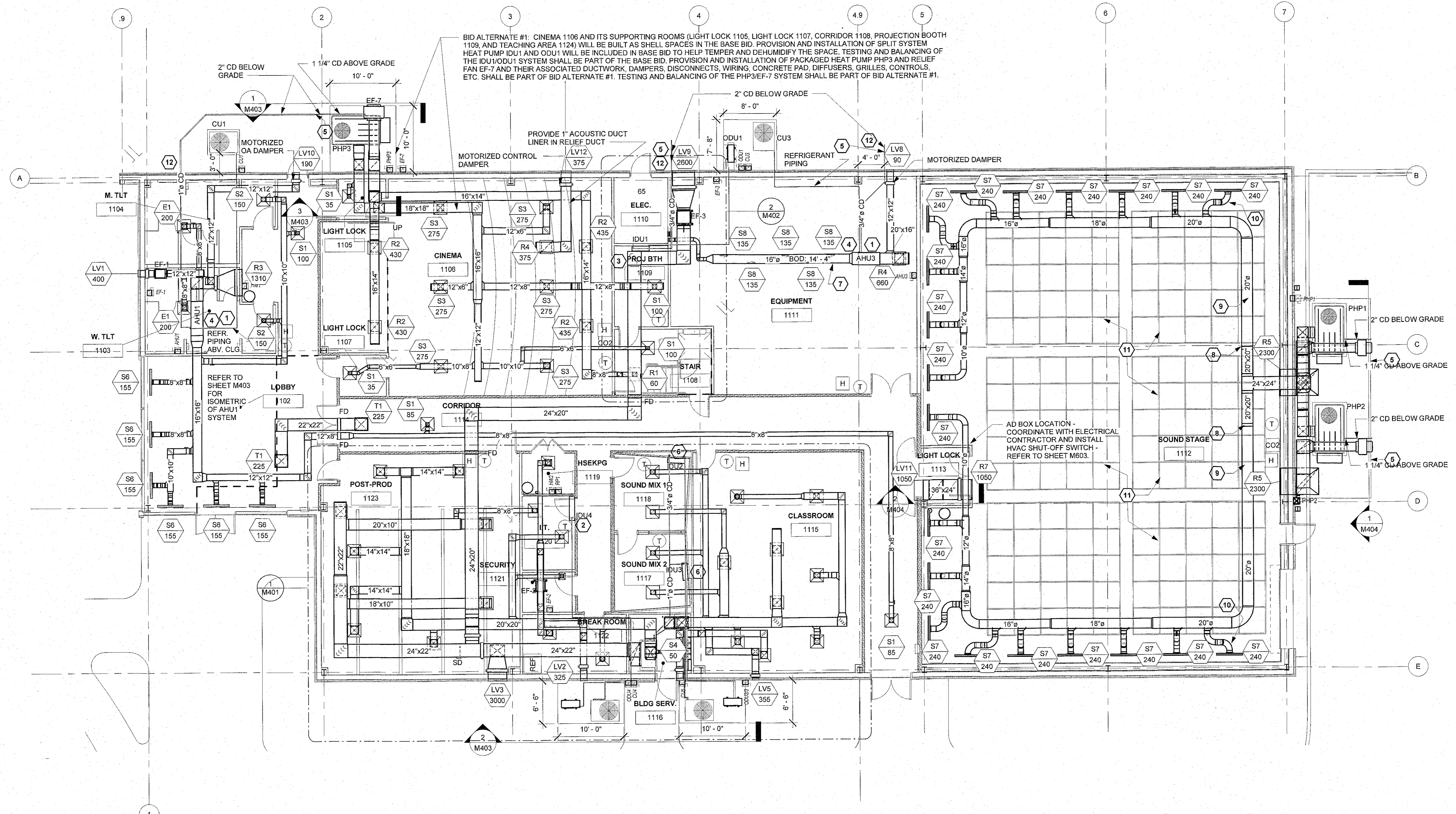


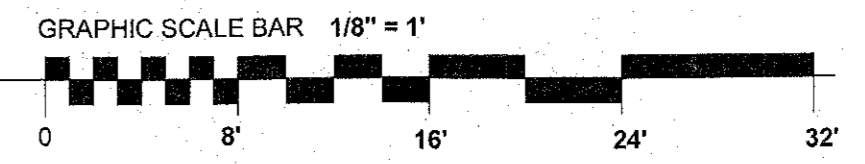
**UNCW FILM STUDIES**  
601 S College Rd, Wilmington, NC, 28403

PROJECT TITLE  
**MECHANICAL FLOOR PLAN**

Mark	Date	Description
PROJECT NO.	2018070.01	
DATE:	09/23/2019	
SCALE:	As indicated	
DRAWN BY:	JWS	PROJ MGR: IS
<b>M101</b>		
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**1 FIRST FLOOR - MECHANICAL LAYOUT**  
1/8" = 1'-0"



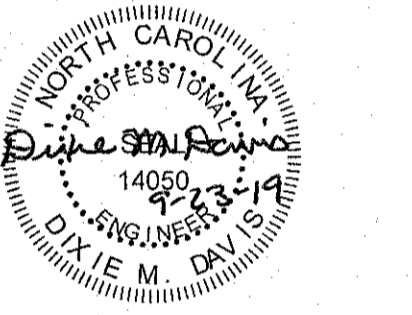
- NOTES:**
- REFER TO SHEET M100 FOR GENERAL NOTES, LEGENDS, AND ABBREVIATIONS.
  - REFER TO THE M500 SERIES FOR DETAILS AND TO M600 SERIES FOR EQUIPMENT SCHEDULES.
  - DUCT DIMENSIONS GIVEN ARE CLEAR INSIDE DIMENSIONS. WHERE ACOUSTIC DUCT LINER IS CALLED FOR THE SHEET METAL SIZES MUST BE ADJUSTED ACCORDINGLY. REFER TO NOTES ON THE DRAWINGS FOR LOCATIONS OF DUCT LINER (SOME ARE NOTED ON ENLARGED PLANS AND ELEVATIONS ON OTHER SHEETS). REFER TO DUCT LINER INSTALLATION DETAIL ON M501.
  - REFRIGERANT PIPING SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE NORTH CAROLINA STATE BUILDING CODE, MECHANICAL CODE AND THE MANUFACTURER'S INSTALLATION INSTRUCTIONS. REFRIGERANT PIPING SHALL NOT BE RUN ABOVE OR THROUGH ANY EXIT ENCLOSURE. ALSO REFER TO SPECIFICATION SECTION 232300 - REFRIGERANT PIPING AND SPECIALTIES.
  - LOUVERS SHALL BE FURNISHED BY THE MECHANICAL CONTRACTOR AND INSTALLED BY THE GENERAL CONTRACTOR. WHERE DAMPERS OR DUCTWORK ARE REQUIRED AT LOUVERS, THE MECHANICAL CONTRACTOR SHALL INSTALL THEM.
  - REFER TO THE ARCHITECTURAL PLANS FOR LOUVER INSTALLATION DETAILS.
  - REFER TO THE ARCHITECTURAL PLANS FOR A DETAIL OF HOW TO HANDLE A DUCT OR PIPE PENETRATION THROUGH AN EXTERIOR WALL.
  - SUPPORT ALL EQUIPMENT, DUCTWORK, AND PIPING FROM THE STRUCTURE OR THE FLOOR AS RECOMMENDED BY THE MANUFACTURER. CONCEAL DUCTS, PIPES, AND WIRING ABOVE CEILINGS WHEREVER CEILINGS ARE PROVIDED.
  - LOCKING VOLUME DAMPERS SHALL BE PROVIDED AT ALL DUCT TAKE-OFFS AND BRANCHES. LOCKING VOLUME DAMPERS ARE NOT ALL SHOWN ON THE DRAWINGS FOR CLARITY. AIR BALANCING SHALL BE PERFORMED USING DUCT VOLUME DAMPERS, NOT DAMPERS AT THE DIFFUSERS OR GRILLES.
  - CONDENSATE DRAINS FOR AHU1, IDU1, AND AHU3 SHALL BE RUN ABOVE CEILINGS WHERE AVAILABLE, AND DROP TO BELOW GRADE WITHIN THE BUILDING. THIS VERTICAL PIPING SHALL BE CONCEALED IN WALLS. THE PIPES SHALL HAVE A MINIMUM OF 36" OF COVER WHERE THEY ARE RUN OUTSIDE THE BUILDING.

**KEYED NOTES**

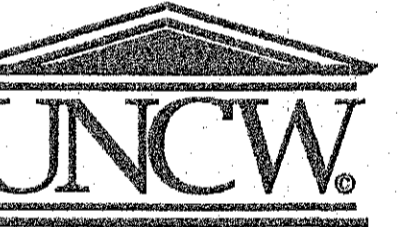
- ROUTE CONDENSATE FROM AHU1 AND AHU3 OUT TO CLEAN OUT PROVIDED BY SITE UTILITY CONTRACTOR. SEE DETAIL 2/M502 FOR TRAP DEPTH AND SIZE. INCREASE TO 2" BEFORE GOING BELOW FLOOR OR GRADE.
- ROUTE PUMPED CONDENSATE DRAIN FROM IDU4 TO JANITOR'S SINK IN HOUSEKEEPING 1120. INCLUDE CHECK VALVE AFTER EACH PUMP.
- ROUTE PUMPED CONDENSATE DRAIN FROM IDU1 TO CLEAN OUT OUTSIDE OF BUILDING. INCLUDE CHECK VALVE AFTER PUMP.
- AHU SHALL HAVE SECONDARY DRAIN PAN WITH MOISTURE SHUTOFF SWITCH.
- TIE INTO CLEAN OUT PROVIDED BY SITE UTILITY CONTRACTOR. SEE SHEET C4.01 FOR CONTINUATION OF DRAIN.
- ROUTE CONDENSATE DRAIN FROM IDU2 AND IDU3 TO FLOOR DRAIN IN BLDG SERV. 1116. INCLUDE CHECK VALVE AFTER THE PUMP.
- SUPPLY DUCT SHALL BE DOUBLE WALL SPIRAL DUCT WITH THE INTERIOR OF THE 16" DIAMETER PORTION PERFORATED. RETURN DUCT SHALL BE DOUBLE WALL RECTANGULAR DUCT WITH INTERIOR PERFORATED. O.A. DUCT SHALL BE DOUBLE WALL RECTANGULAR WITH SOLID INTERIOR.
- PROVIDE DOUBLE WALL RECTANGULAR INSULATED DUCT WITH PERFORATED INTERIOR FROM ELBOW AT WALL TO THIS POINT.
- PROVIDE DOUBLE WALL INSULATED DUCTWORK WITH SOLID INTERIOR WALLS - TYPICAL FOR SUPPLY TRUNK DUCTS IN THIS ROOM.
- BRANCH DUCTS MAY BE SINGLE WALL ROUND DUCT WITH NO MORE THAN 3' OF FLEXIBLE DUCT FOR CONNECTION TO LINEAR DIFFUSER PLENUM BOXES - TYPICAL FOR THIS ROOM.
- SIX THEATRICAL LIGHTING GRIDS TO BE INSTALLED BELOW THE CEILING BY G.C. COORDINATE EXACT LOCATION OF DUCTWORK, DIFFUSERS, AND GRILLES TO AVOID INTERFERENCE WITH THE SUPPORTS FOR THIS GRID.
- WHERE CONDENSATE DRAIN PIPES PASS UNDER THE EDGE OF THE FOOTING (TURNED DOWN SLAB), PROVIDE A SCHEDULE 40 STEEL PIPE SLEEVE TWO PIPE SIZES LARGER THAN THE PIPE. EXTEND THE PIPE SLEEVE 1'-0" PAST EACH SIDE OF THE CONCRETE FOOTING. PROVIDE SPACERS INSIDE SLEEVE TO MAINTAIN SLOPE OF PIPE. FILL OR SEAL ANNULAR SPACE IN AN APPROVED MANNER. BACKFILL TRENCH WITH #57 STONE. THE BEARING CAPACITY OF THIS AREA MUST MEET OR EXCEED THE ALLOWABLE SOIL BEARING CAPACITY. COORDINATE WITH STRUCTURAL WORK.

**FIRE RATED SCHEDULE**

	0 HR RATED SMOKE PARTITION
	1 HR RATED FIRE PARTITION / FIRE BARRIER
	2 HR RATED FIRE WALL



PROJECT TITLE



**UNCW FILM STUDIES**

601 S College Rd, Wilmington, NC, 28403

SHEET TITLE

**ENLARGED FLOOR PLANS**

ISSUE BLOCK

Mark	Date	Description

PROJECT NO: 2018070.01

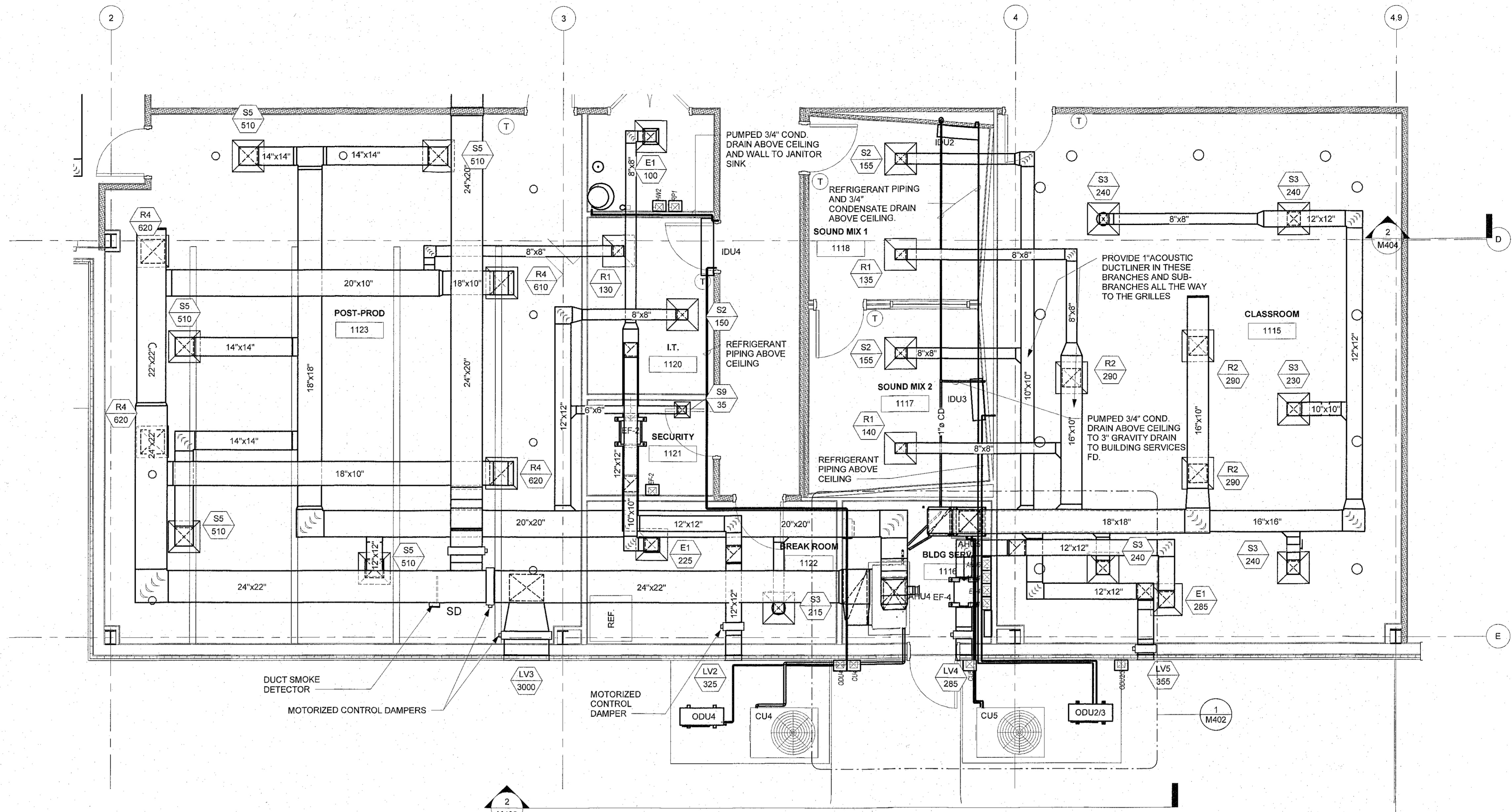
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SCALE: As indicated

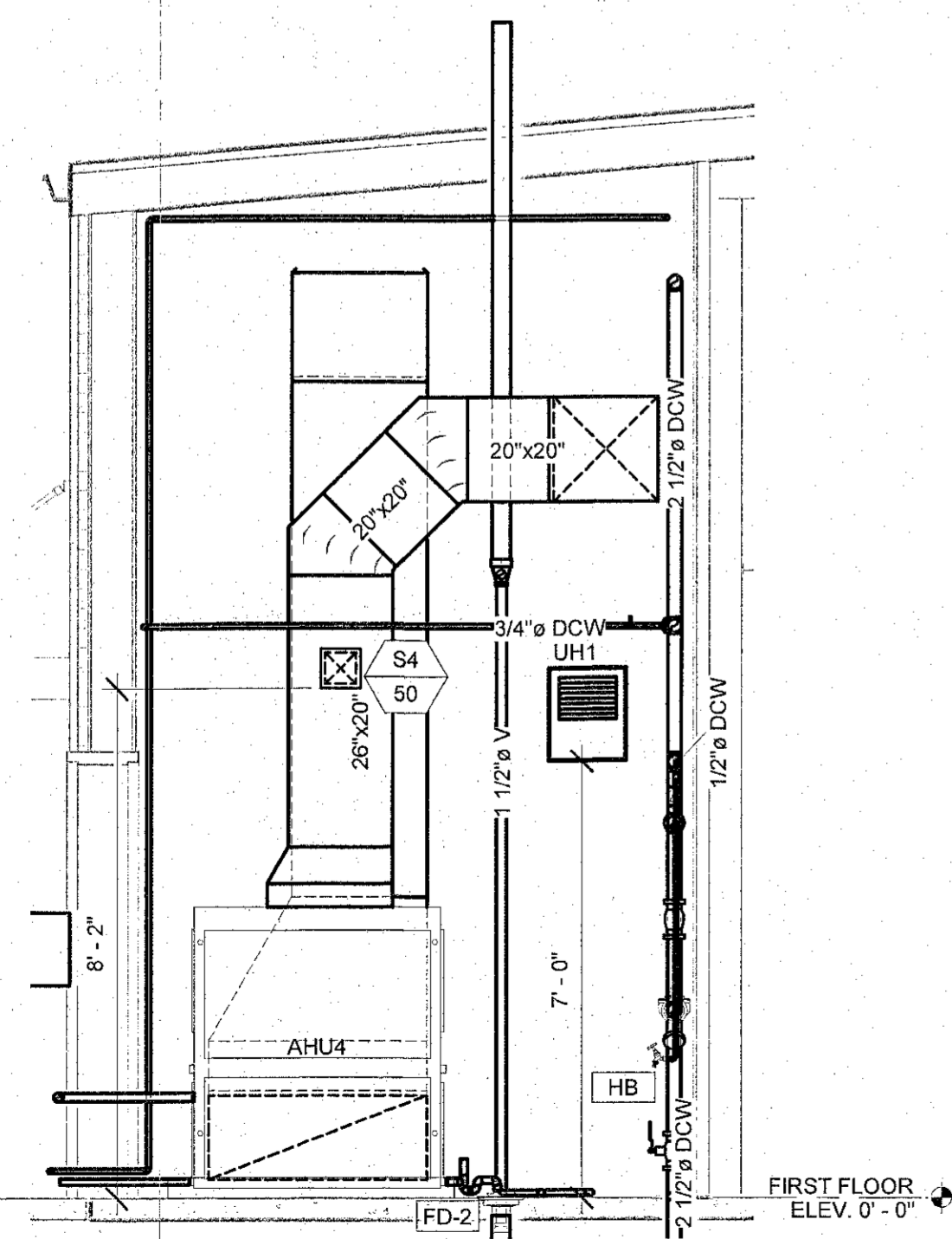
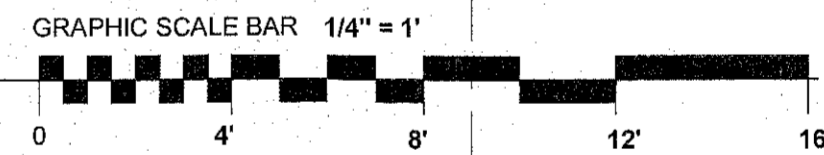
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**M401**

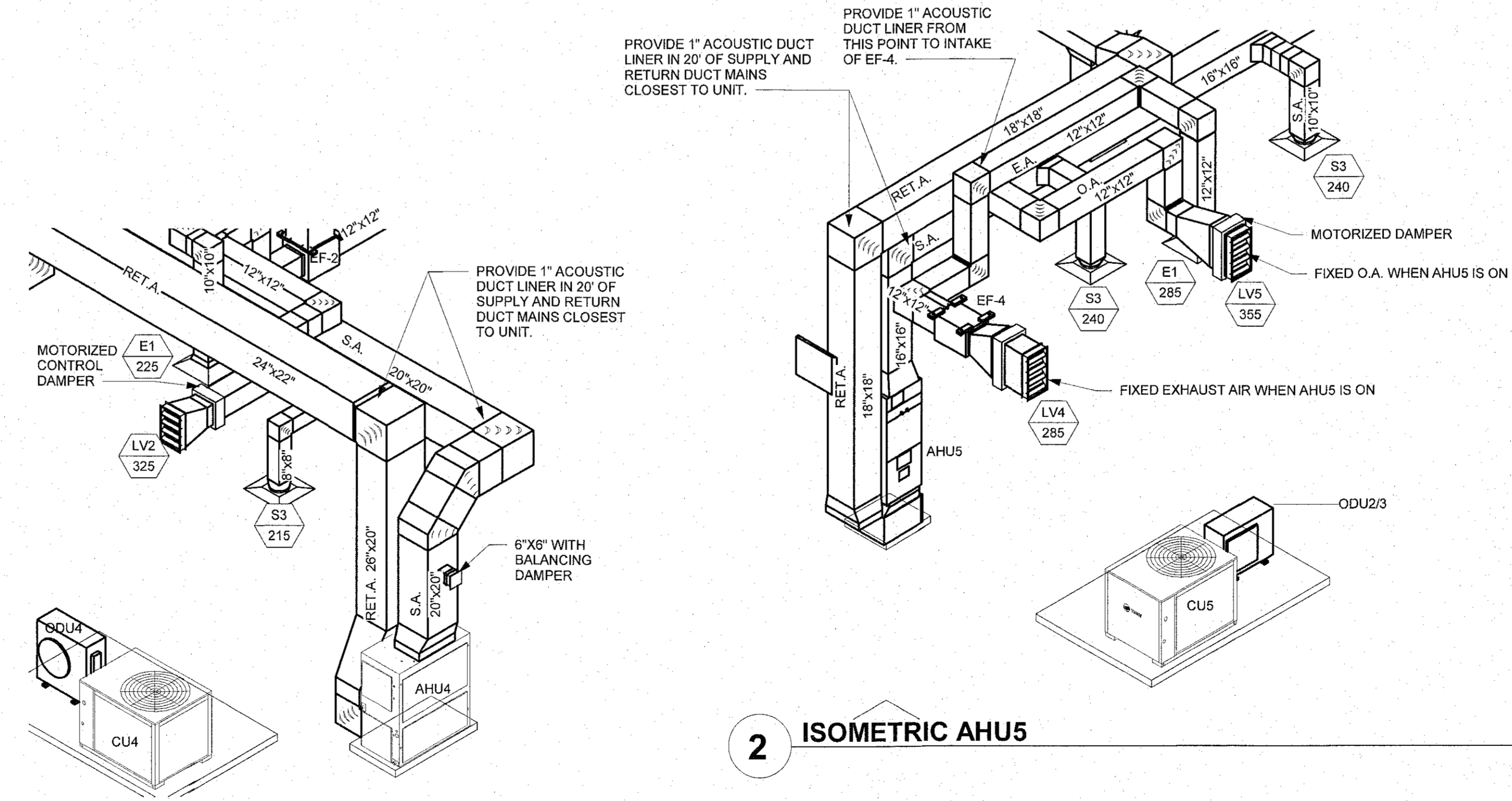
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**1 ENLARGED POST-PROD AND CLASSROOM**  
1/4" = 1'-0"



