUTION FOR R-VALUE REQUIREMENTS.)
- 4. OUTER LAYER: FIBERGLASS REINFORCED METALIZED FILM VAPOR BARRIER.
- 5. OPERATING PRESSURE: 10" WG POSITIVE, 5" WG NEGATIVE UP TO 16", 1" NEGATIVE OVER 16".
- 6. OPERATING TEMPERATURE: -20°F TO 250°F.
- 7. MAXIMUM VELOCITY: 5,500 FPM.
- 8. VAPOR BARRIER PERMEANCE: 0.05 PER ASTM E96, PROCEDURE A.

D. ELBOW SUPPORT

- 1. MANUFACTURERS: FLEXMASTER MODEL 41650. SUBSTITUTIONS: ALLOWED.
- 2. GENERAL: 1 PIECE ADJUSTABLE COPOLYMER POLYPROPYLENE RADIUS FORMING BRACE, NYLON CABLE TIES, UL LISTED.

2.4 DUCT LINER

A. ELASTOMERIC

- 1. MANUFACTURERS: ARMACELL AP COILFLEX, K-FLEX DUCT LINER GRAY OR R-6 BLACK. SUBSTITUTIONS: ALLOWED.
- 2. GENERAL: ELASTOMERIC FOAM DUCT LINER, INTEGRAL EPA REGISTERED ANTIMICROBIAL AGENT, IN ACCORDANCE TO NFPA 90A AND NFPA 90B FOR DUCT COVERINGS AND LININGS.
- 3. TECHNICAL DATA: MINIMUM R-VALUE OF 4.0 FT<sup>2</sup>/HR °F/BTU FOR 1" THICK AT 75°F MEAN TEMPERATURE PER ASTM C177 OR ASTM C518, 0°F TO 180°F OPERATING TEMPERATURE RANGE, 6,000 FPM AIR EROSION VELOCITY PER ASTM C1071, NO BACTERIA GROWTH PER ASTM G22, NO FUNGI GROWTH PER ASTM G21, 0.5 NOISE REDUCTION COEFFICIENT (NRC) FOR 1" THICK.

2.5 DUCTWORK FABRICATION

- A. FABRICATE AND SUPPORT RECTANGULAR DUCTS IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE.
- B. CONSTRUCT ELBOWS WITH MINIMUM RADIUS 1-1/2 TIMES CENTERLINE DUCT WIDTH. WHERE NOT POSSIBLE AND WHERE RECTANGULAR ELBOWS ARE USED, PROVIDE TURNING VANES EXCEPT WHERE TURNING VANES ARE NOT PERMITTED PER CODE. WHERE ACOUSTICAL LINING IS INDICATED, FURNISH TURNING VANES OF PERFORATED METAL WITH GLASS FIBER INSULATION.
- C. INCREASE DUCT SIZES GRADUALLY, NOT EXCEEDING 15 DEGREES DIVERGENCE WHEREVER POSSIBLE; MAXIMUM 30 DEGREES DIVERGENCE UPSTREAM OF EQUIPMENT AND 45 DEGREES CONVERGENCE DOWNSTREAM.
- D. SEAL JOINTS BETWEEN DUCT SECTIONS AND DUCT SEAMS WITH WELDS, GASKETS, MASTIC ADHESIVES, MASTIC PLUS EMBEDDED FABRIC SYSTEMS. SEALANT AND MASTICS SHALL HAVE THE APPROPRIATE UL 181A LABEL.