**4 ELEVATION VIEW AHU4**  
3/8" = 1'-0"



**2 ISOMETRIC AHU5**

**3 ISOMETRIC AHU4**

**FIRE RATED SCHEDULE**

	0 HR RATED SMOKE PARTITION
	1 HR RATED FIRE PARTITION / FIRE BARRIER
	2 HR RATED FIRE WALL

**MCADAMS**

CIVIL ENGINEERING  
2805 MERIDIAN PARKWAY  
DURHAM, NC 27715

OFFICE: 919.361.5000

**WOODS ENGINEERING**

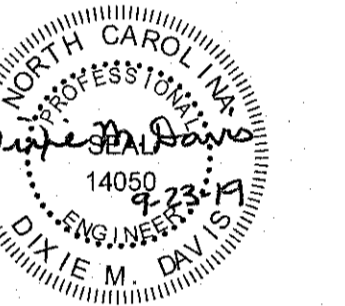
STRUCTURAL ENGINEERING  
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WILMINGTON, NC 28401

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PROJECT TITLE



**UNCW FILM STUDIOS**

601 S College Rd, Wilmington, NC, 28403

SHEET TITLE

**ENLARGED FLOOR PLANS**

ISSUE BLOCK

Mark Date Description

PROJECT NO: 2018070.01

DATE: 09/23/2019

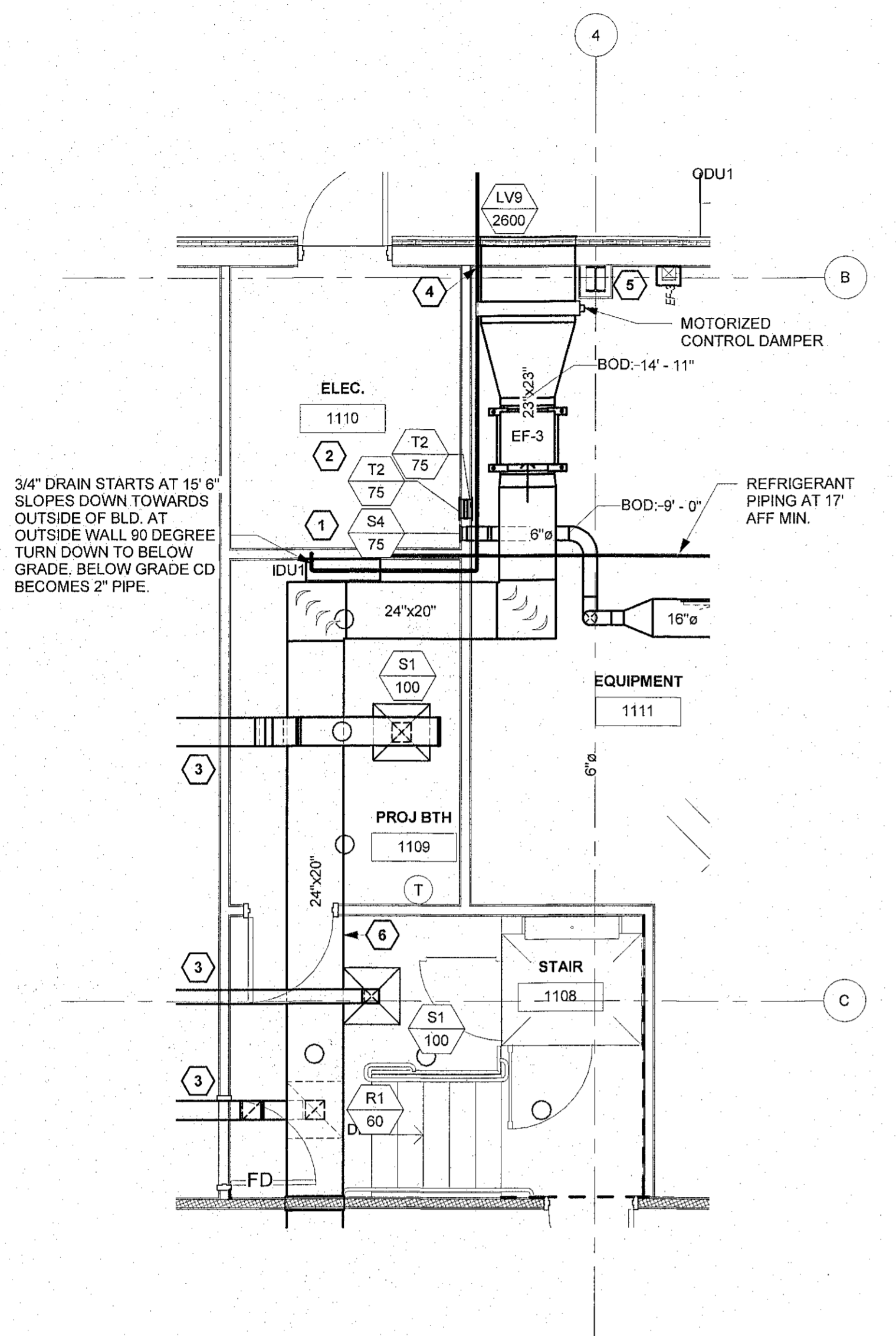
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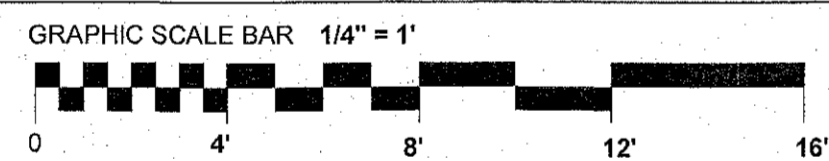
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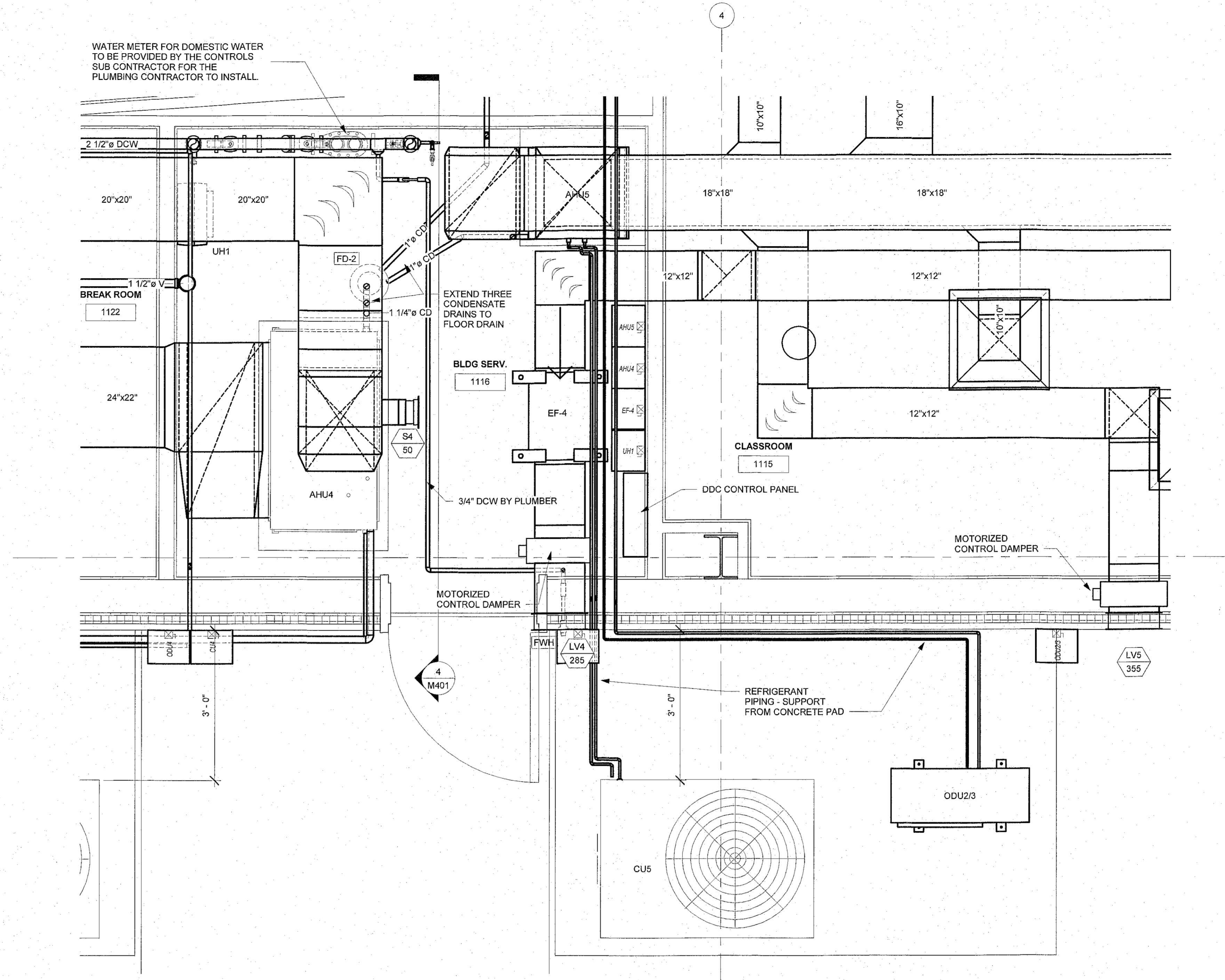
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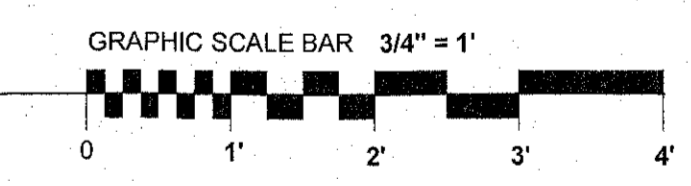
**2 ENLARGED PROJECTION BOOTH AND CORRIDOR**  
1/4" = 1'-0"



- KEYED NOTES:
- 1 SUPPLY DIFFUSER TO BE APPROXIMATELY 9'-0" AFF IN CORNER TO AVOID ELECTRICAL PANELS. COORDINATE EXACT LOCATION WITH ELECTRICAL CONTRACTOR AND DO NOT INSTALL DIRECTLY OVER ANY ELECTRICAL PANEL.
  - 2 TRANSFER GRILLES TO BE INSTALLED DIRECTLY BELOW THE SUPPLY DIFFUSER AT APPROXIMATELY 12" AFF. COORDINATE EXACT LOCATION WITH ELECTRICAL CONTRACTOR AND DO NOT INSTALL DIRECTLY BELOW ANY ELECTRICAL PANEL.
  - 3 THESE THREE BRANCHES AND THEIR DIFFUSERS AND GRILLE ARE PART OF BID ALTERNATE #1.
  - 4 RUN 3/4" CONDENSATE DRAIN DOWN AGAINST WALL. TRANSITION TO 2" NEAR THE FLOOR, RUN OUT BELOW GRADE AS 2" TO JOIN THE CLEANOUT PROVIDED BY THE SITE UTILITY CONTRACTOR.
  - 5 RUN THE REFRIGERANT PIPING DOWN ALONG THE WALL AND OUT HORIZONTALLY ABOVE GRADE TO ODU1.
  - 6 PROVIDE 1" ACOUSTIC DUCT LINER FROM THIS POINT TO THE INTAKE OF EF-3.

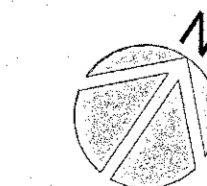


**1 ENLARGED BUILDING SERVICES**  
3/4" = 1'-0"



**FIRE RATED SCHEDULE**

	0 HR RATED SMOKE PARTITION
	1 HR RATED FIRE PARTITION / FIRE BARRIER
	2 HR RATED FIRE WALL



**MCADAMS**

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2905 MERIDIAN PARKWAY  
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**WOODS ENGINEERING**

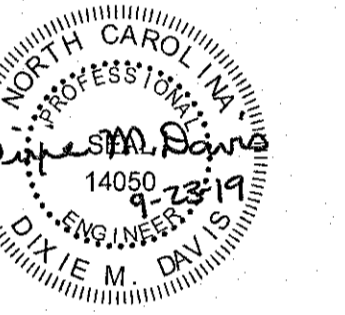
STRUCTURAL ENGINEERING  
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WILMINGTON, NC 28401

910-343-8007 fax 910-343-8088

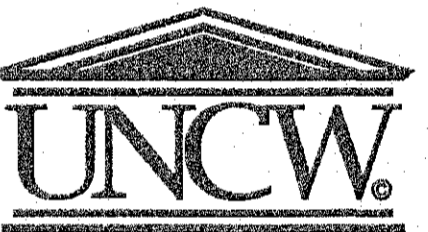
**SUD ASSOCIATES, P.A.**

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1813 CHAPEL HILL ROAD  
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PROJECT TITLE



**UNCW FILM STUDIES**

601 S College Rd, Wilmington, NC, 28403

SHEET TITLE

**ELEVATION VIEWS**

ISSUE BLOCK

Mark	Date	Description

PROJECT NO: 2018070.01

DATE: 09/23/2019

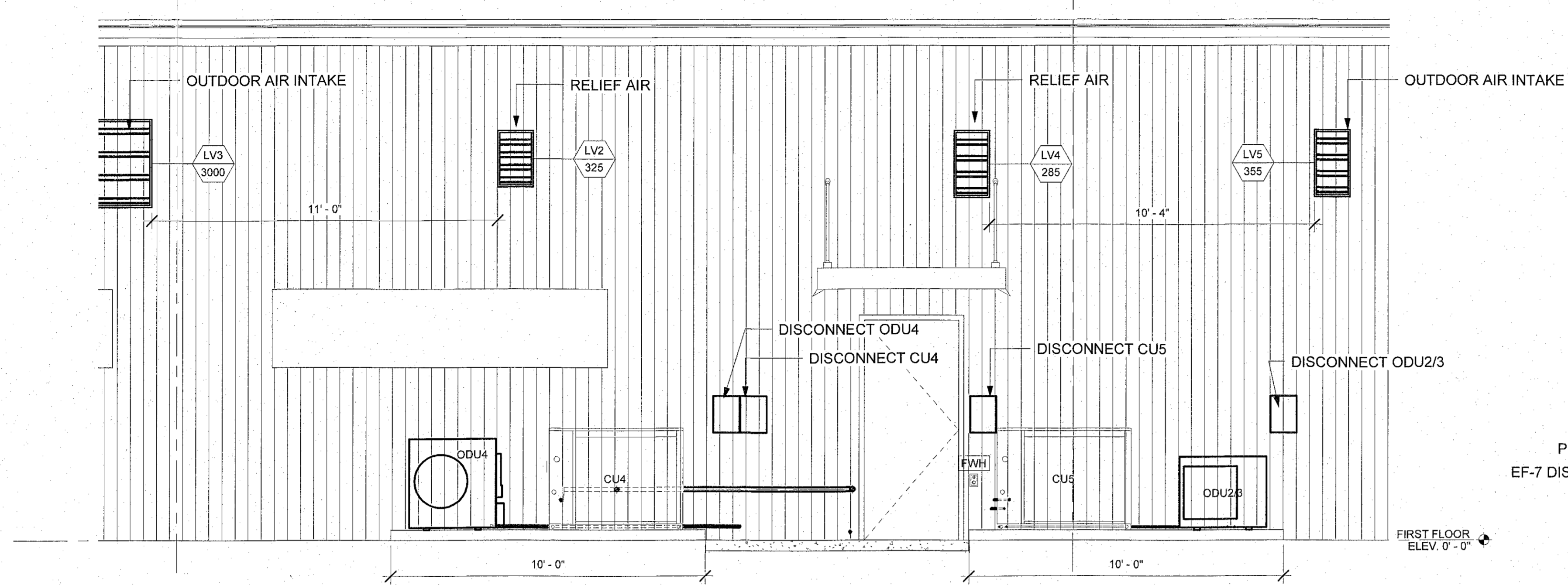
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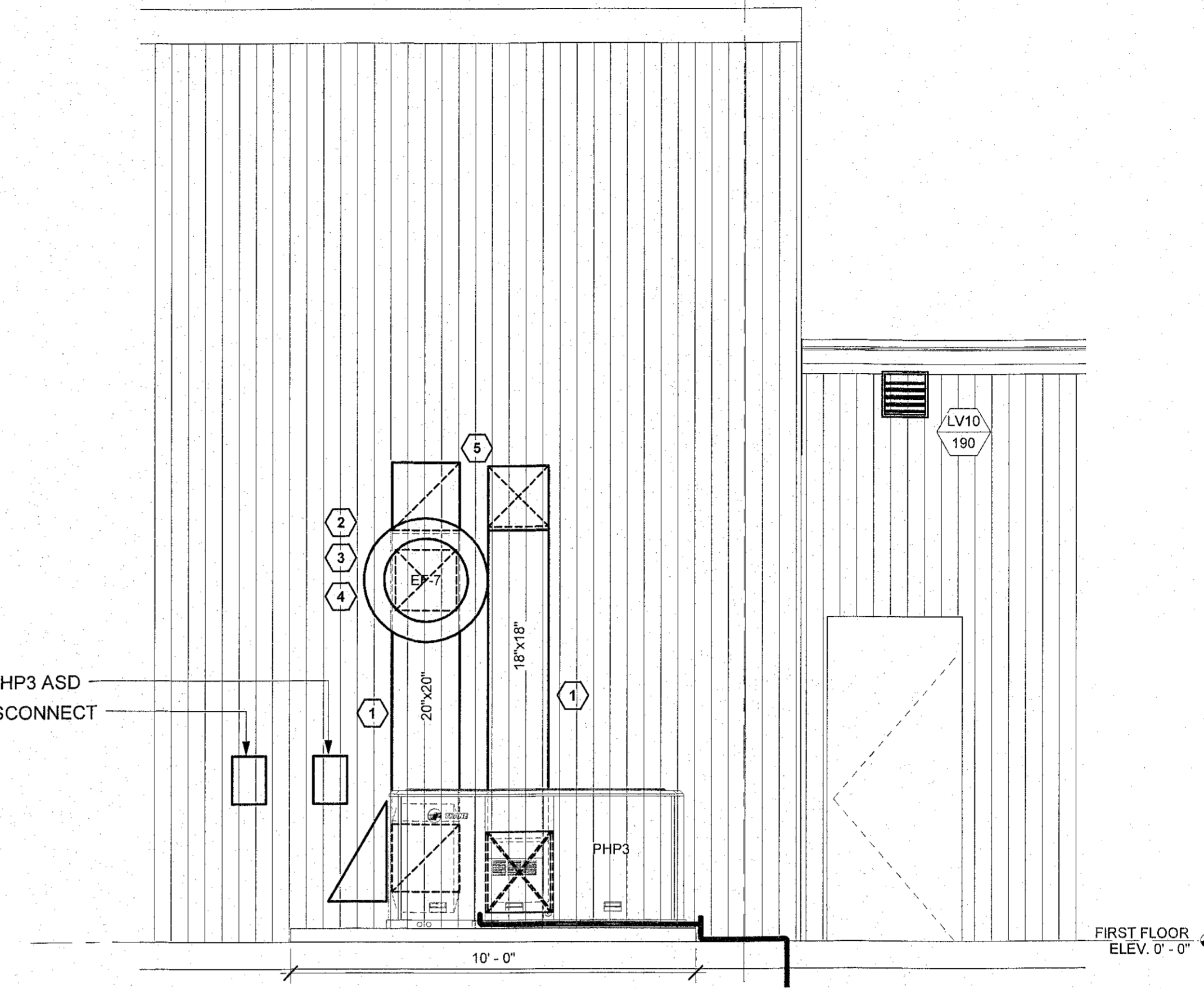
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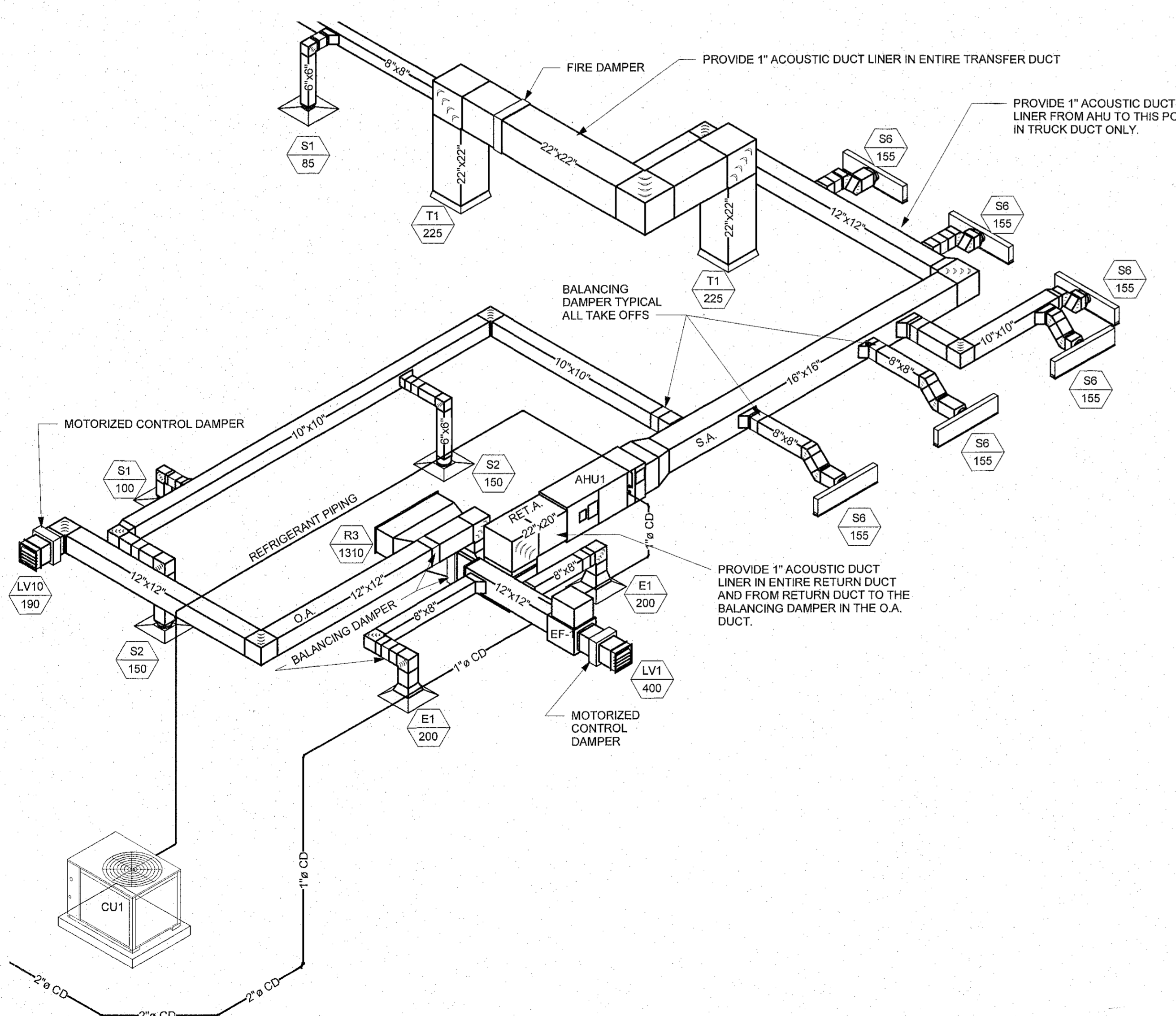
**2 ELEVATION VIEW OUTSIDE BUILDING SERVICES**  
3/8" = 1'-0"



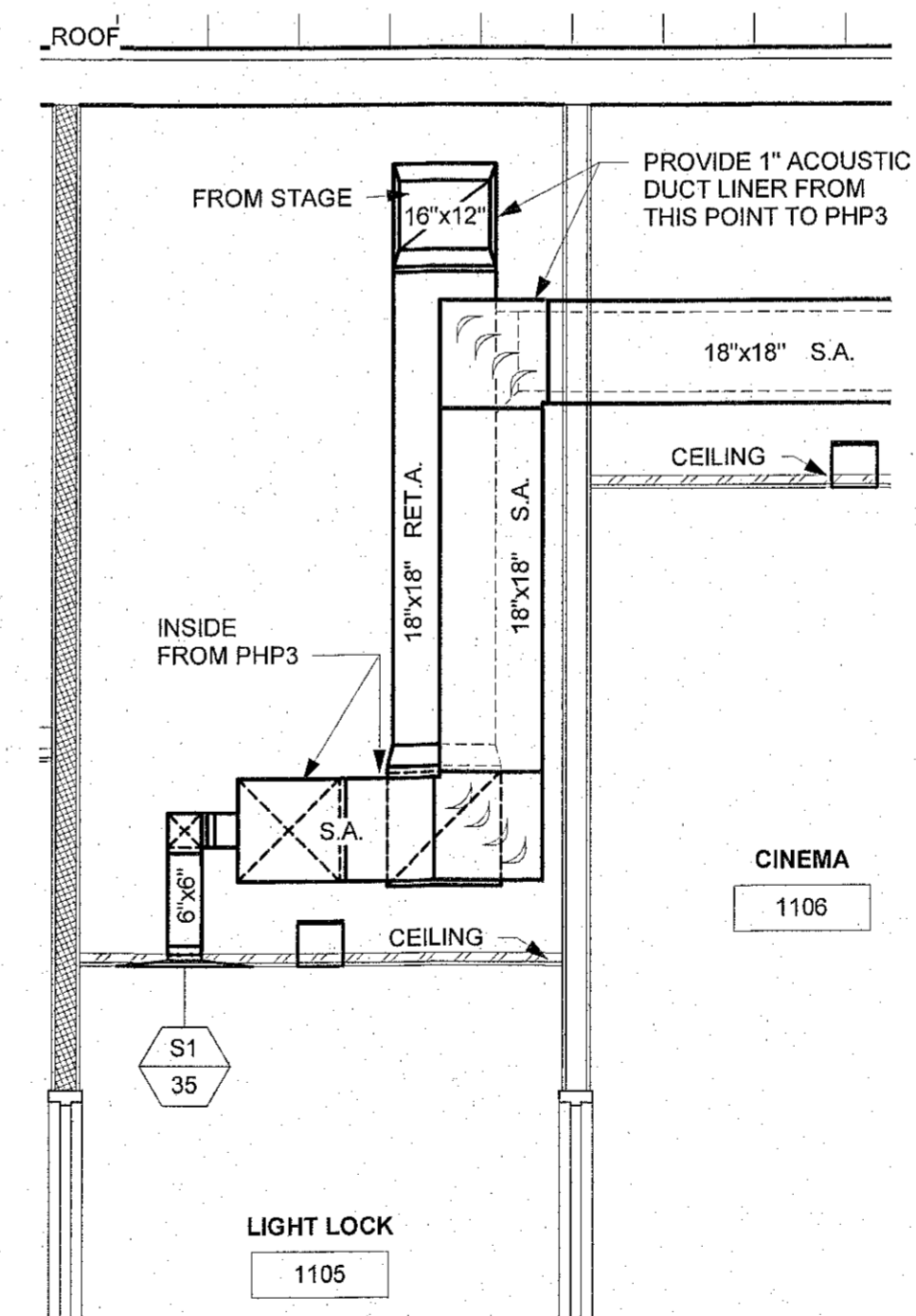
**1 ELEVATION VIEW PHP3**  
3/8" = 1'-0"

- GENERAL NOTES FOR ELEVATION VIEW PHP3
- REFER TO DETAIL SHEETS FOR EXTERIOR DUCT INSULATION DETAIL AND OUTDOOR DUCT SUPPORT DETAIL. IN ADDITION TO DUCT BOARD ON THE OUTSIDE OF THE DUCT, PROVIDE 1" ACOUSTIC LINER FOR SOUND ATTENUATION IN ALL EXTERIOR DUCTS. DUCT DIMENSIONS GIVEN ARE CLEAR INSIDE DIMENSIONS SO SHEET METAL SIZE MUST BE ADJUSTED ACCORDINGLY.
  - CONNECT SUPPLY AND RETURN DUCTS TO THE PACKAGED UNITS WITH FLEXIBLE CONNECTIONS.
  - REFER TO DETAIL SHEETS FOR CONDENSATE DRAIN PIPING SCHEMATIC. HEAT TRACE AND INSULATE CONDENSATE DRAINS FROM THE UNIT DISCHARGE TO WHERE THE CONDENSATE DRAIN GOES BELOW GRADE.
  - ALL STEEL USED FOR SUPPORTING EQUIPMENT SHALL BE GALVANIZED WITH STAINLESS STEEL FASTENERS. OTHER MATERIAL RECOMMENDED BY METAL BUILDING FABRICATOR MAY BE USED IF APPROVED DURING SHOP DRAWING REVIEW.

- KEYED NOTES:
- SUPPORT SUPPLY AND RETURN DUCTS FROM CONCRETE SLAB AND WALL STRUCTURE. COORDINATE WITH G.C. AND/OR METAL BUILDING FABRICATOR.
  - PROVIDE FLEXIBLE DUCT CONNECTION BETWEEN THE 16" x 16" RELIEF DUCT AND THE RELIEF FAN.
  - REINFORCE THE RELIEF AIR DUCT AND PROVIDE 4"x4"x1/4" ANGLE FRAME AT THE END OF THE RELIEF DUCT TO ACCEPT MOUNTING OF THE RELIEF FAN. SUPPORT THE RELIEF AIR DUCTWORK AND RELIEF FAN FROM THE CONCRETE SLAB UTILIZING 4"x4"x1/4" ANGLES.
  - INSTALL MOTORIZED DAMPER IN RELIEF DUCT PROVIDED BY CONTROLS CONTRACTOR.
  - REFER TO ARCHITECTURAL DRAWINGS FOR DETAIL OF DUCT PENETRATION OF WALL. COORDINATE WITH G.C. TO PROVIDE WEATHERPROOF/SOUND DEADENING SEAL.



**4 ISOMETRIC AHU1**  
3/8" = 1'-0"



**3 ELEVATION VIEW ABOVE LIGHT LOCK 1105**  
3/8" = 1'-0"

FIRE RATED SCHEDULE	
	0 HR RATED SMOKE PARTITION
	1 HR RATED FIRE PARTITION / FIRE BARRIER
	2 HR RATED FIRE WALL

**MCADAMS**

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2905 MERIDIAN PARKWAY  
DURHAM, NC 27713

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**WOODS ENGINEERING**

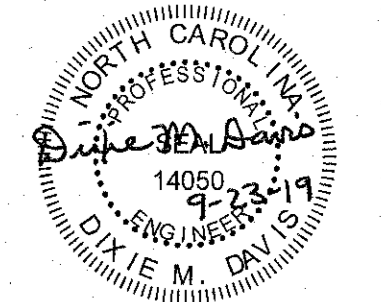
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WILMINGTON, NC 28401

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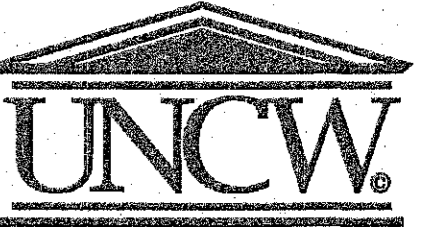
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PROJECT TITLE



**UNCW FILM  
STUDIES**

601 S College Rd, Wilmington,  
NC, 28403

SHEET TITLE

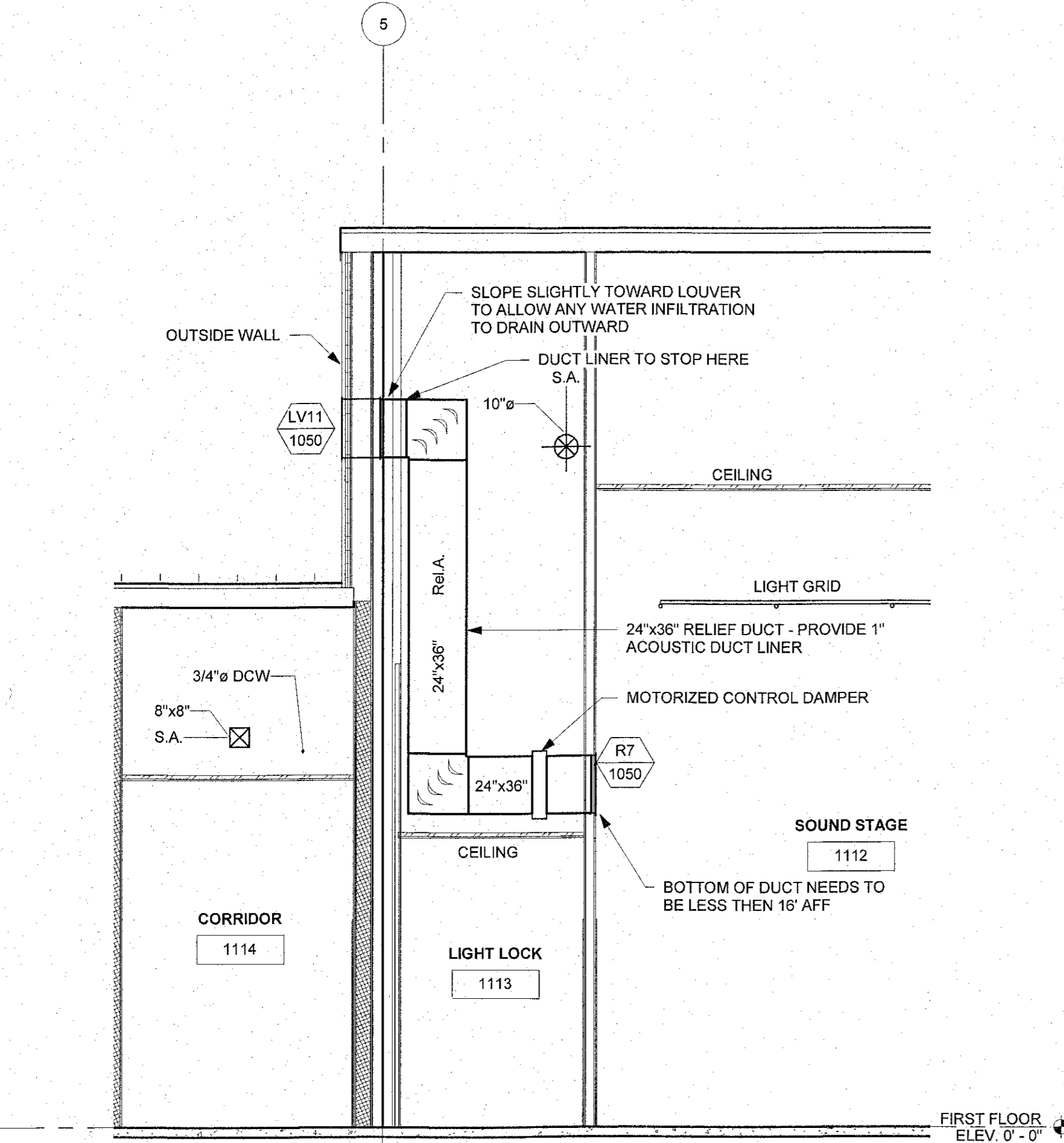
**ELEVATION VIEWS**

Mark	Date	Description

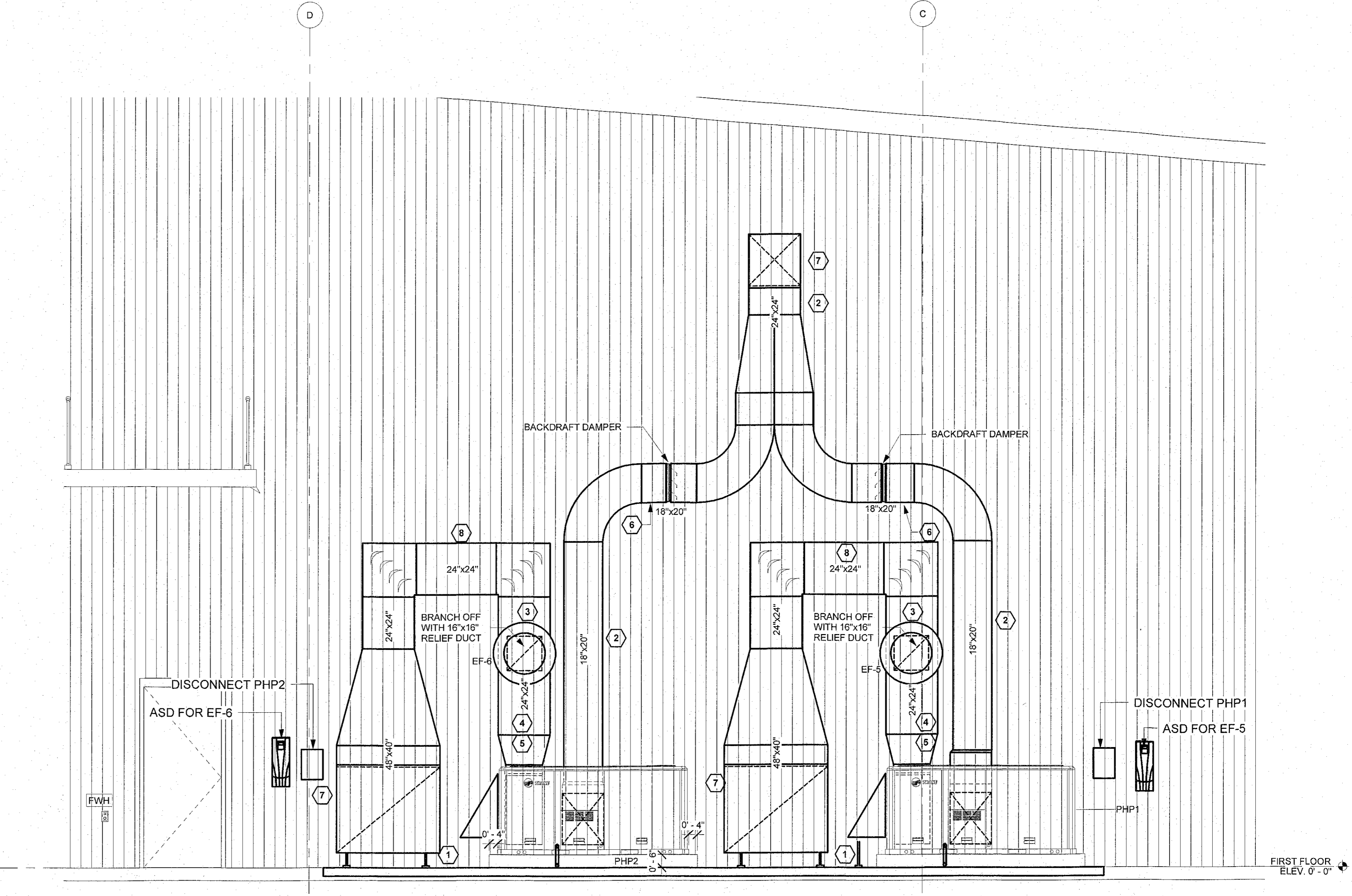
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**2 ELEVATION VIEW RELIEF AIR SOUND STAGE**  
1/4" = 1'-0"



**1 ELEVATION OF OUTSIDE DUCTWORK AND PACKAGED UNITS PHP1 AND PHP2**  
3/8" = 1'-0"

GENERAL NOTES

- REFER TO DETAIL SHEETS FOR EXTERIOR DUCT INSULATION DETAIL AND OUTDOOR DUCT SUPPORT DETAIL. IN ADDITION TO DUCT BOARD ON THE OUTSIDE OF THE DUCT, PROVIDE 1" ACOUSTIC LINER FOR SOUND ATTENUATION IN ALL EXTERIOR DUCTS. DUCT DIMENSIONS GIVEN ARE CLEAR INSIDE DIMENSIONS SO SHEET METAL SIZE MUST BE ADJUSTED ACCORDINGLY.
- CONNECT SUPPLY AND RETURN DUCTS TO THE PACKAGED UNITS WITH FLEXIBLE CONNECTIONS.
- REFER TO DETAIL SHEETS FOR CONDENSATE DRAIN PIPING SCHEMATIC.
- HEAT TRACE AND INSULATE CONDENSATE DRAINS FROM THE UNIT DISCHARGE TO WHERE THE CONDENSATE DRAIN GOES BELOW GRADE.
- ALL STEEL USED FOR SUPPORTING EQUIPMENT SHALL BE GALVANIZED WITH STAINLESS STEEL FASTENERS. OTHER MATERIAL RECOMMENDED BY METAL BUILDING FABRICATOR MAY BE USED IF APPROVED DURING SHOP DRAWING REVIEW.

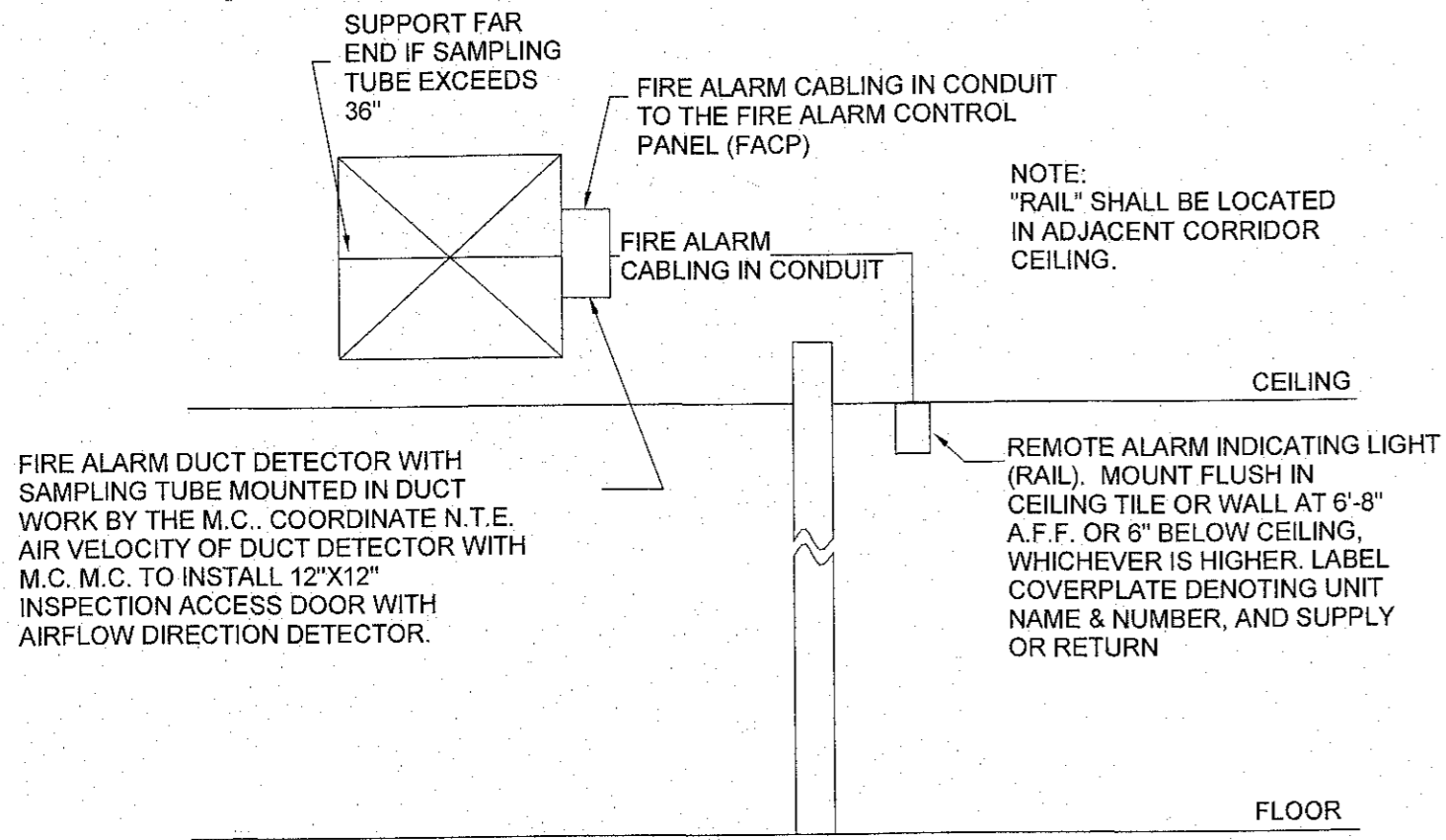
KEYED NOTES:

- SUPPORT DUCTS FROM CONCRETE SLAB USING GALVANIZED STEEL ANGLES, CHANNELS, OR UNISTRUT. BOLT THESE SUPPORTS INTO THE CONCRETE. TYPICAL FOR RETURN/RELIEF/SUPPLY DUCTS NEAR GRADE.
- SUPPORT SUPPLY DUCTS FROM CONCRETE SLAB AND WALL STRUCTURE. COORDINATE WITH G.C. AND/OR METAL BUILDING FABRICATOR.
- PROVIDE FLEXIBLE DUCT CONNECTION BETWEEN THE 16" x 16" RELIEF DUCT AND THE RELIEF FAN.
- REINFORCE THE RELIEF AIR DUCT AND PROVIDE 4" x 4" x 1/4" ANGLE FRAME AT THE END OF THE RELIEF DUCT TO ACCEPT MOUNTING OF THE RELIEF FAN. SUPPORT THE RELIEF AIR DUCTWORK AND RELIEF FAN FROM THE CONCRETE SLAB UTILIZING 4" x 4" x 1/4" ANGLES.
- INSTALL MOTORIZED DAMPER IN RELIEF DUCT PROVIDED BY CONTROLS CONTRACTOR.
- PROVIDE ACCESS DOOR ON THE BOTTOM OF THE DUCT FOR CHECKING THE BACKDRAFT DAMPER.
- REFER TO ARCHITECTURAL DRAWINGS FOR DETAIL OF DUCT PENETRATION OF WALL. COORDINATE WITH G.C. TO PROVIDE WEATHERPROOF/SOUND DEADENING SEAL.
- PROVIDE UPSIDE-DOWN U-SHAPED RETURN/RELIEF DUCT WITH 1" ACOUSTIC LINER TO ABSORB SOUND. ENTIRE PATH FROM THE GRILLES TO THE FAN AND TO THE UNIT SHALL BE LINED. OUTSIDE OF DUCTS SHALL ALSO BE INSULATED WITH DUCT BOARD AND COVERED WITH ALUMINUM JACKETING. SUPPORT FROM CONCRETE SLAB AND WALL STRUCTURE. COORDINATE WITH G.C. AND/OR METAL BUILDING FABRICATOR.