PART 3 EXECUTION

3.1 INSTALLATION

- A. DURING CONSTRUCTION, INSTALL TEMPORARY CLOSURES OF METAL OR TAPED POLYETHYLENE ON OPEN DUCTWORK TO PREVENT CONSTRUCTION DUST FROM ENTERING DUCTWORK SYSTEM.
  - B. CONNECT FLEXIBLE DUCTS TO METAL DUCTS WITH DRAW BANDS AND TAPE. FLEXIBLE DUCTS SHALL BE MAXIMUM 5' LONG, AND SHALL BE PERMITTED ABOVE ACCESSIBLE CEILING LINES ONLY. FOR 90° FLEXIBLE DUCT ELBOWS AT DIFFUSERS, GRILLES, AND REGISTERS PROVIDE AN ELBOW SUPPORT.
  - C. CLEAN DUCT SYSTEMS WITH HIGH POWER VACUUM MACHINES. PROTECT EQUIPMENT WITH POTENTIAL TO BE HARMED BY EXCESSIVE DIRT WITH FILTERS, OR BYPASS DURING CLEANING. INSTALL ACCESS OPENINGS INTO DUCTWORK FOR CLEANING PURPOSES.
- 3.2 FLEXIBLE DUCTWORK
- A. GENERAL
    - 1. WHEN LOCATED ABOVE CEILING, SUPPORT FLEXIBLE DUCT FROM ABOVE; FLEXIBLE DUCT SHALL NOT TOUCH THE CEILING.
    - 2. INSTALL FLEXIBLE DUCT WITH KINKS AND SAGS MINIMIZED.
    - 3. MAXIMUM LENGTH: 5 FEET.
    - 4. LOCATION: UNLESS OTHERWISE INDICATED, FLEXIBLE DUCT SHALL BE LOCATED ONLY WHERE CONCEALED AND ACCESSIBLE.
  - B. NON-INSULATED FLEXIBLE DUCTWORK: PROVIDE WHEN THE METAL DUCTWORK CONNECTED TO IS NOT INSULATED.
  - C. INSULATED FLEXIBLE DUCTWORK: PROVIDE WHEN THE METAL DUCTWORK CONNECTED TO IS INSULATED. R-VALUE OF FLEXIBLE DUCTWORK INSULATION SHALL MEET OR EXCEED THE R-VALUE OF THE METAL DUCTWORK INSULATION.
  - D. ELBOW SUPPORTS: PROVIDE ABOVE FLEXIBLE DUCTWORK CONNECTIONS TO CEILING DIFFUSERS. USE CABLE TIES AS INDICATED IN THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
  - E. CONNECTIONS TO RIGID DUCTWORK: PROVIDE BOTH A DRAWBAND AND TWO LAYERS OF DUCT TAPE LAPPED APPROXIMATELY 25% AT EACH CONNECTION OF FLEXIBLE DUCTWORK TO RIGID DUCTWORK. DRAWBANDS SHALL BE THE NON-METALLIC TYPE LISTED AND LABELED IN ACCORDANCE WITH UL 181B. DUCT TAPE SHALL BE LISTED AND LABELED IN ACCORDANCE WITH UL 181B.

3.3 DUCT LINER

- A. LOCATION: UNLESS WHERE INDICATED ON THE DRAWINGS.
- B. THICKNESS: 1" UNLESS OTHERWISE INDICATED.
- C. INSTALLATION: SHALL BE IN ACCORDANCE WITH THE LATEST SMACNA DUCT CONSTRUCTION STANDARD AND THE FOLLOWING - WHICHEVER IS THE MOST STRINGENT.
  - 1. DUCT LINER SHALL BE INSTALLED WITH BOTH ADHESIVE AND MECHANICAL FASTENERS. ADHESIVE SHALL COMPLY WITH THE REQUIREMENTS OF ASTM C 916 AND WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
  - 2. JOINTS SHALL BE NEATLY BUTTED WITHOUT INTERRUPTIONS OR GAPS. DUCT LINER SHALL BE INSTALLED WITH THE BLACK SURFACE TREATMENT EXPOSED TO THE AIR STREAM.
  - 3. DUCT LINER SHALL BE ADHERED TO THE SHEET METAL WITH 90% (MINIMUM) COVERAGE OF ADHESIVE
  - 4. TRANSVERSE EDGES THAT ARE NOT TO RECEIVE SHEET METAL NOSING SHALL BE COATED. LONGITUDINAL JOINTS SHALL OCCUR AT THE CORNERS OF DUCTS. IF DUCT SIZE AND STANDARD DUCT LINER PRODUCT DIMENSIONS MAKE EXPOSED LONGITUDINAL JOINTS NECESSARY, SUCH JOINTS SHALL BE COATED WITH ADHESIVE.

3.4 SCHEDULE

- A. UNLESS OTHERWISE INDICATED: GALVANIZED STEEL, ALUMINUM, OR STAINLESS STEEL, 1" PRESSURE CLASS 23 37 00 - AIR OUTLETS AND INLETS

23 37 00 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. DIFFUSERS AND GRILLES.