FIRE RATED SCHEDULE

- 0 HR RATED SMOKE PARTITION
- 1 HR RATED FIRE PARTITION / FIRE BARRIER
- 2 HR RATED FIRE WALL

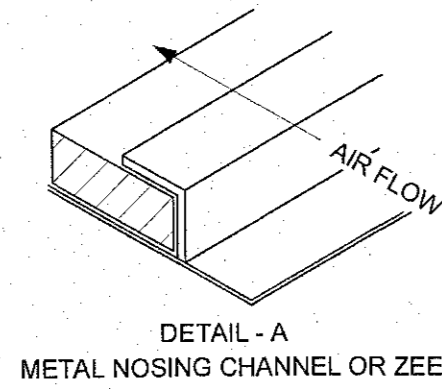
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**3 DUCT DETECTOR DETAIL**  
12" = 1'-0"

NOTE:

METAL NOSING MUST BE USED WHEREVER LINER IS PRECEDED BY UNLINED METAL. OTHERWISE WHEN VELOCITY EXCEEDS 4000 FPM USE METAL NOSING ON EVERY LEADING EDGE. NOSING MAY BE FORMED ON DUCT OR BE CHANNEL OR ZEE ATTACHED BY SCREWS, RIVETS OR WELDS.



INTERIOR WIDTH OF 8" AND LESS DOES NOT REQUIRE PINS.

THE VELOCITY RATED SIDE OF THE LINER MUST FACE THE AIR FLOW.

DUCT SECTION (TYPICAL 4 FT. OR 5 FT.)

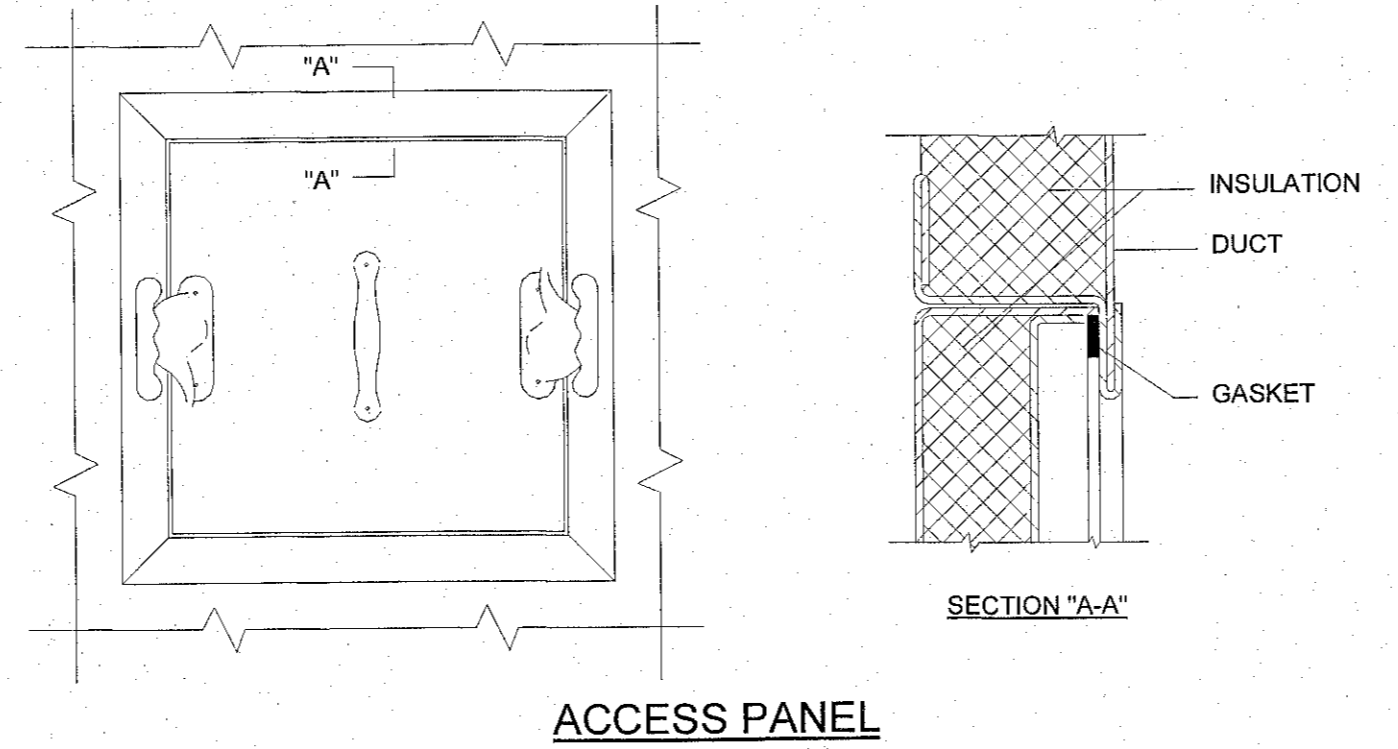
MAXIMUM SPACING FOR FASTENERS ACTUAL INTERVALS ARE APPROXIMATE.

"A" PIN MAY BE OMITTED WHEN METAL NOSING IS USED. "E" THEN STARTS FROM THE NOSING.

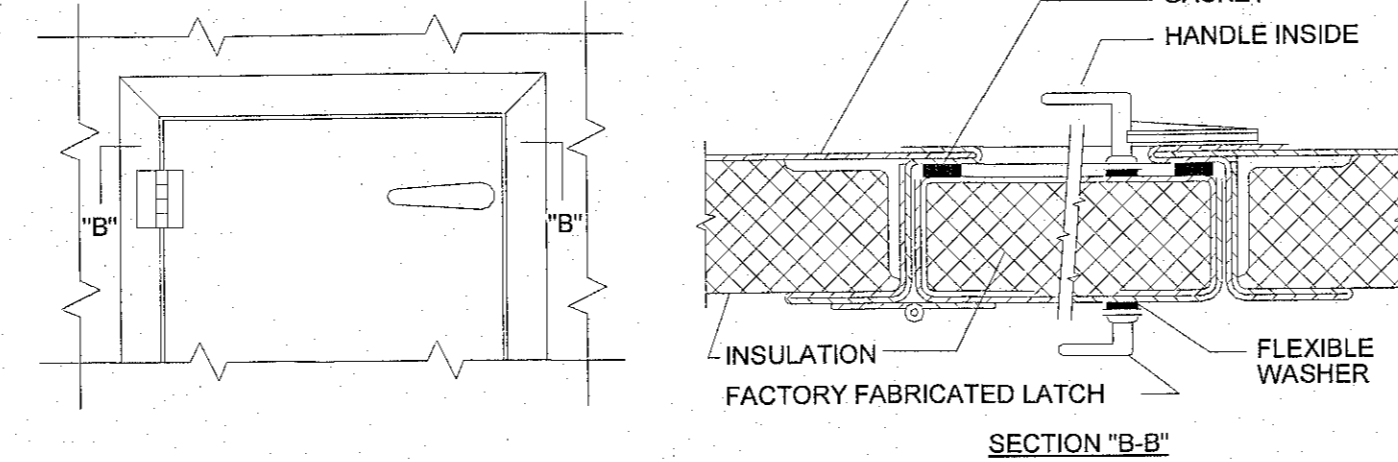
Velocity	A	B	C	D	E
0 - 2500 FPM	3"	12"	4"	6"	18"
2501 - 6000 FPM	3"	6"	4"	6"	16"

**6 DUCT LINER INSTALLATION DETAIL**  
12" = 1'-0"

NOTE: DUCT LINER IS TO BE USED FOR SOUND ABSORPTION. DUCT LINER IS TO BE USED WHERE NOTED ON THE DRAWINGS. LINED SUPPLY DUCTS SHALL ALSO BE WRAPPED WITH INSULATION. DUCT LINER SHALL BE PROVIDED ONLY WHERE NOTED. DUCT SIZES ON THE DRAWINGS ARE CLEAR INSIDE DIMENSIONS. WHERE LINER IS CALLED FOR THE SHEET METAL SIZE SHALL BE ADJUSTED ACCORDINGLY.



**ACCESS PANEL**



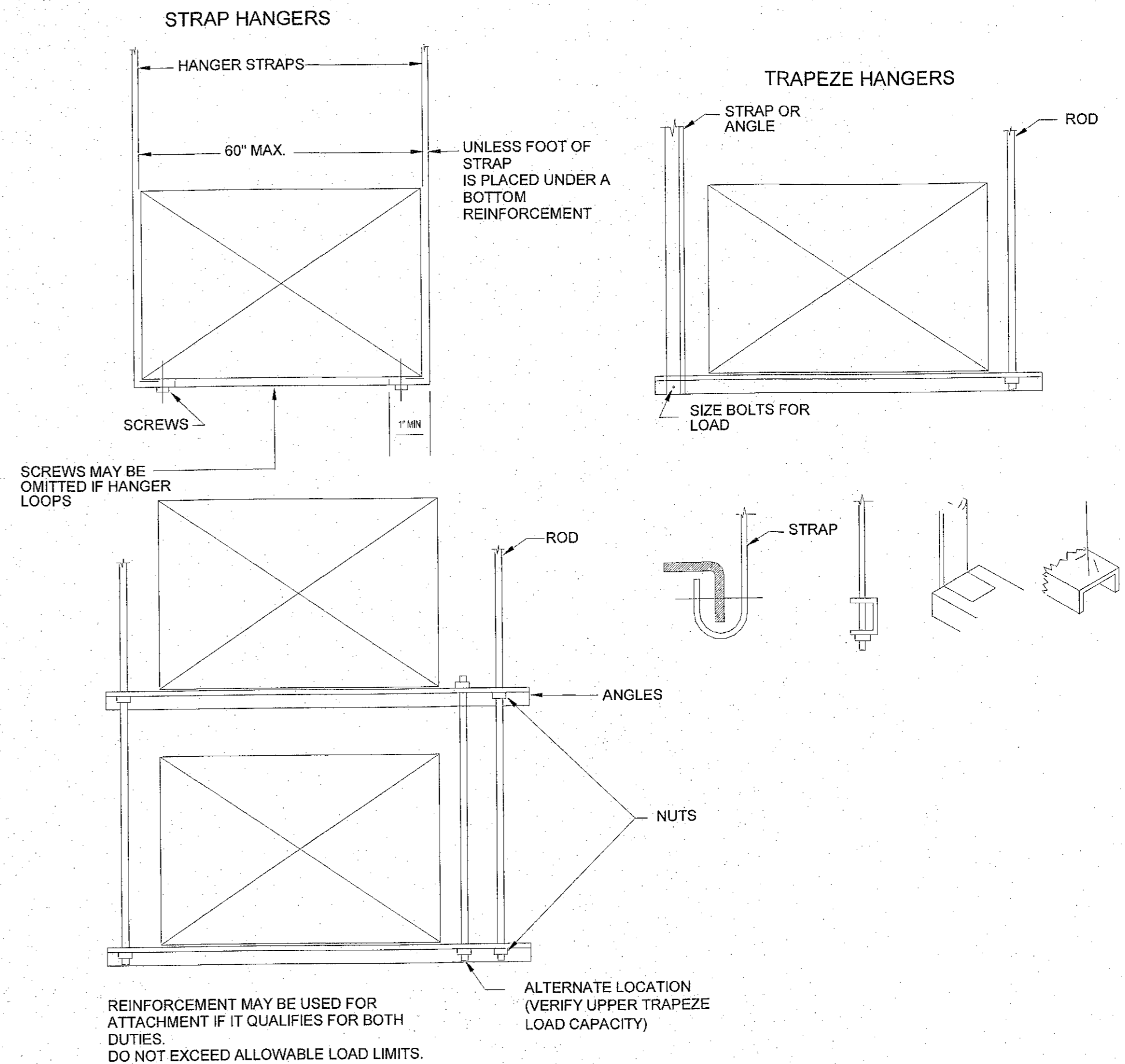
**ACCESS DOOR**

NOTES:  
1. LATCHES SHALL BE OF THE WEDGE TYPE TO CLOSE DOORS TIGHTLY.  
2. HINGES ON THE ACCESS DOORS SHALL HAVE NON-CORROSIVE PINS.

DESIGNER'S NOTES:  
1. USE ACCESS DOORS ON AIR HANDLING UNITS AND DUCTWORK INSTALLED IN EQUIPMENT ROOMS.  
2. USE ACCESS PANELS ON ALL EQUIPMENT AND DUCTWORK INSTALLED ABOVE FINISHED CEILINGS.

**2 DUCT ACCESS DOOR**  
12" = 1'-0"

**1 DUCT HANGER DETAIL**  
12" = 1'-0"

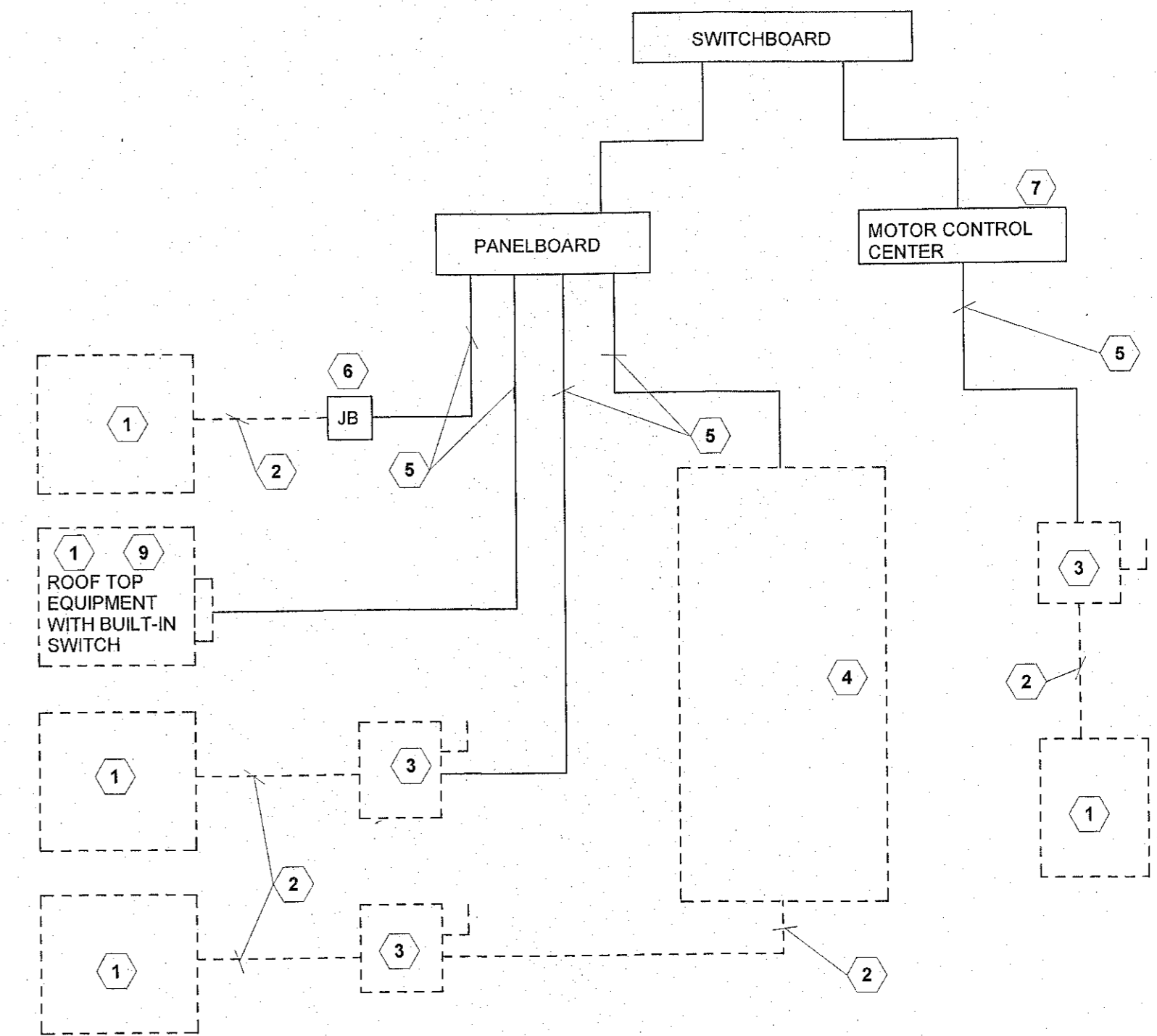


REINFORCEMENT MAY BE USED FOR ATTACHMENT IF IT QUALIFIES FOR BOTH DUTIES. DO NOT EXCEED ALLOWABLE LOAD LIMITS.

**ELECTRICAL NOTES**

- EQUIPMENT OF TRADES OTHER THAN ELECTRICAL.
- CONDUIT AND WIRING BY HVAC, PLUMBING CONTRACTOR OR OTHER TRADES.
- IF AN ADDITIONAL DISCONNECT IS REQUIRED BY NEC IT SHALL BE PROVIDED AND INSTALLED BY THE EQUIPMENT CONTRACTOR.
- A COMBINATION STARTER OR VFD MAY BE USED IN LIEU OF A SEPARATE DISCONNECT SWITCH AND STARTER. LOCATE ADJACENT TO THE EQUIPMENT.
- FEEDER CIRCUIT WIRING AND CONDUIT IN ELECTRICAL WORK. SEE PANELBOARD SCHEDULES FOR WIRE AND BREAKER SIZES.
- JUNCTION BOX MAY BE SHOWN ON THE ELECTRICAL PLANS FOR SOME EQUIPMENT. IF NO STARTER OR DISCONNECT IS SUPPLIED A JUNCTION BOX SHALL BE INSTALLED ADJACENT TO THE EQUIPMENT. THE ELECTRICAL CONTRACTOR SHALL PROVIDE LINE SIDE WIRING TO THE JUNCTION BOX. LOAD SIDE WIRING WILL BE PROVIDED BY MECHANICAL CONTRACTOR OR OTHER TRADES.
- PROJECTS UTILIZING AN MCC, THE STARTER, CIRCUIT BREAKER OR VFD IN THE MCC ARE PROVIDED BY THE ELECTRICAL CONTRACTOR.
- IN ALL CASES THE EQUIPMENT CONTRACTOR SHALL MAKE FINAL CONNECTIONS, START UP, AND TEST EQUIPMENT.
- IF ROOF TOP EQUIPMENT (RTE) IS NOT PROVIDED WITH A BUILT-IN DISCONNECT SWITCH, THE ELECTRICAL CONTRACTOR SHALL PROVIDE A DISCONNECT SWITCH.
- IN A SINGLE PRIME CONTRACT, IT IS THE RESPONSIBILITY OF THE PRIME CONTRACTOR TO COORDINATE BETWEEN THE ELECTRICAL AND OTHER TRADES.

**4 MECHANICAL/ELECTRICAL EQUIPMENT CONNECTION**  
12" = 1'-0"



**MCADAMS**

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2905 MERIDIAN PARKWAY  
DURHAM, NC 27713

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**WOODS ENGINEERING**

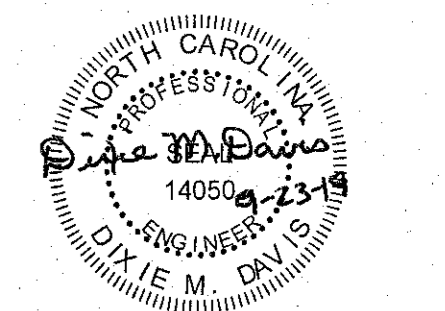
STRUCTURAL ENGINEERING  
254 N. FRONT STREET, SUITE 201  
WILMINGTON, NC 28401

910-343-8007 fax 910-343-8088

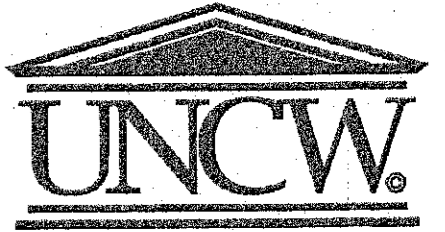
**SUD ASSOCIATES, P.A.**

PME ENGINEERING  
1813 CHAPEL HILL ROAD  
DURHAM, NC 27707

office: 919.493.5277 fax: 919.493.5549



PROJECT TITLE



**UNCW FILM STUDIES**

601 S College Rd, Wilmington, NC, 28403

SHEET TITLE

**DUCT DETAILS**

ISSUE BLOCK

Mark	Date	Description

PROJECT NO: 2018070.01

DATE: 09/23/2019

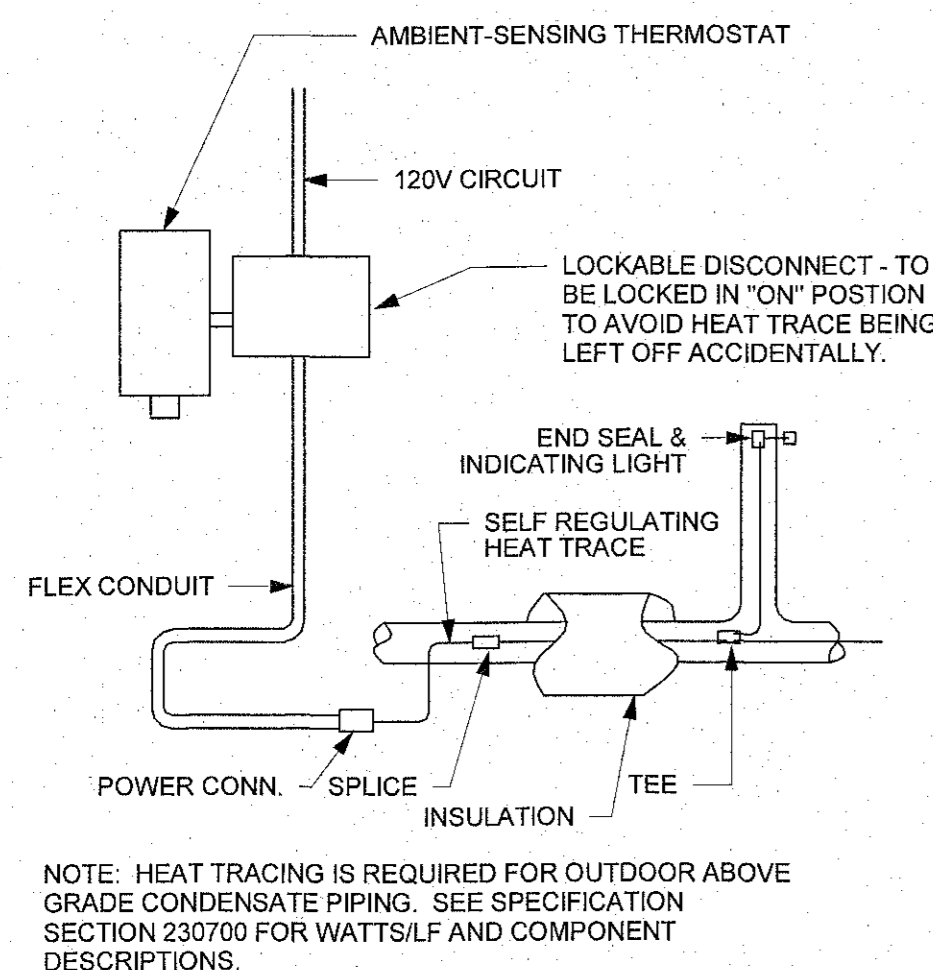
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**M501**

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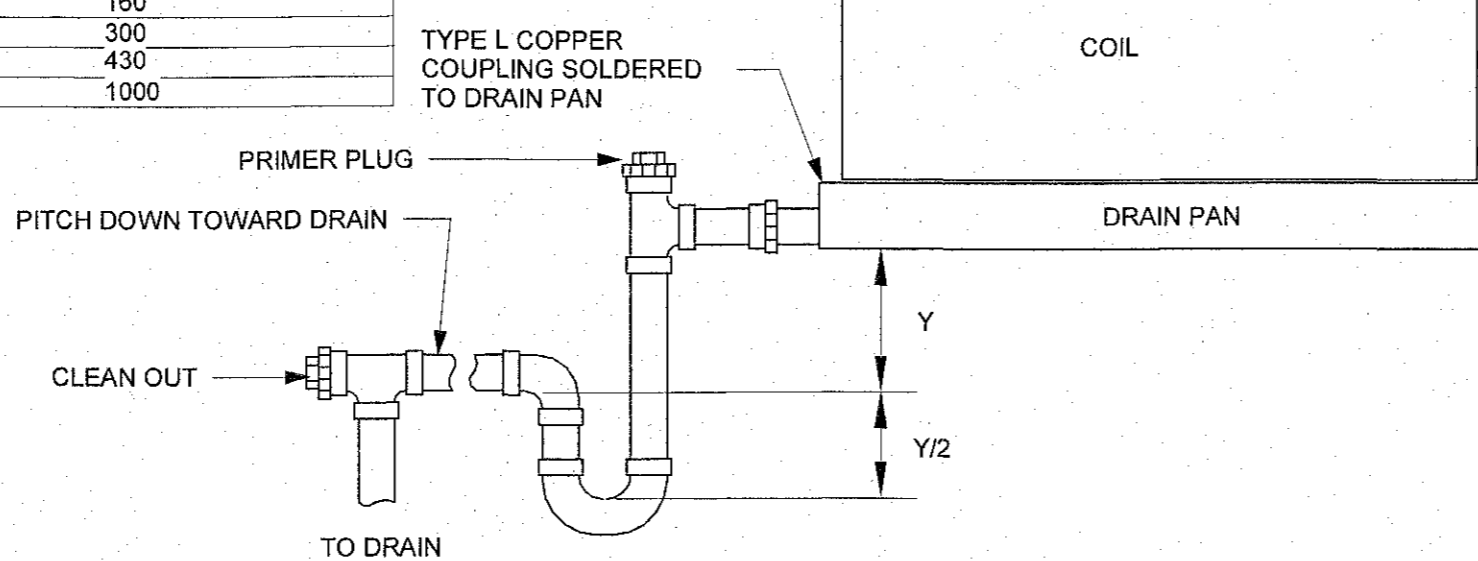


NOTE: HEAT TRACING IS REQUIRED FOR OUTDOOR ABOVE GRADE CONDENSATE PIPING. SEE SPECIFICATION SECTION 230700 FOR WATTS/LF AND COMPONENT DESCRIPTIONS.

## 6 HEAT TRACING

12" = 1'-0"

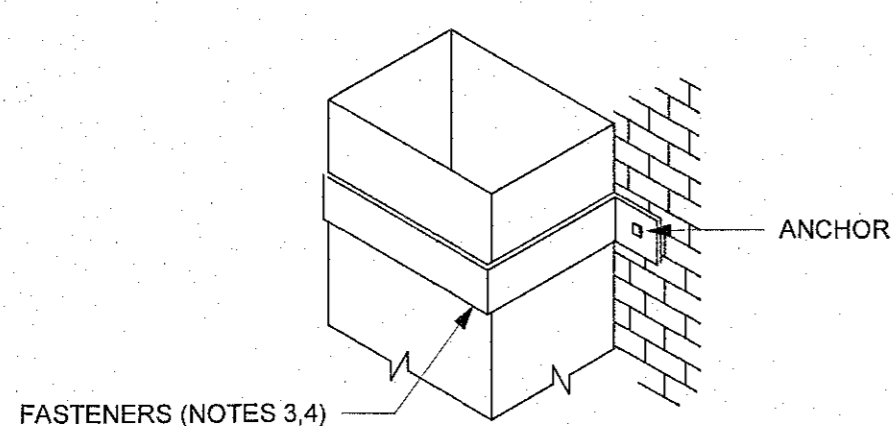
PIPE SIZE	MAX. COIL LOAD (TONS)
3/4"	2
1"	5
1-1/4"	30
1-1/2"	50
2"	160
3"	300
4"	430
5"	1000



DIMENSIONS  
Y = FAN INLET PRESSURE (IN. WG) + 1"

## 2 CONDENSATE DRAIN PIPING SCHEMATIC

12" = 1'-0"



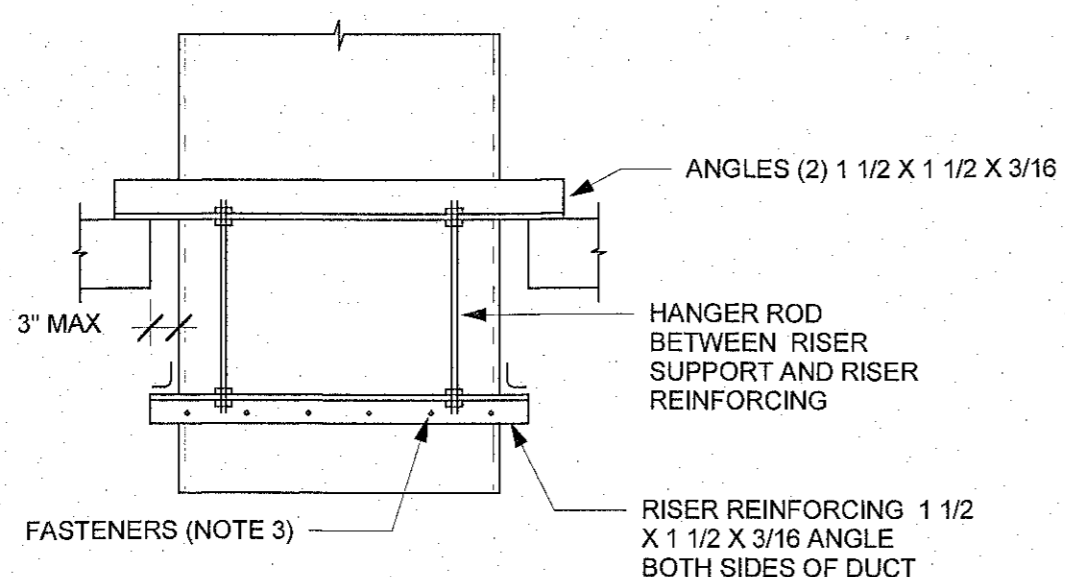
SUPPORT FROM WALL

### NOTES

1. RISER SUPPORTS FROM SMACNA, HVAC DUCT CONSTRUCTION STANDARDS.
2. SUPPORT RISERS SO THAT THEY ARE IN TENSION.
3. MINIMUM NUMBER OF FASTENERS ON EACH OF TWO SUPPORT BARS.

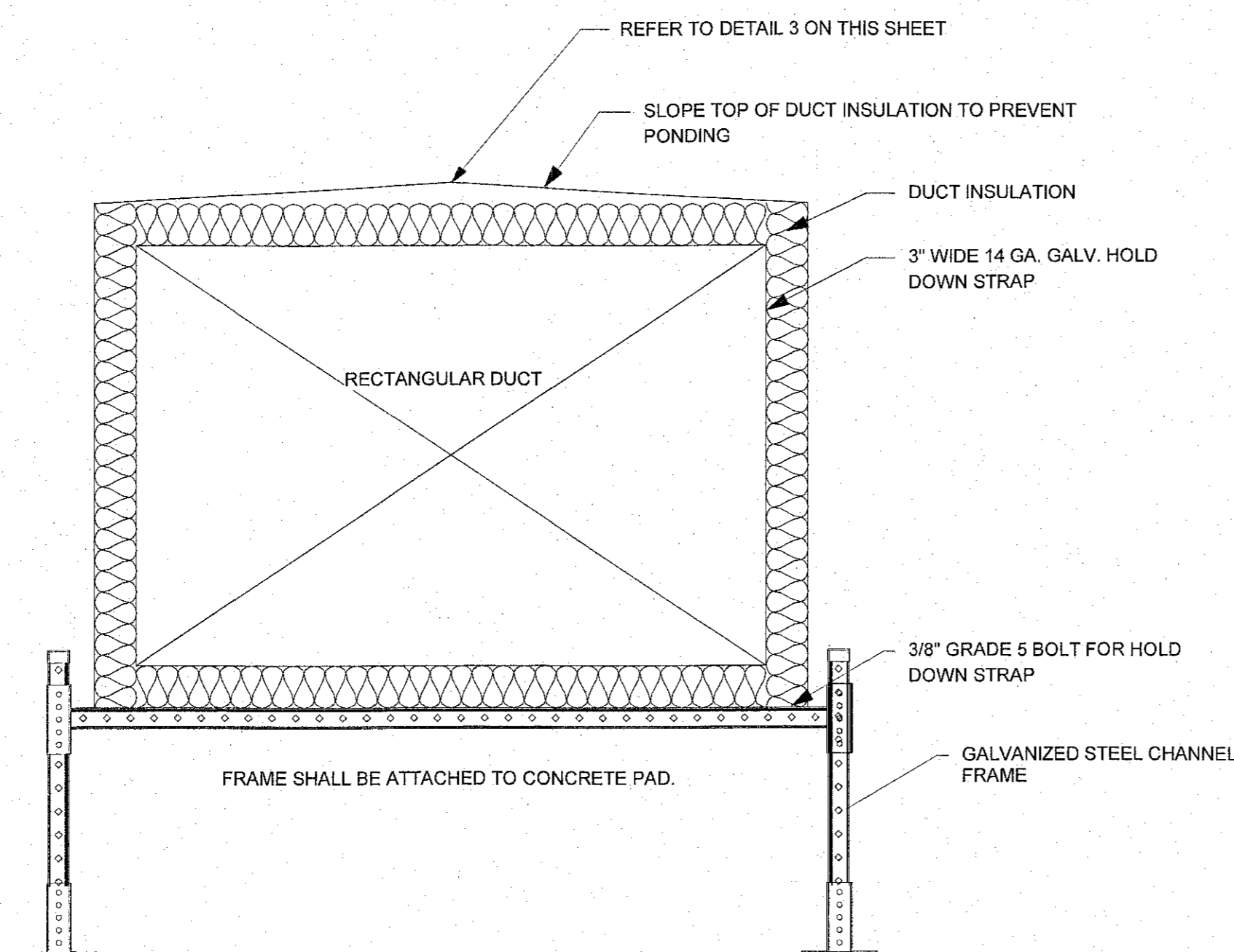
LARGEST DUCT DIM.	MINIMUM NUMBER OF FASTENERS
16" AND DOWN	2
17" - 24"	3
OVER 24"	LARGEST DUCT DIM. DIVIDED BY 8

4. LOCATE A FASTENER WITHIN 2" IF THE DUCT EDGES. LOCATE OTHERS AT EVENLY SPACED INTERVALS.



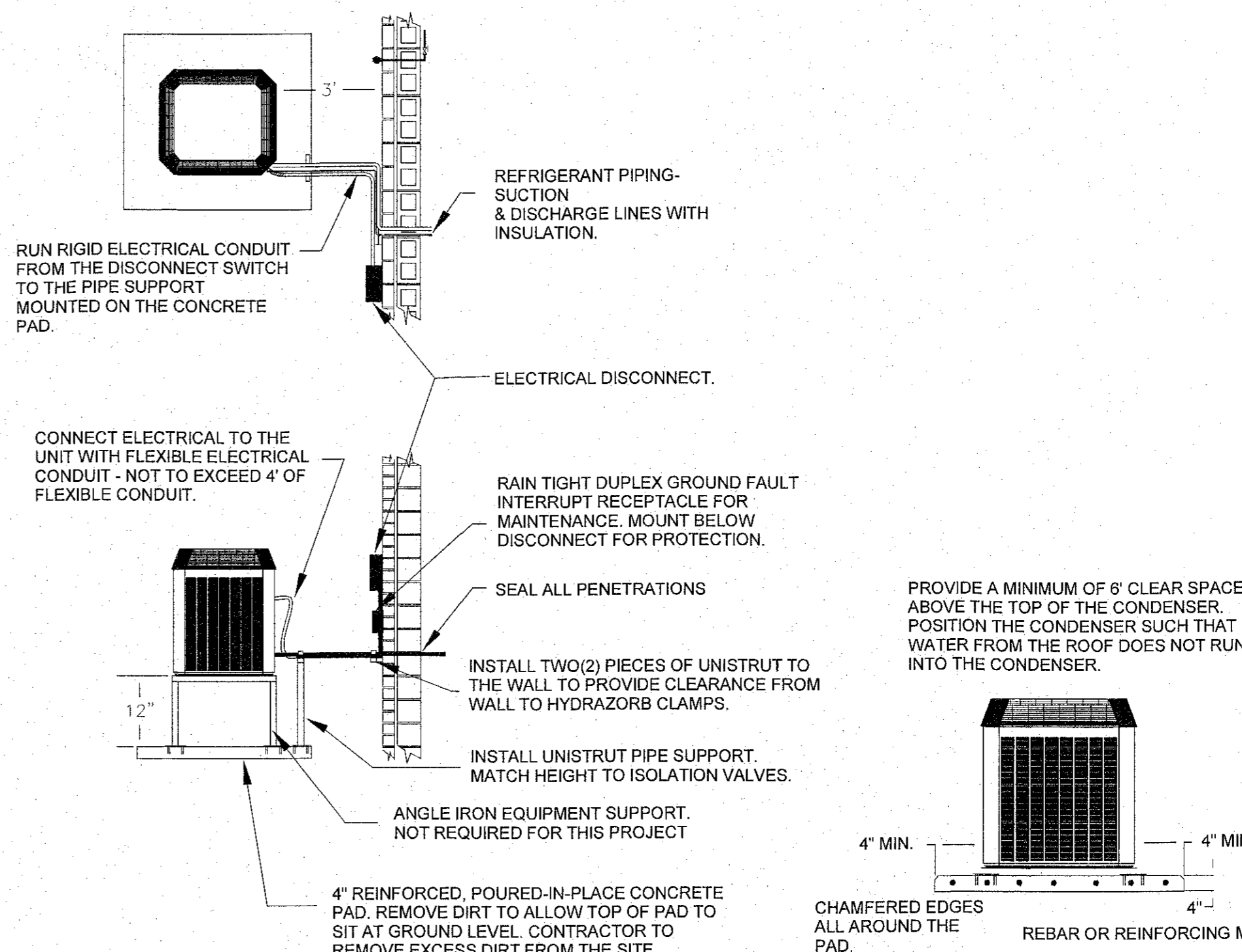
## 4 DUCT RISER SUPPORTS DETAIL

12" = 1'-0"



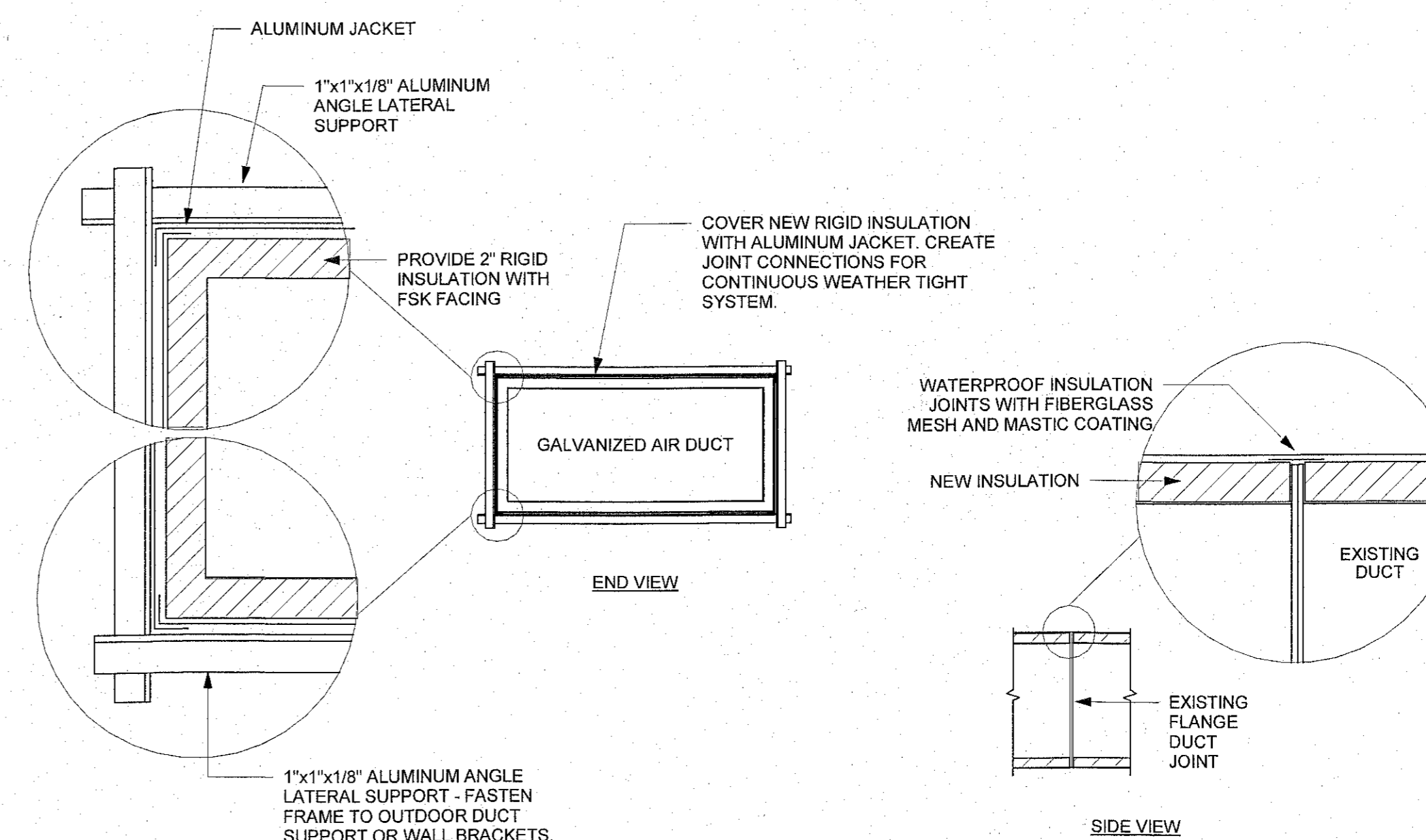
## 5 OUTDOOR DUCT SUPPORT DETAIL

12" = 1'-0"



## 1 OUTDOOR CONDENSING UNIT INSTALLATION DETAILS

12" = 1'-0"



## 3 EXTERIOR DUCT INSULATION DETAIL

12" = 1'-0"

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**WOODS ENGINEERING**

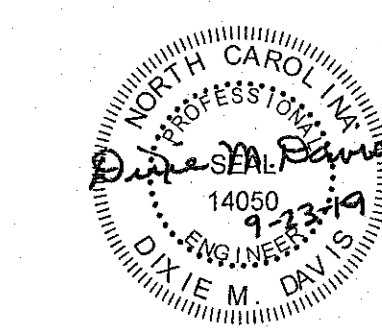
STRUCTURAL ENGINEERING  
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WILMINGTON, NC 28401

910-343-8007 fax: 910-343-8088

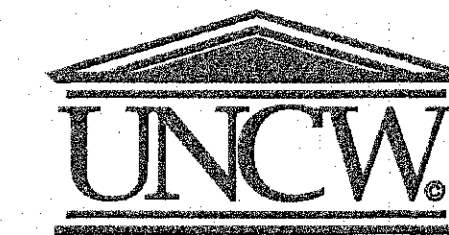
**SUD ASSOCIATES, P.A.**

PME ENGINEERING  
1813 CHAPEL HILL ROAD  
DURHAM, NC 27707

office: 919.493.5277 fax: 919.493.5549



PROJECT TITLE



**UNCW FILM STUDIES**

601 S College Rd, Wilmington, NC, 28403

SHEET TITLE

DETAILS

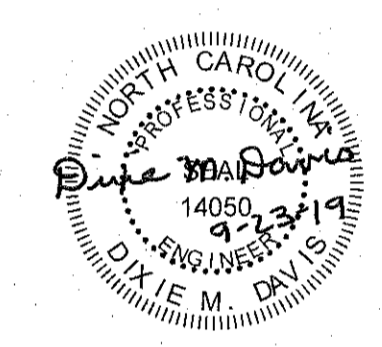
ISSUE BLOCK

Mark Date Description  
PROJECT NO: 2018070.01  
DATE: 09/23/2019  
SCALE: 12" = 1'-0"  
DRAWN BY: JWS PROJ MGR: IS

**M502**

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PROJECT TITLE



UNCW FILM  
STUDIES

601 S College Rd, Wilmington,  
NC, 28403

SHEET TITLE  
ROUND DUCT  
DETAILS

ISSUE BLOCK

Mark	Date	Description

PROJECT NO: 2018070.01

DATE: 09/23/2019

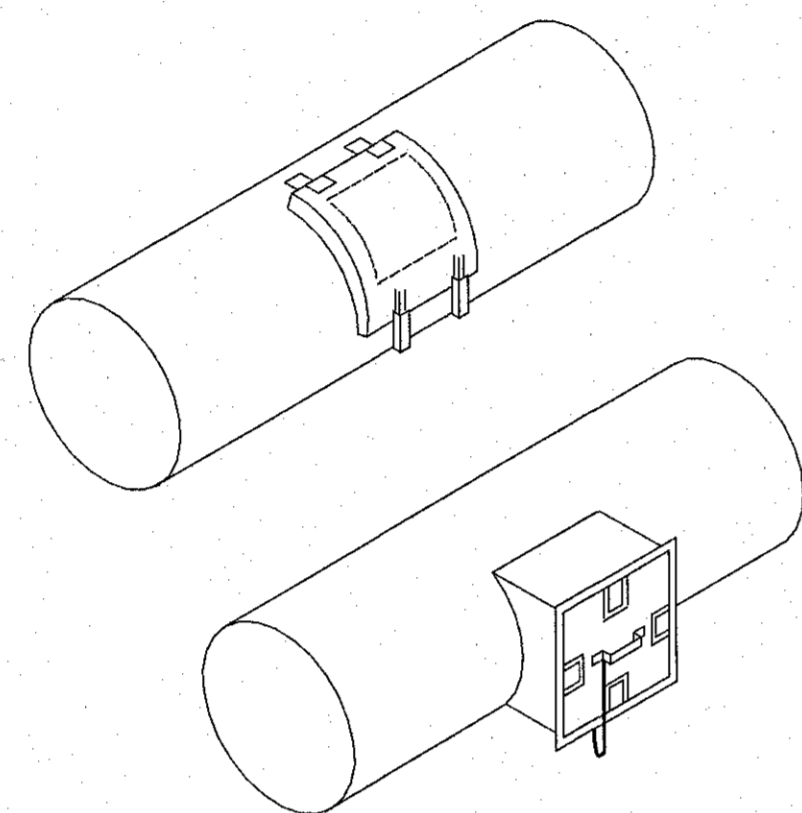
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DRAWN BY: JWS | PROJ MGR: IS