1.2 REFERENCES

- A. AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.: AMCA 500 - TEST METHODS FOR LOUVERS, DAMPERS, AND SHUTTERS.
  - B. AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS: ASHRAE 70 - METHOD OF TESTING FOR RATING THE PERFORMANCE OF AIR OUTLETS AND INLETS.
  - C. SHEET METAL AND AIR CONDITIONING CONTRACTORS: SMACNA - HVAC DUCT CONSTRUCTION STANDARD - METAL AND FLEXIBLE.
- 1.3 QUALITY ASSURANCE
- A. TEST AND RATE DIFFUSER, REGISTER, AND GRILLE PERFORMANCE IN ACCORDANCE WITH ASHRAE 70.
  - B. TEST AND RATE LOUVER PERFORMANCE IN ACCORDANCE WITH AMCA 500.

PART 2 PRODUCTS

2.1 DIFFUSERS AND GRILLES

- A. MANUFACTURERS: KRUEGER, E.H. PRICE, TITUS. SUBSTITUTIONS: ALLOWED.

PART 3 EXECUTION

3.1 INSTALLATION

- A. VERIFY CEILING AND WALL SYSTEMS ARE READY FOR INSTALLATION.
- B. VERIFY LOCATION OF OUTLETS AND INLETS AND MAKE NECESSARY ADJUSTMENTS IN POSITION TO CONFORM TO ARCHITECTURAL FEATURES, SYMMETRY, AND LIGHTING ARRANGEMENT.
- C. INSTALL DIFFUSERS AND GRILLES TO DUCTWORK WITH AIRTIGHT CONNECTION.
- D. EXCEPT WHERE VISIBLE DUCTWORK BEHIND DIFFUSERS AND GRILLES IS PROVIDED WITH BLACK DUCT LINER, PAINT VISIBLE DUCTWORK BEHIND DIFFUSERS AND GRILLES MATTE BLACK.

DUCTWORK LEGEND	
SYMBOL	DESCRIPTION
	DUCTWORK
	DUCTWORK WITH ACOUSTICAL LINING
	RECTANGULAR SUPPLY AIR DUCT UP
	RECTANGULAR RETURN AIR DUCT UP
	RECTANGULAR EXHAUST AIR DUCT UP
	RECTANGULAR SUPPLY AIR DUCT DOWN
	RECTANGULAR RETURN AIR DUCT DOWN
	RECTANGULAR EXHAUST AIR DUCT DOWN
	ROUND DUCTWORK UP
	ROUND DUCTWORK DOWN
	VOLUME DAMPER (MANUAL) SEE DUCTWORK GENL. NOTE E
	AIR ENTERING OPENING
	AIR LEAVING OPENING
	EQUIPMENT TAG

DUCTWORK GENERAL NOTES

- A. UOI, DUCTWORK SHALL BE MOUNTED AS HIGH AS POSSIBLE. EXCEPT THAT DUCTWORK HEIGHT SHALL BE ADJUSTED AS NECESSARY FOR THE PROPER INSTALLATION OF EQUIPMENT, PIPING, AND CONDUIT.
- B. UOI, FLEXIBLE DUCTS ARE ALLOWED ONLY AT CONNECTIONS TO DIFFUSERS AND GRILLES. FLEXIBLE DUCTS SHALL BE MAXIMUM 5'-0" LONG, SHALL BE LOCATED ABOVE ACCESSIBLE CEILING LINES ONLY, AND SHALL BE SUSPENDED OFF OF THE CEILING.
- C. FLEXIBLE DUCTS CONNECTED DIRECTLY TO NECKS OF CEILING MOUNTED DIFFUSERS AND GRILLES WHERE A METAL ELBOW IS NOT PROVIDED AND WHERE THE STRAIGHT/VERTICAL LENGTH OF FLEXIBLE DUCT DIRECTLY ABOVE THE DIFFUSER OR GRILLE IS LESS THAN TWO DUCT DIAMETERS SHALL BE SUPPORTED WITH TITUS FLEXRIGIT ELBOW SUPPORTS OR SIMILAR.
- D. WHERE DIFFUSER OR GRILLE SIZES ARE NOT INDICATED, THE SIZES ARE BASED ON THE AIRFLOW. SEE THE DIFFUSER AND GRILLE SIZE SCHEDULE.
- E. WHERE BRANCH DUCT SIZES TO DIFFUSERS OR GRILLES ARE NOT INDICATED, THE BRANCH DUCT SIZES ARE BASED ON THE DIFFUSER OR GRILLE SIZE. SEE THE DIFFUSER AND GRILLE BRANCH DUCT S