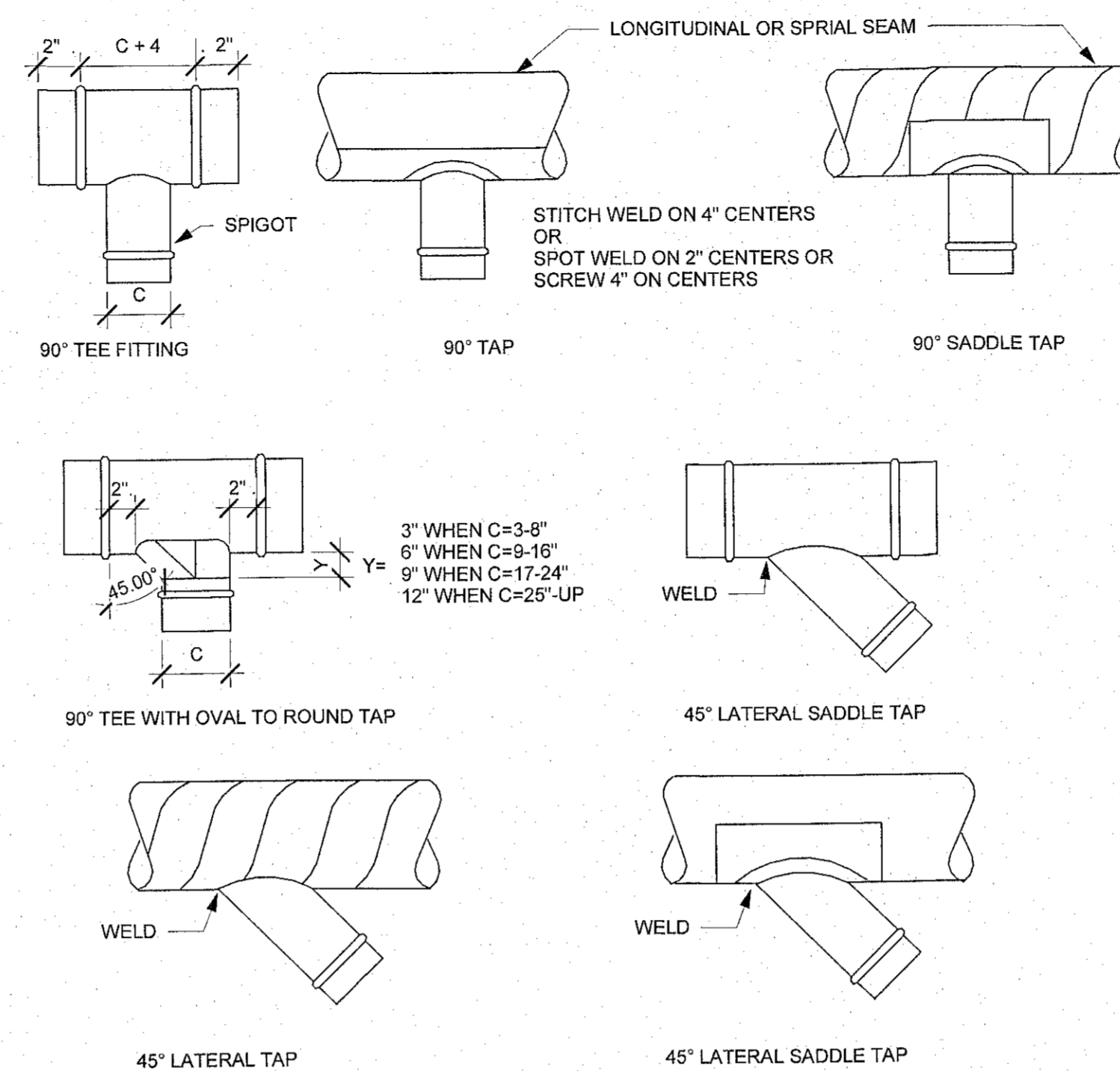
M503

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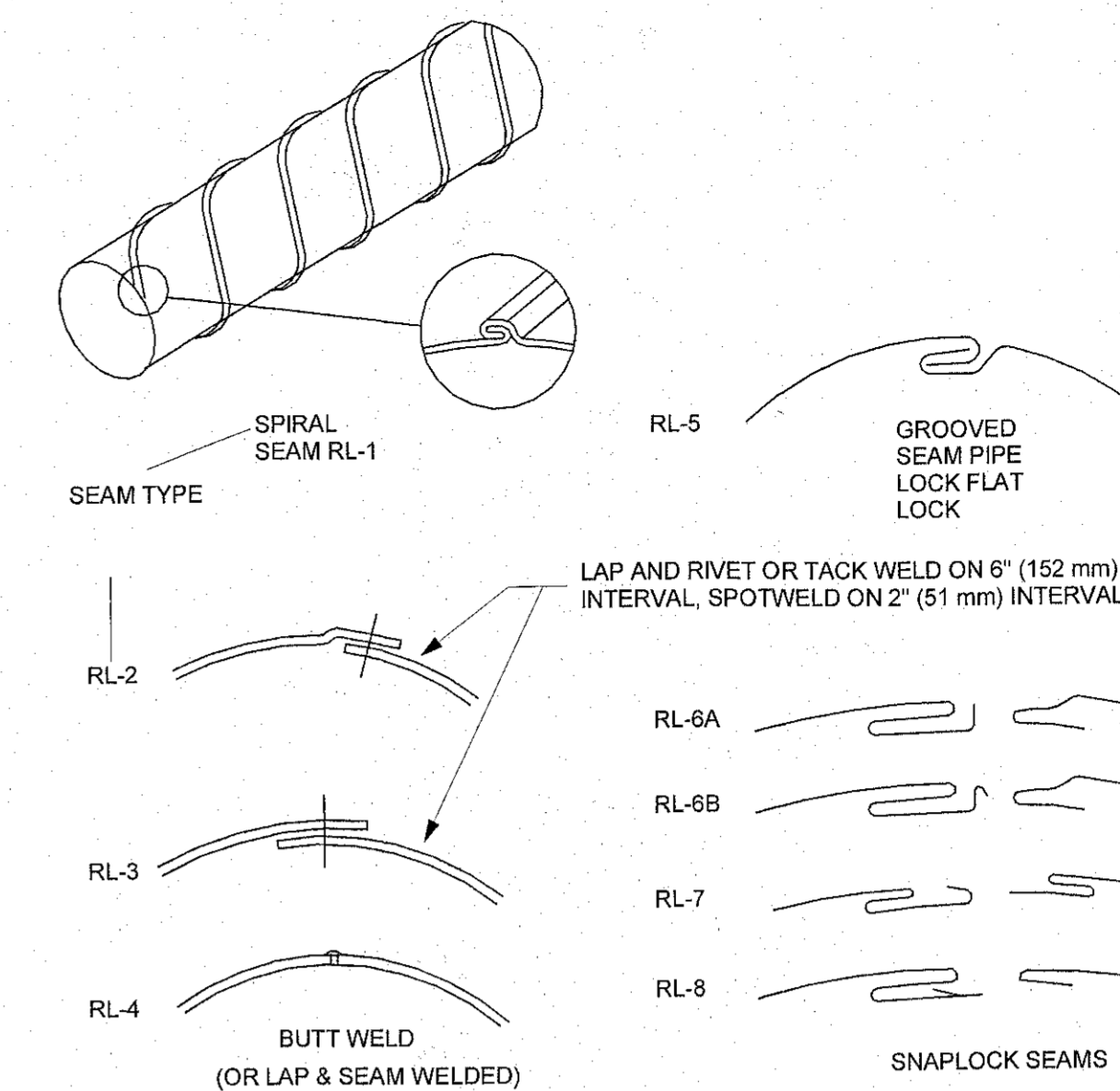
8/20/2019 2:38:11 PM F:\2018\18221.0 Becker Morgan, UNCW Film Studios\Sheets\23\_M5-FP18221\_MP\_Rev02019.rvt



**3** ACCESS DOOR ROUND DUCT DETAIL  
12" = 1'-0"



**2** 90 DEGREE TEES AND LATERALS DETAIL  
12" = 1'-0"

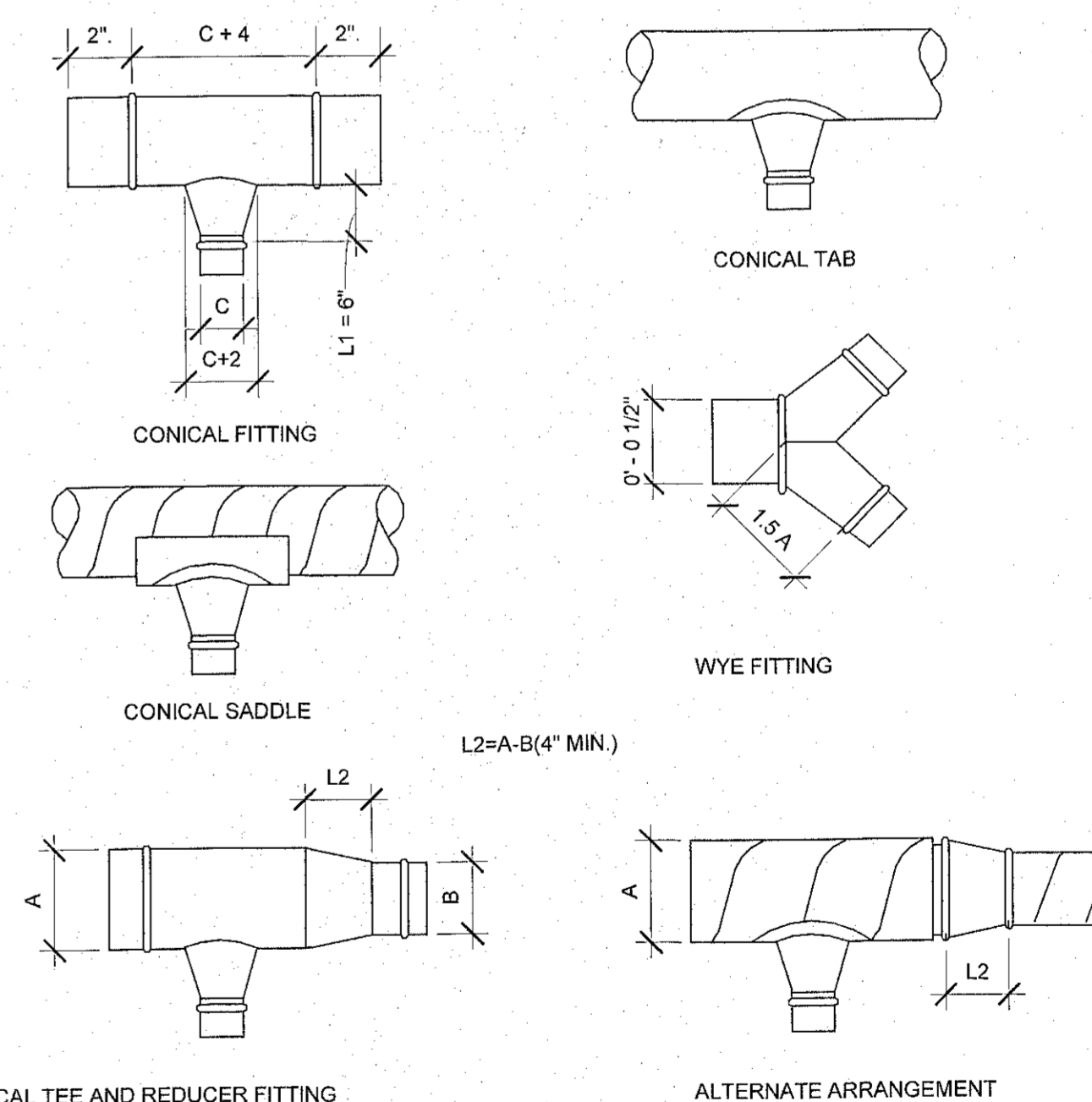


PRESSURE CLASS IN W.G. (Pa)	SEAM TYPE PERMITTED
POSITIVE	
TO +10" W.G. (2500)	RL-1,4,5 (2',3')
TO +4" W.G. (1000)	RL-1,2,3,4,5
TO +2" W.G. (500)	ALL
NEGATIVE	
TO -10" W.G. (-2500)	RL-1,4 (2',3')
TO -4" W.G. (-1000)	RL-1,2,3,4 (5")
TO -2" W.G. (-500)	ALL

\* ACCEPTABLE IF SPOTWELDED ON 1" (25 mm) INTERVALS OR TACK WELDED ON 3" (75 mm) INTERVALS.

\*\* RL-5 PRESSURE LIMIT IS -3" W.G. (-750 Pa)

**1** SEAMS-ROUND DUCT AND FITTINGS DETAIL  
12" = 1'-0"



**4** CONICAL TEES DETAIL  
12" = 1'-0"

# System No. W-L-1001

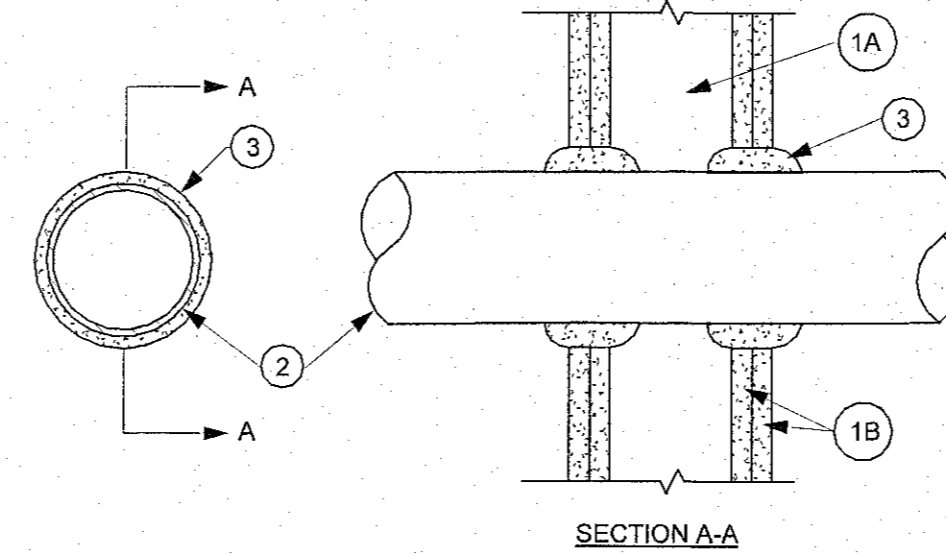
June 15, 2005

F Ratings -- 1, 2, 3 and 4 Hr (See Items 2 and 3)

T Ratings -- 0, 1, 2, 3 and 4 Hr (See Item 3)

L Rating At Ambient -- less than 1 CFM/sq ft

L Rating At 400 F -- less than 1 CFM/sq ft



1. **Wall Assembly** — The 1, 2, 3 or 4 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner described in the individual U300 or U400 Series Wall or Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs (max 2 h fire rated assemblies) or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC with nom 2 by 4 in. (51 by 102 mm) lumber end plates and cross braces. Steel studs to be min 3-5/8 in. (92 mm) wide by 1-3/8 in. (35 mm) deep channels spaced max 24 in. (610 mm) OC.

B. **Gypsum Board\*** — Nom 1/2 or 5/8 in. (13 or 16 mm) thick, 4 ft. (122 cm) wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 26 in. (660 mm).

2. **Through-Penetrant** — One metallic pipe, conduit or tubing installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and periphery of opening shall be min of 0 in / (0 mm), (point contact) to max 2 in. (51 mm) Pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:

A. **Steel Pipe** — Nom 24 in. (610 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

B. **Iron Pipe** — Nom 24 in. (610 mm) diam (or smaller) service weight (or heavier) cast iron soil pipe, nom 12 in (305 mm) diam (or smaller) or Class 50 (or heavier) ductile iron pressure pipe.

C. **Conduit** — Nom 6 in. (152 mm) diam (or smaller) steel conduit or nom 4 in (102 mm) diam (or smaller) steel electrical metallic tubing

D. **Copper Tubing** — Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing

E. **Copper Pipe** — Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.

F. **Through Penetrating Product\*** — Flexible Metal Piping The following types of steel flexible metal gas piping may be used:

1. Nom 2 in. (51 mm) diam (or smaller) steel flexible metal gas piping. Plastic covering on piping may or may not be removed on both sides of floor or wall assembly.

OMEGA FLEX INC

2. Nom 1 in. (25 mm) diam (or smaller) steel flexible metal gas piping. Plastic covering on piping may or may not be removed on both sides of floor or wall assembly.

GASTITE, DIV OF TITFLEX

3. Nom 1 in. (25 mm) diam (or smaller) steel flexible metal gas piping. Plastic covering on piping may or may not be removed on both sides of floor or wall assembly.

WARD MFG L L C

3. **Fill, Void or Cavity Material\*** — **Caulk or Sealant** — Min 5/8 ., 1-1/4, 1-7/8 and 2-1/2 in. (16, 32, 48 and 64 mm) thickness of caulk for 1, 2, 3 and 4 hr rated assemblies, respectively, applied within annulus, flush with both surfaces of wall. Min 1/4 in. (6 mm) diam bead of caulk applied to gypsum board/penetrant interface at point contact location on both sides of wall. The hourly F Rating of the firestop system is dependent upon the hourly fire rating of the wall assembly in which it is installed, as shown in the following table. The hourly T Rating of the firestop system is dependent upon the type or size of the pipe or conduit and the hourly fire rating of the wall assembly in which it is installed, as tabulated below:

Max Pipe or Conduit Diam in	F Rating Hr	T Rating Hr
1	1 or 2	0+, 1 or 2
1	3 or 4	3 or 4
4	1 or 2	0
6	3 or 4	0
12	1 or 2	0

+When copper pipe is used, T Rating is 0 h.

3M COMPANY — CP 25WB+ or FB-3000 WT.

\* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.

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# System No. W-L-5001

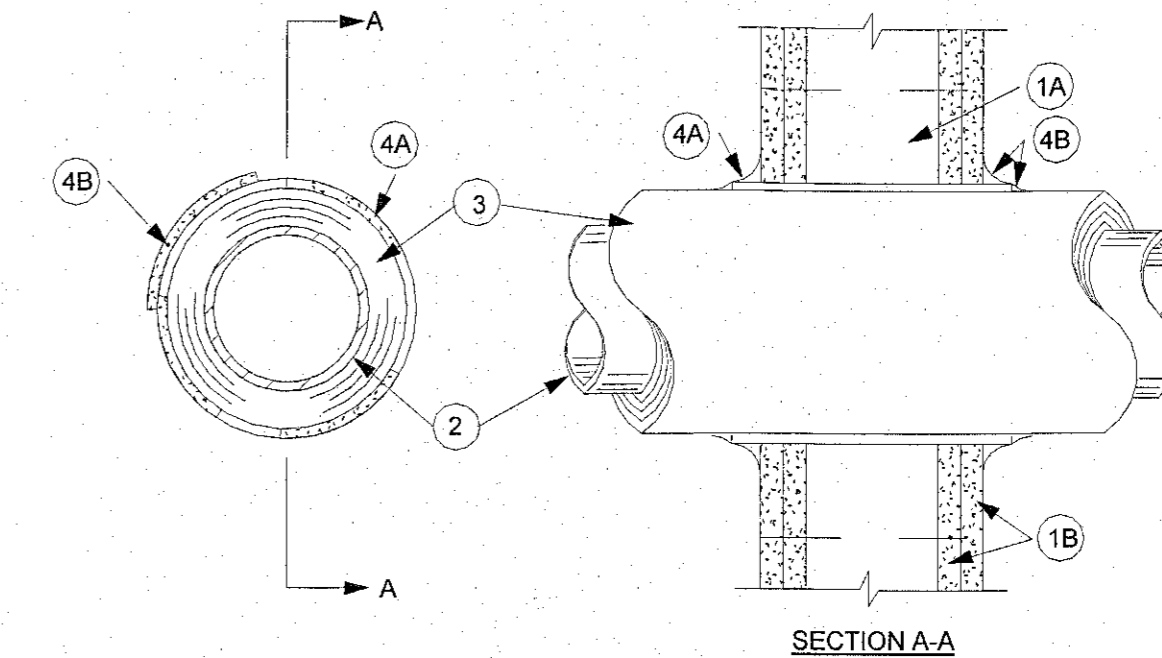
May 19, 2005

F Ratings - and 2 Hr (See Item 1)

T Ratings - 3/4, 1 and 1-1/2 Hr (See Item 3)

L Rating At Ambient - 2 CFM/sq ft

L Rating At 400 F - Less than 1 CFM/sq ft



1. **Wall Assembly** — The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner described in the individual U300, U400 or V400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC with nom 2 by 4 in. (51 by 102 mm) lumber end plates and cross braces. Steel studs to be min 3-5/8 in. (92 mm) wide by 1-3/8 in. (35 mm) deep channels spaced max 24 in. (610 mm) OC.

B. **Gypsum Board\*** — Nom 5/8 in. (16 mm) thick, 4 ft. (122 cm) wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual Design in the UL Fire Resistance Directory. Max diam of opening is 14-1/2 (368mm) in for wood stud walls and 18 in. (457 mm) for steel stud walls.

The hourly F Rating of the firestop system is 1 hr when installed in a 1 hr fire rated wall and 2 hr when installed in a 2 hr fire rated wall.

2. **Through Penetrants** — One metallic pipe or tubing to be centered within the firestop system. Pipe or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes or tubing may be used:

A. **Steel Pipe** — Nom 12 in. (305 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

B. **Copper Tubing** — Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing.

C. **Copper Pipe** — Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.

3. **Pipe Covering\*** — Nom 1 or 2 in. (25 or 51 mm) thick hollow cylindrical heavy density (min 3.5 pcf or 56 kg/m3) glass fiber units jacketed on the outside with an all service jacket. Longitudinal joints sealed with metal fasteners or factory-applied self-sealing lap tape. Transverse joints sealed with metal fasteners or with butt strip tape supplied with the product. When nom 1 in. (25 mm) thick pipe covering is used, the annular space between the pipe covering and the circular cutout in the gypsum wallboard layers on each side of the wall shall be min 1/4 in. (6 mm) to max 3/8 in. (10 mm) When nom 2 in. (51 mm) thick pipe covering is used, the annular space between the pipe covering and the circular cutout in the gypsum board layers on each side of the wall shall be min 1/2 in. (13 mm) to max 3/4 in. (19 mm)

See **Pipe and Equipment Covering Materials** (BRGU) category in Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.

The hourly T Rating of the firestop system is 3/4 hr when nom 1 in. (25 mm) thick pipe covering is used. The hourly F Rating of the firestop system is 1 hr and 1-1/2 hr when nom 2 in. (51 mm) thick pipe covering is used with 1 hr and 2 hr fire rated walls, respectively.

4. **Firestop System** — Installed symmetrically on both sides of wall assembly. The details of the firestop system shall be as follows:

A. **Fill, Void or Cavity Materials\*** — **Wrap Strip** — Nom 1/4 in. (6 mm) thick intumescent elastomeric material faced on one side with aluminum foil, supplied in 2 in. (51 mm) wide strips. Nom 2 in. (51 mm) wide strip tightly wrapped around pipe covering (foil side out) with seam butted. Wrap strip layer securely bound with steel wire or aluminum foil tape and slid into annular space approx 1-1/4 in. (32 mm) such that approx 3/4 in. (19 mm) of the wrap strip width protrudes from the wall surface. One layer of wrap strip is required when nom 1 in. (25 mm) thick pipe covering is used. Two layers of wrap strip are required when nom 2 in. (51 mm) thick pipe covering is used.

3M COMPANY — FS-195+

B. **Fill, Void or Cavity Materials\*** — **Caulk or Sealant** — Min 1/4 in. (6 mm) diam continuous bead applied to the wrap strip/wall interface and to the exposed edge of the wrap strip layer approx 3/4 in. (19 mm) from the wall surface.

3M COMPANY — CP 25WB+, IC 15WB+, FireDam 150+ caulk or FB-3000 WT sealant

\* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.

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**Maryland**  
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410.546.9100

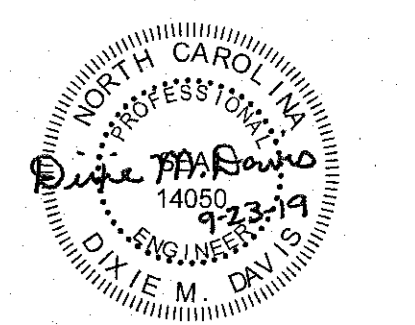
**Delaware**  
309 S Governors Ave  
Dover, DE 19904  
302.734.7950

Rittenhouse Station  
250 South Main Street, Suite 109  
Newark, DE 19711  
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PROJECT TITLE



# UNCW FILM STUDIES

601 S College Rd, Wilmington, NC, 28403

SHEET TITLE

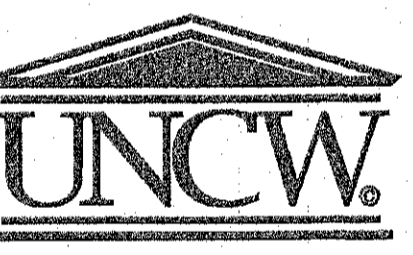
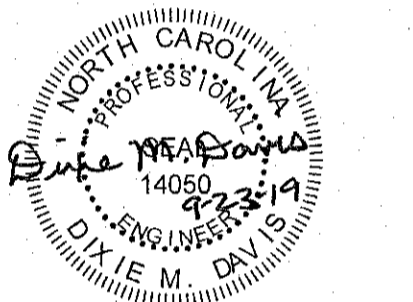
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ISSUE BLOCK

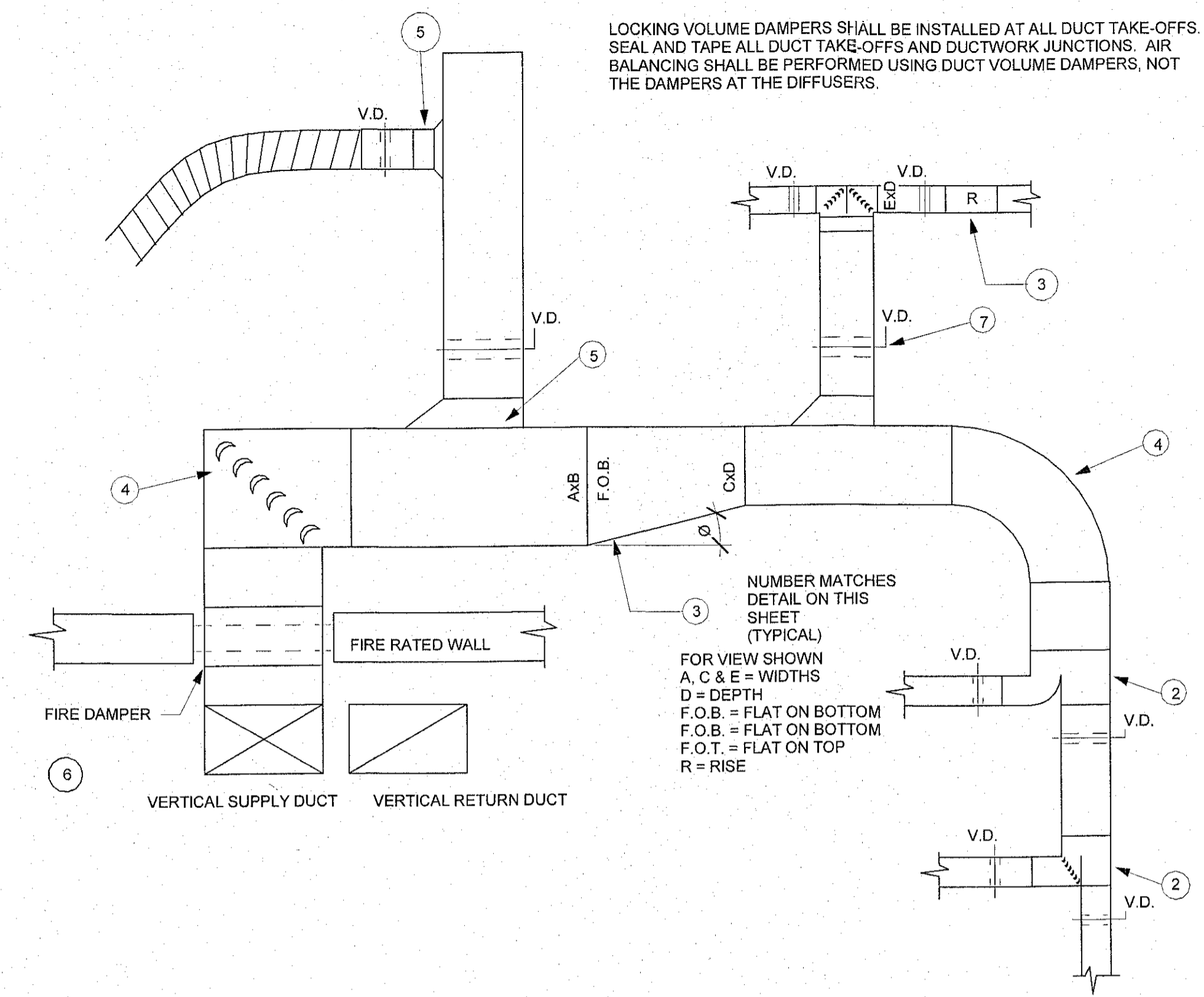
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PROJECT NO: 2018070.01  
DATE: 09/23/2019  
SCALE: 12" = 1'-0"  
DRAWN BY: JWS PROJ MGR: IS

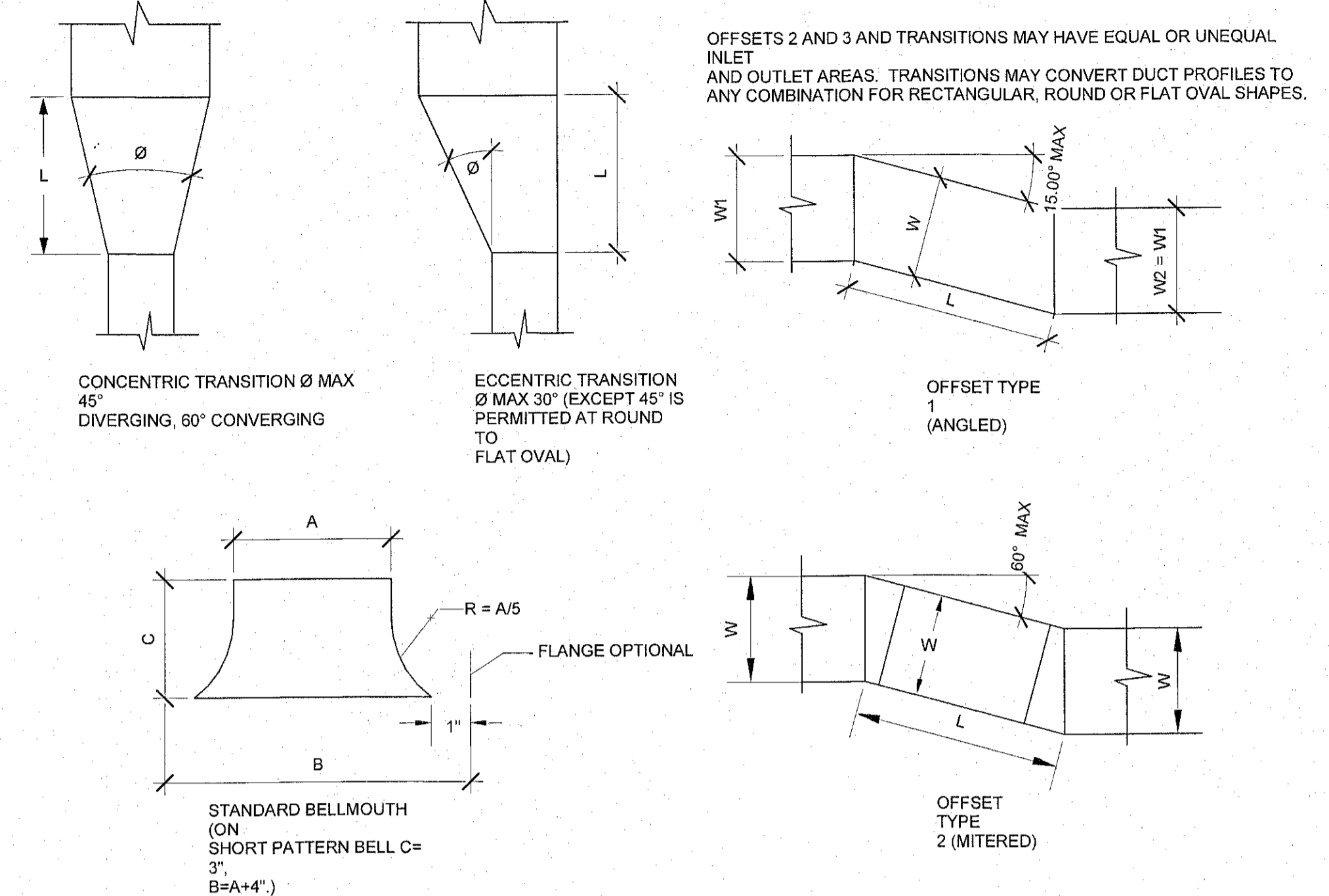
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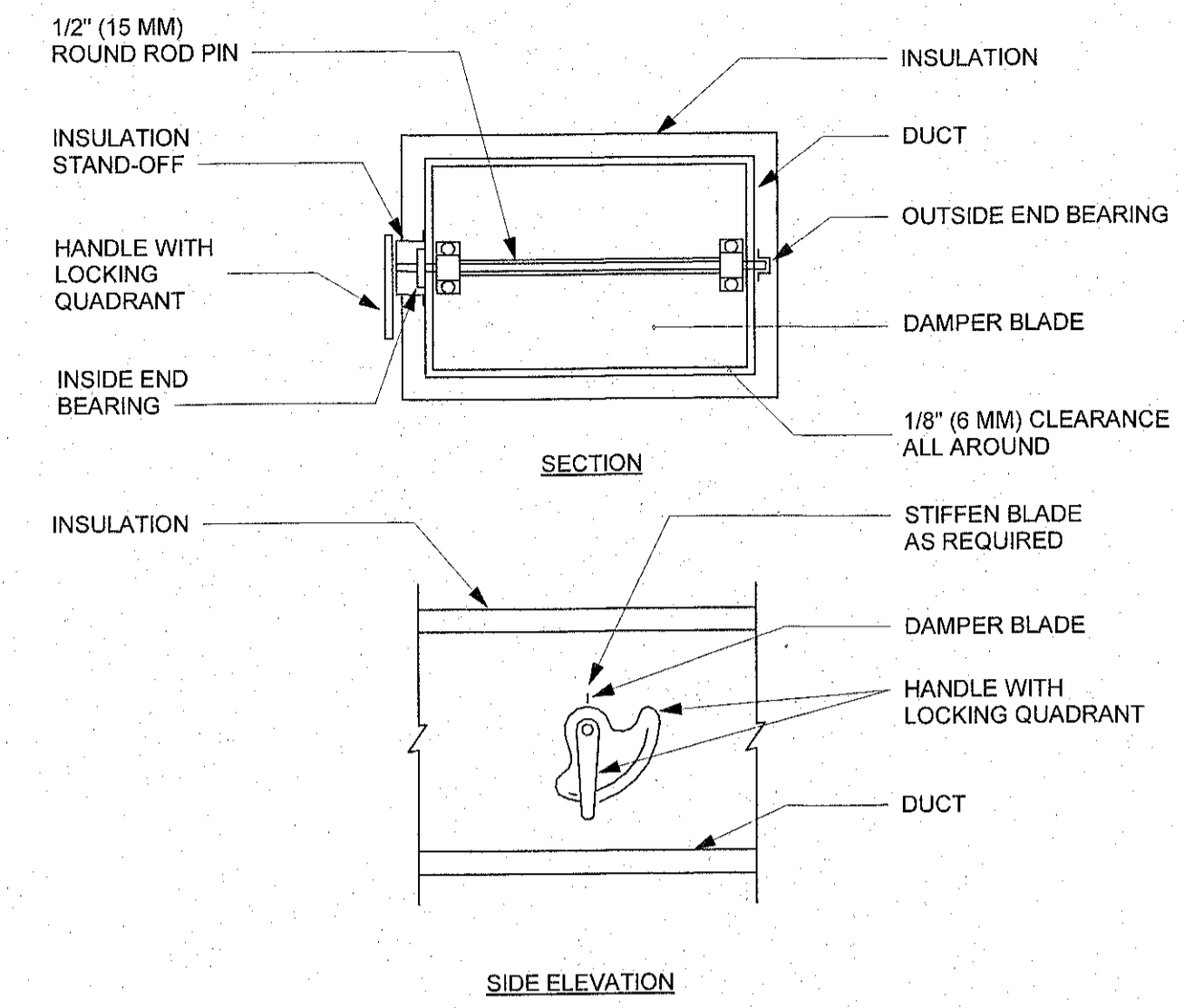
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		PROJECT NO: 2018070.01
		DATE: 09/23/2019
		SCALE: 12" = 1'-0"
		DRAWN BY: JWS PROJ MGR: IS



**1 SAMPLE DUCT LAYOUT**  
NTS

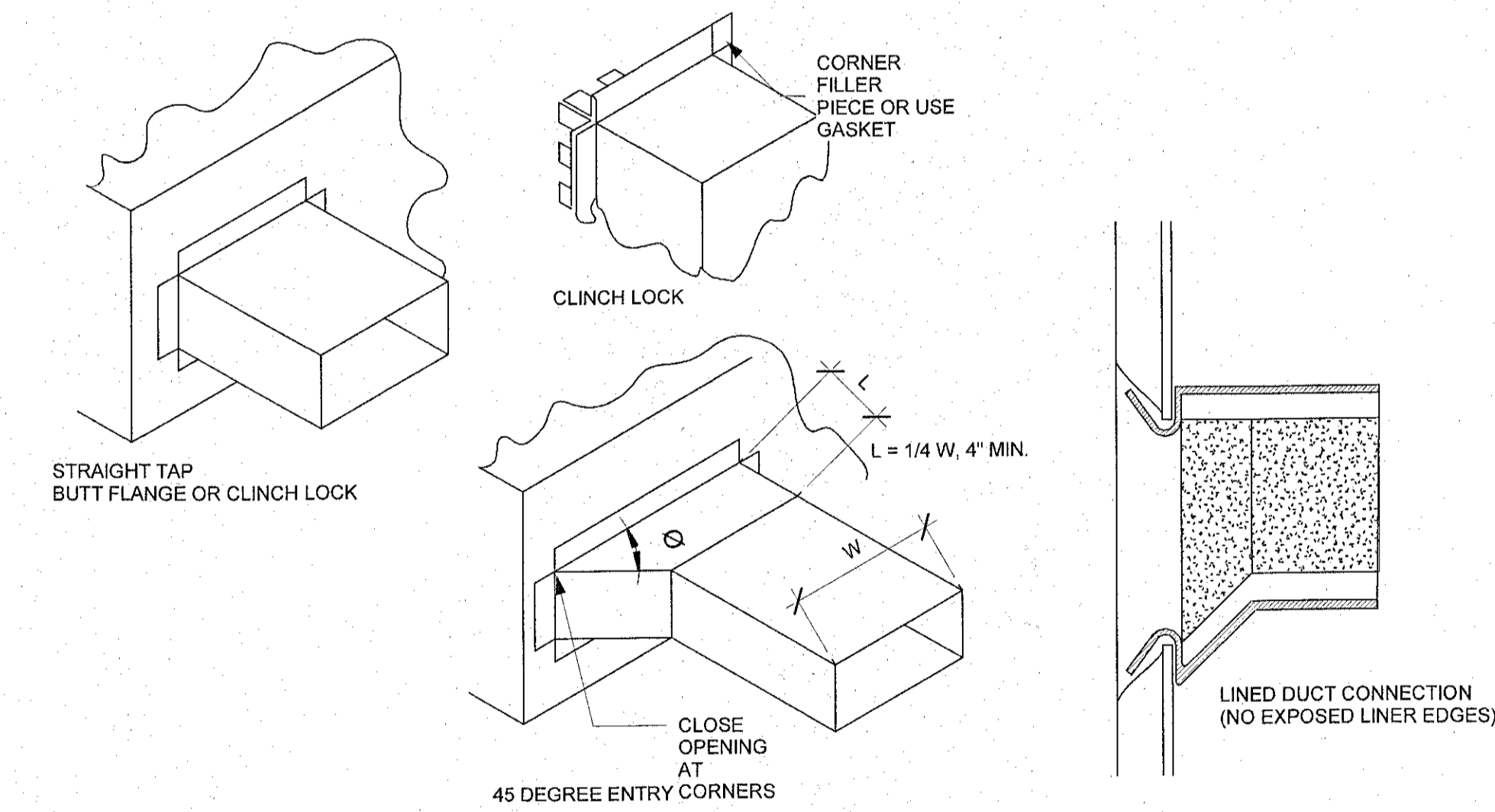


**3 OFFSETS AND TRANSITIONS**  
NTS

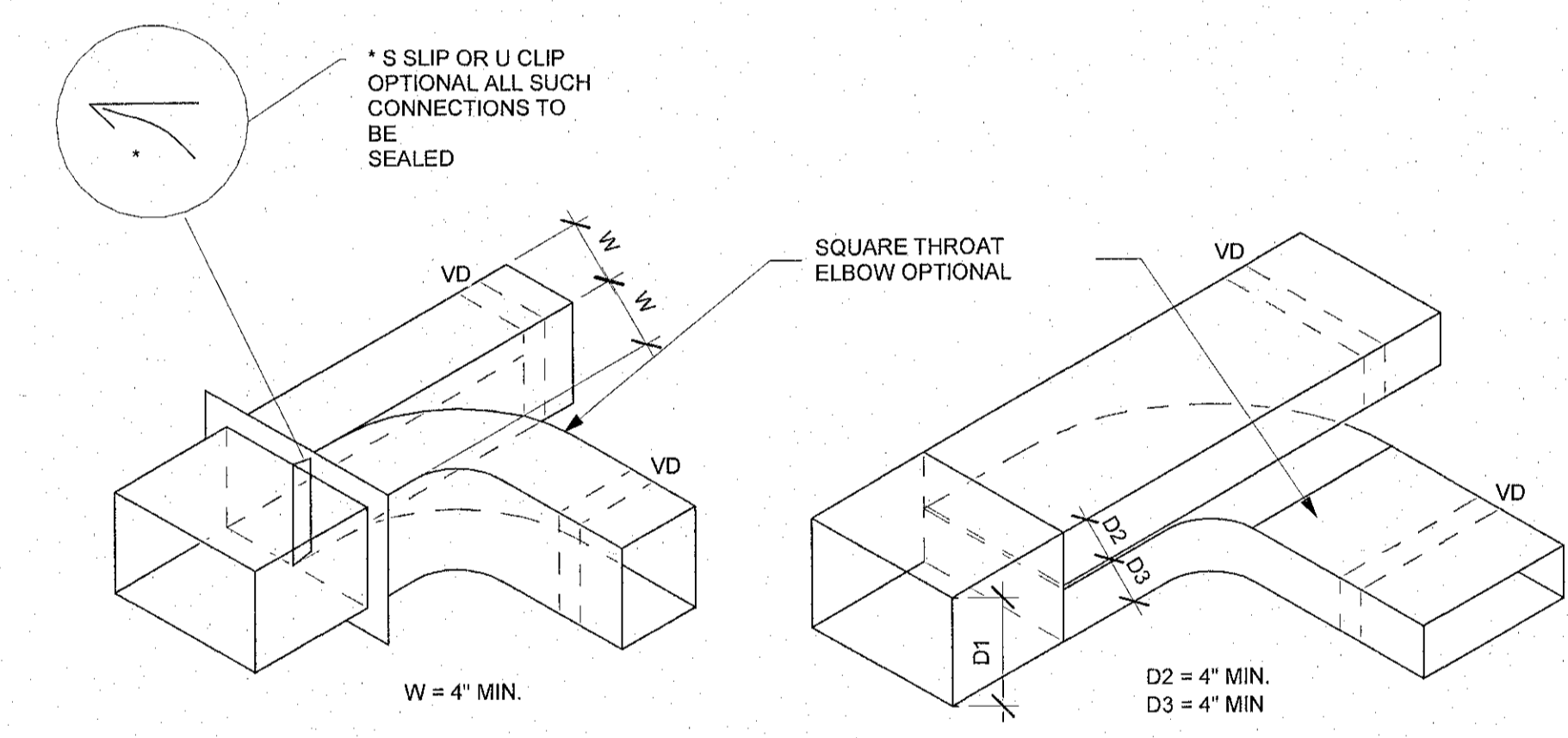
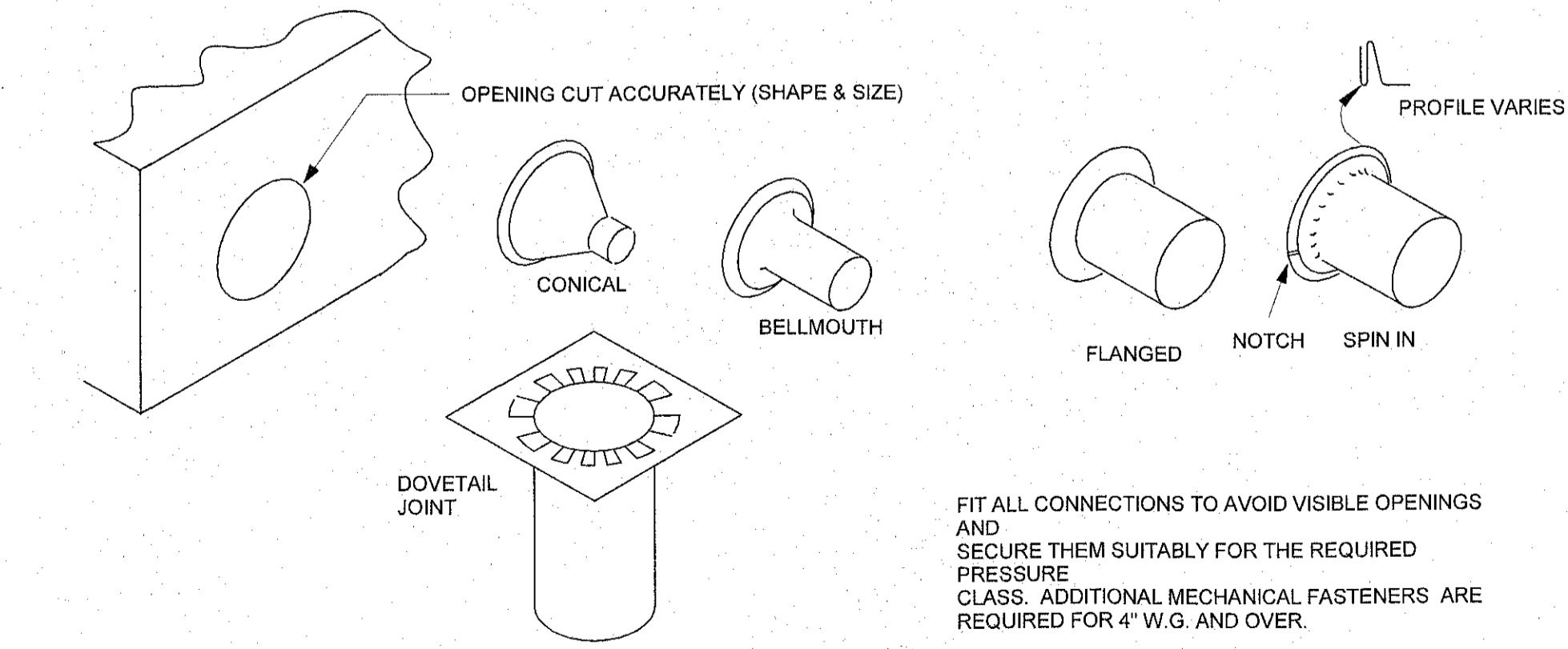


**7 VOLUME DAMPER DETAIL**  
NTS

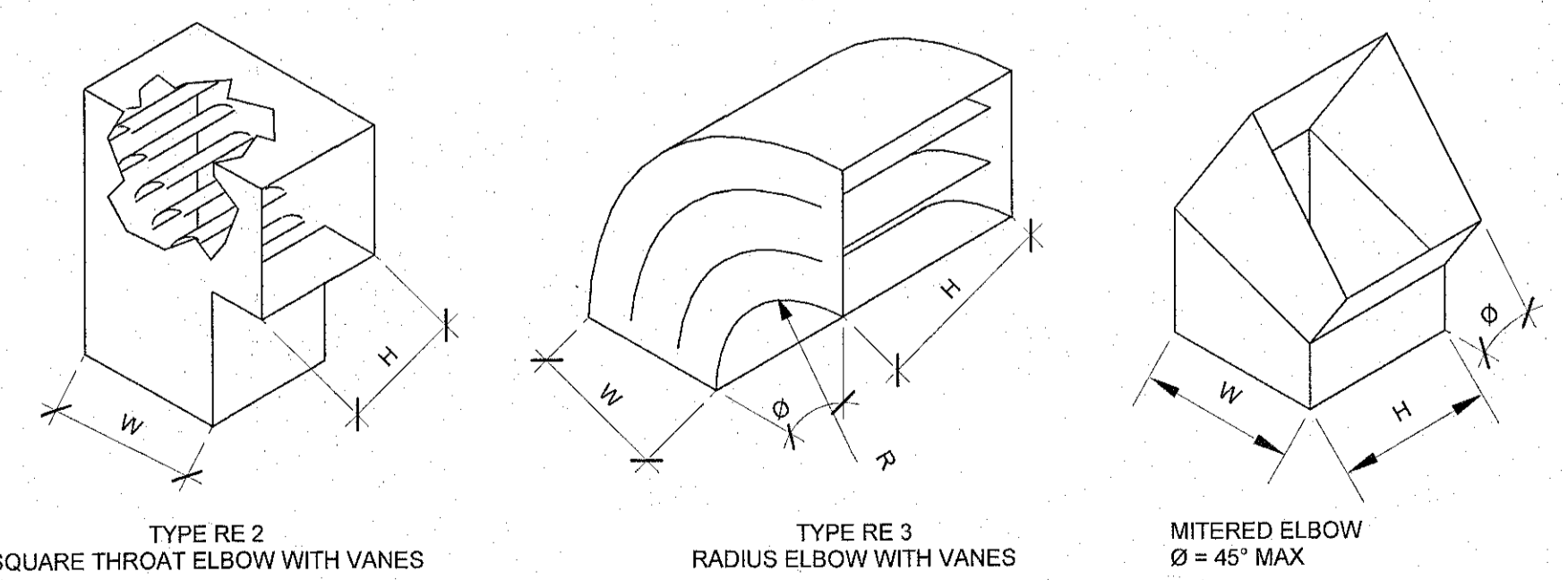
NOTES:  
1. DELETE INSULATION STAND-OFF ON DUCTWORK WITHOUT EXTERIOR INSULATION.  
2. DETAIL SHOWS SINGLE BLADE DAMPER. DAMPER INSTALLATION SHALL BE SIMILAR FOR MULTI-BLADE DAMPERS & ROUND DAMPERS.



**5 BRANCH CONNECTIONS DETAIL**  
NTS

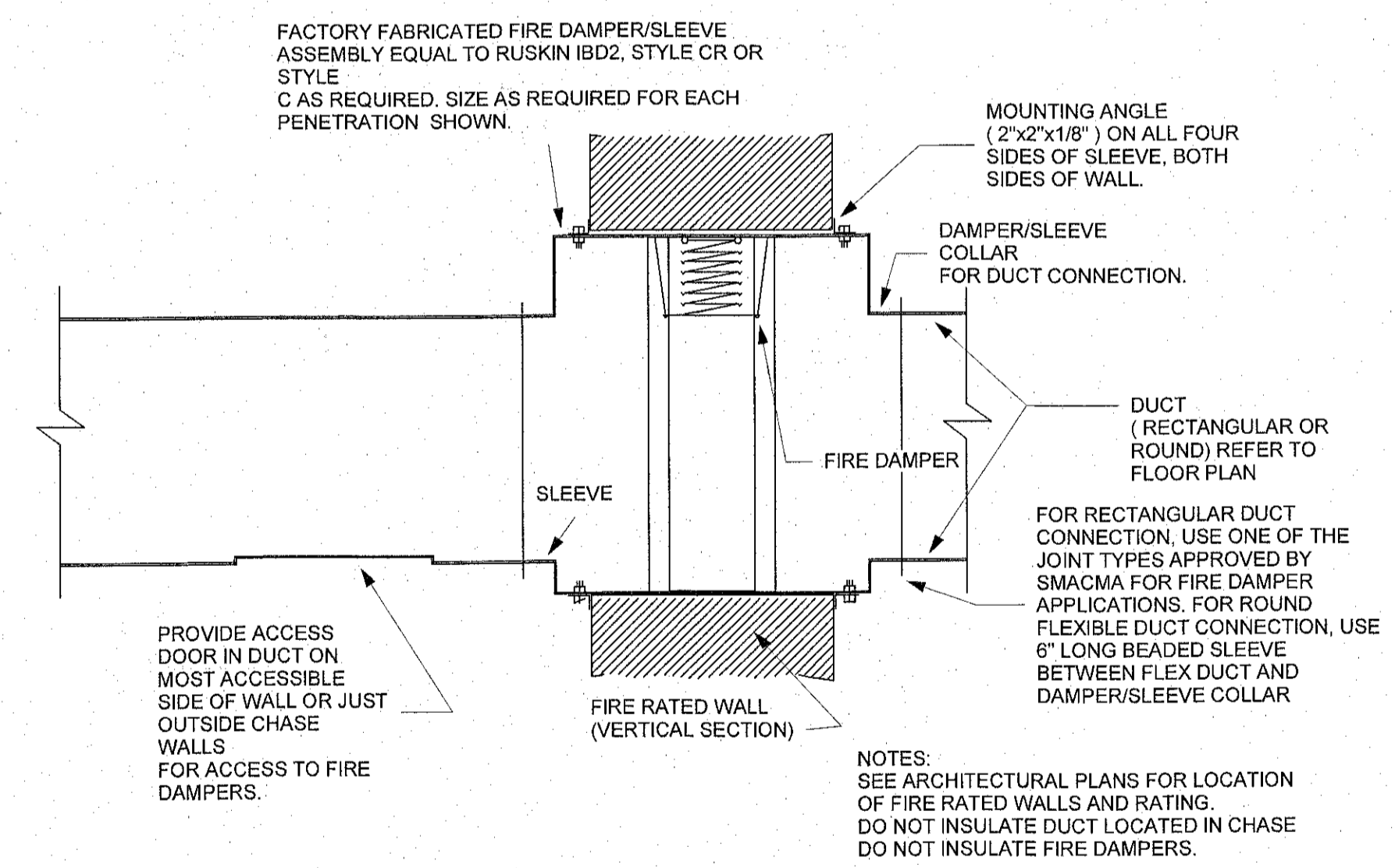


**2 PARALLEL FLOW BRANCHES**  
NTS



**4 RECTANGULAR ELBOWS DETAIL**  
NTS

BEAD, CROSSBREAK AND REINFORCE FLAT SURFACES AS IN STRAIGHT DUCT



**6 FIRE DAMPER INSTALLATION DETAIL**  
NTS

LOUVERS										
Mark	Manufacturer	Flow	Pressure Drop	Free Area %	Free Velocity Area fpm	Beginning Water Pen. (fpm)	Water Pen. Safety Factor	Model	Size, WxH	Description
LV1	Ruskins	400 CFM	0.04	40	574			ELF6375DX	12"x12"	EXHAUST
LV2	Ruskins	325 CFM	0.04	43	453			ELF6375DX	12"x20"	EXHAUST
LV3	Ruskins	3000 CFM	0.09	54	742	1023	1.38	ELF6375DX	34"x32"	INTAKE
LV4	Ruskins	285 CFM	0.01	43	330			ELF6375DX	12"x24"	EXHAUST
LV5	Ruskins	355 CFM	0.03	43	411	1023	2.49	ELF6375DX	12"x24"	INTAKE
LV8	Ruskins	90 CFM	0.03	31	346	1023	3.16	ELF6375DX	12"x12"	INTAKE
LV9	Ruskins	2600 CFM	0.08	49	792			ELF6375DX	40"x24"	EXHAUST
LV10	Ruskins	190 CFM	0.06	31	614	1023	1.66	ELF6375DX	12"x12"	INTAKE
LV11	Ruskins	1050 CFM	0.03	49	360			ELF6375DX	36"x24"	EXHAUST
LV12	Ruskins	375 CFM	0.03	43	387			ELF6375DX	18"x18"	EXHAUST

**LOUVER SCHEDULE NOTES:**

- FURNISH LOUVERS WITH FACTORY APPLIED BAKED ON PRIMER. SUBMIT COLOR SELECTIONS FOR OWNER'S APPROVAL.
- FURNISH LOUVER WITH EXTENDED SILL, 1/4" MINIMUM INSECT SCREEN OPENING, DRAINABLE BLADES.
- MANUFACTURER: RUSKIN OR EQUALS BY ARROW, GREENHECK, LOUVERS & DAMPERS, SAFE-AIR, VENT PRODUCTS CO., OR UNITED ENERTECH.
- INSTALLATION OF LOUVERS SHALL BE BY GENERAL CONTRACTOR (GC).

CONDENSING UNIT SCHEDULE										
Mark	Manufacturer	Model	Refrigerant	Frequency	Voltage	Phase	Max Circuit Breaker	MCA	System EER	Equipment Served
CU1	Trane	4TWA4060A3000A	410A	60 Hz	208 V	3	35.0 A	21.0 A	12.5	AHU1
CU3	Trane	4TWR4024	410A	60 Hz	208 V	1	25.0 A	14.0 A	12.0	AHU3
CU4	Trane	TWA09043DAB	410A	60 Hz	208 V	3	45.0 A	33.0 A	12.8	AHU4
CU5	Trane	4TWA4060A3000A	410A	60 Hz	208 V	3	35.0 A	21.0 A	12.5	AHU5

**CU NOTES:**

- PROVIDE UNITS WITH EER VALUES SIMILAR TO THESE UNITS, BUT IN NO CASE LESS THAN N.C. STATE BUILDING CODE - ENERGY CONSERVATION VOLUME MINIMUMS.
- CU4 SHALL HAVE TWO COMPRESSORS. LINE SIZE IS BASED ON MANUFACTURER'S PIPING CALCULATIONS FOR SIZE AND LENGTH.

AIR TERMINAL SCHEDULE										
Mark	Manufacturer	Model	Accessories / Notes	Number of Slots	Description	Min Flow	Max Flow	Neck Size	Type	System Type
E1	Metalaire	4002R-6			Ceiling exhaust grille for lay in T-Bar ceiling.	50 CFM	350 CFM	12"x12"	24 x 24 Face 12 x 12 Connection	Exhaust Air
R1	Metalaire	7000R-6	NC Shall be less than 20		T-Bar Lay-in - Return, Aluminum, Perforated Grille	60 CFM	175 CFM	8"x8"	24 x 24 Face 8 x 8 Connection	Return Air
R2	Metalaire	7000R-6			T-Bar Lay-in - Return, Aluminum, Perforated Grille	280 CFM	470 CFM	14"x14"	24 x 24 Face 14 x 14 Connection	Return Air
R3	Metalaire	4002R			Surface Mount - Return, Aluminum	760 CFM	1500 CFM	48"x16"	48"x16" Surface Mounted	Return Air
R4	Metalaire	7000R-6			T-Bar Lay-in - Return, Aluminum, Perforated Grille	90 CFM	675 CFM	18"x18"	24 x 24 Face 18 x 18 Connection	Return Air
R5	Metalaire	HDRH			Heavy Duty Surface Mounted Aluminum Grille with Flat Black Finish	275 CFM	3000 CFM	48"x40"	48x40 Surface Mounted	Return Air
R7	Metalaire	4002R			Surface Mount - Relief, Aluminum, Black Finish	350 CFM	1050 CFM	36"x24"	36"x24" Surface Mounted	Relief Air
S1	Metalaire	5700-6 AL			T-bar Lay-in - 2 Cone Supply Round Neck, Aluminum	0 CFM	125 CFM	6"ø	24x24 - 6 Neck	Supply Air
S2	Metalaire	5700-6 AL	NC Shall be less than 15		T-bar Lay-in - 2 Cone Supply Round Neck, Aluminum	130 CFM	195 CFM	8"ø	24x24 - 8 Neck	Supply Air
S3	Metalaire	5700-6 AL			T-bar Lay-in - 2 Cone Supply Round Neck, Aluminum	200 CFM	300 CFM	10"ø	24x24 - 10 Neck	Supply Air
S4	Metalaire	H4004			Surface Mounted, double deflection, Aluminum	50 CFM	75 CFM	6"x6"	6 x 6 Surface Mounted	Supply Air
S5	Metalaire	5700-6 AL			T-bar Lay-in - 2 Cone Supply Round Neck, Aluminum	455 CFM	550 CFM	14"ø	24x24 - 14 Neck	Supply Air
S6	Metalaire	PHPSI-IT-75-6-CC	PHP-TBPF Frame for surface mounting.	2	Linear Slot Ceiling Diffuser 4' long	0 CFM	155 CFM	8"ø	8" Neck	Supply Air
S7	Metalaire	PHPSI-IT-75-9-CC	NC Shall be less than 22	3	Linear Slot Ceiling Diffuser 4' long. All Black Finish	200 CFM	240 CFM	10"ø	10" Oval Neck	Supply Air
S8	Metalaire	4004P	Aluminum Finish		Spiral Duct Diffuser, double deflection, aluminum finish.	100 CFM	195 CFM	14"x6"	14x6 for Sprial Duct	Supply Air
S9	Metalaire	5700-6 AL			T-bar Lay-in - 2 Cone Supply Round Neck, Aluminum	0 CFM	100 CFM	6"ø	12x12 - 6 Neck	Supply Air
T1	Metalaire	4002R-6			Ceiling transfer grille for lay in T-Bar ceiling.	50 CFM	400 CFM	22"x22"	24 x 24 Face 22x22 Connection	Transfer Air
T2	Metalaire	4002R			Surface Mount - Return, Aluminum	50 CFM	75 CFM	8"x6"	8x6 Surface Mounted	Transfer Air

**DIFFUSER SCHEDULE NOTES:**

- MANUFACTURER: METALAIRE OR EQUALS BY KRUEGER, PRICE, NAILOR INDUSTRIES, TUTTLE & BAILEY, TITUS OR CARNES.
- DIFFUSERS AND GRILLES IN CINEMA & PROJECTION BOOTH TO BE BLACK FINISH. OTHERS TO BE WHITE FINISH EXCEPT WHERE INDIVIDUALLY NOTED OTHERWISE.
- MAXIMUM NOISE LEVEL SHALL BE 25 NC. EXCEPT WHERE NOTED OTHERWISE.
- BALANCING DAMPER TO BE LOCATED IN DUCT UNLESS INDICATED OTHERWISE ON PLAN.
- CEILING SUPPLY DIFFUSERS SHALL HAVE INSULATED BACKPANS.

AIR HANDLING UNIT SCHEDULE																			
Mark	Manufacturer	Model	Design Supply Air Flow	Min Outdoor Air	Economizer	External Static Pressure	Entering Air Cooling Temperature DB/WB	Leaving Air Cooling Temperature DB/WB	Net Total Cooling Capacity	Net Sensible Cooling Capacity	Heating Ambient Dry Bulb Temperature	Heating Capacity MBh @ 47F Ambient	Heating Capacity MBh @ 17F Ambient	EER/SEER @ AHRI Conditions	COP @ 47F / COP @ 17F	Electric Heat	VOLTS / PHASE / HZ	Maximum Overcurrent Protection	Minimum Circuit Current
AHU1	Trane	TAM9A0C60V51	1500 CFM	190 CFM	No	0.90 in-wg	80 °F/67 °F	56 °F/54 °F	56.056 MBh	38.781 MBh	17 °F	52.5	34.8	12.5/15.0	3.7/2.6	10.8 kW @ 208V/3Ph	208 V / 3 / 60 Hz	45.0 A	45.0 A
AHU3	Trane	TAM9A0A24V21	750 CFM	90 CFM	No	0.90 in-wg	80 °F/67 °F	59 °F/57 °F	23.166 MBh	16.887 MBh	17 °F	21.8	14.3	12/14.5	3.7/2.5	5.77 kW @ 208V/3 Ph	208 V / 3 / 60 Hz	30.0 A	29.0 A
AHU4	Trane	TWE09043BAA	3000 CFM	400 CFM	Yes	1.00 in-wg	80 °F/67 °F	60 °F/58 °F	91.90 MBh	70.14 MBh	17 °F	82.0	51.5	12.2 IEER/	3.3/2.25	11.25 kW @ 208/ 3Ph	208 V / 3 / 60 Hz	60.0 A	51.0 A
AHU5	Trane	TAM9A0C60V51	1500 CFM	355 CFM	No	0.90 in-wg	80 °F/67 °F	56 °F/54 °F	56.056 MBh	38.781 MBh	17 °F	52.5	34.8	12.5/15.0	3.7/2.6	10.8 kW @ 208V/3Ph	208 V / 3 / 60 Hz	45.0 A	45.0 A

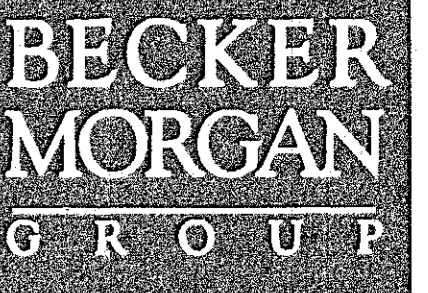
**AHU NOTES:**

- REFER TO SPECIFICATIONS FOR OTHER ACCEPTABLE MANUFACTURERS. FOR UNITS OTHER THAN TRANE, PROVIDE DRAWINGS WHICH SHOW THE UNITS WILL FIT IN THE AVAILABLE SPACE WITH PROPER DUCTWORK AND PIPING CONNECTIONS, AND WITH PROPER SERVICE CLEARANCES.
- HIGH EFFICIENCY MERV 8 FILTERS SHALL BE PROVIDED AND CHANGED AS NEEDED DURING CONSTRUCTION, FROM UNIT START-UP THROUGH FINAL ACCEPTANCE. AT THE TIME OF OWNER ACCEPTANCE, THE CONTRACTOR SHALL INSTALL A NEW SET OF FILTERS.
- MOTORS SHALL BE HIGH EFFICIENCY.
- MOTORS FOR AHU1, AHU3 AND AHU5 SHALL BE ECM PROGRAMMABLE TYPE. THE MOTOR SHALL BE PREPROGRAMMED IN THE FACTORY TO MEET SPECIFIED AIRFLOW REQUIREMENTS.
- PROVIDE 3HP ULTRA HIGH STATIC MOTOR FOR AHU4.

FAN SCHEDULE											
Mark	Manufacturer	Model	Description	Drive Type	External Static Pressure	Max Air Flow	Volts/Phase/Hz	Motor HP	Motor Speed	Inlet Sones	Serves
EF-1	Greenheck	BSQ-80-3	Belt Drive Centrifugal Inline Fan	Belt	1.00 in-wg	400 CFM	208 V/1/60 Hz	0.33 hp	1725	13.9	TOILET ROOMS
EF-2	Greenheck	BSQ-80-3	Belt Drive Centrifugal Inline Fan	Belt	1.00 in-wg	325 CFM	208 V/1/60 Hz	0.33 hp	1725	12.4	HOUSEKEEPING & BREAKROOM
EF-3	Greenheck	BSQ-160-10	Belt Drive Centrifugal Inline Fan	Belt	1.00 in-wg	2600 CFM	208 V/3/60 Hz	1.00 hp	1725	13.3	AHU4 RELIEF AIR
EF-4	Greenheck	SQ-98-VG	Direct Drive Centrifugal Inline Fan	Direct	0.70 in-wg	285 CFM	208 V/1/60 Hz	0.25 hp	1725	10.3	AHU5 RELIEF AIR
EF-5	Greenheck	CW-141-A	Direct Drive Centrifugal Sidewall Exhaust Fan	Direct	0.70 in-wg	2300 CFM	208 V/3/60 Hz	1.00 hp	1725	12.8	PHP1 RELIEF AIR
EF-6	Greenheck	CW-141-A	Direct Drive Centrifugal Sidewall Exhaust Fan	Direct	0.70 in-wg	2300 CFM	208 V/3/60 Hz	1.00 hp	1725	12.8	PHP2 RELIEF AIR
EF-7	Greenheck	CW-141HP-A	Direct Drive Centrifugal Sidewall Exhaust Fan	Direct	0.70 in-wg	1790 CFM	208 V/3/60 Hz	1.00 hp	1725	12.0	PHP3 RELIEF AIR

**FAN SCHEDULE NOTES:**

- MANUFACTURER: GREENHECK, OR EQUAL BY CARNES, LOREN COOK, PENN BARRY, OR TWIN CITY FAN. REFER TO SPECIFICATION SECTION 233423 FOR MORE DETAILED REQUIREMENTS.
- PROVIDE HANGING VIBRATION ISOLATION FOR INLINE AND CEILING EXHAUST FANS.
- FANS SHALL BE CONTROLLED VIA THE DDC CONTROL SYSTEM.
- PROVIDE VARIABLE FREQUENCY DRIVE FOR EF-5, EF6 AND EF7.
- EF-7 AND ITS ASSOCIATED WIRING, CONTROLS, DISCONNECT, DUCTWORK, ETC. ARE PART OF BID ALTERNATE #1.
- FANS SHALL NOT BE SELECTED WITH HIGHER INLET SONES THAN SCHEDULED.



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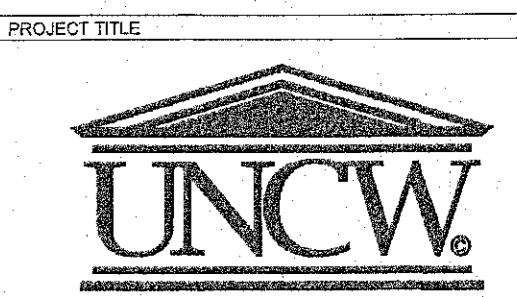
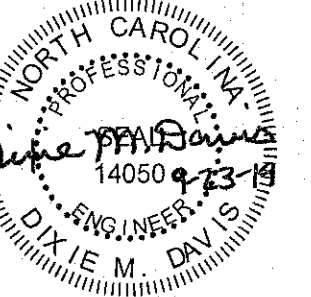
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**UNCW FILM STUDIES**

601 S College Rd, Wilmington, NC, 28403

**SHEET TITLE**

**MECHANICAL SCHEDULES**

**ISSUE CHECK**

Mark Date Description  
PROJECT NO: 2018070.01  
DATE: 09/23/2019  
SCALE:  
DRAWN BY: JWS PROJ MGR: IS

**M601**

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**PACKAGED HEAT PUMP SCHEDULE**

Mark	Manufacturer	Model	Design Supply Air Flow	External Static Pressure	Minimum Outdoor Air	Max.Design Outdoor Air	EER	Refrigerant	Net Total Cooling Capacity	Net Sensible Cooling Capacity	Cooling Entering Air Temperature DB/WB	Leaving Air Cooling Temperature DB/WB	Electric Heating kW	Electric Heating LDB Temperature Rise	Electric Heating Capacity MBh	Heat Pump Heating Capacity with Fan	Heating Entering Dry Bulb Temperature	HP Heating LDB Temperature Rise	VOLTS / PHASE / HZ	Maximum Overcurrent Protection	Minimum Circuit Current	Notes
PHP1	Trane	WHC092	2400 CFM	1.50 in-wg	275 CFM	625 CFM	11.8	410 R	90.71 MBh	81.30 MBh	80 °F/67 °F	56 °F/55 °F	13.5 kW	18 °F	46.1 MBh	85.40 MBh	70 °F	33 °F	208 V / 3 / 60 Hz	90.0 A	90.0 A	
PHP2	Trane	WHC092	2400 CFM	1.50 in-wg	275 CFM	625 CFM	11.8	410 R	90.71 MBh	81.30 MBh	80 °F/67 °F	56 °F/55 °F	13.5 kW	18 °F	46.1 MBh	85.40 MBh	70 °F	33 °F	208 V / 3 / 60 Hz	90.0 A	90.0 A	
PHP3 *	Trane	WHC074	1920 CFM	1.50 in-wg	200 CFM	485 CFM	12.1	410 R	75.14 MBh	48.43 MBh	81 °F/68 °F	57 °F/56 °F	13.5 kW	22 °F	46.1 MBh	73.97 MBh	70 °F	36 °F	208 V / 3 / 60 Hz	90.0 A	89.0 A	ALT #1

**NOTES:**

- PROVIDE TRANE UNITS AS SCHEDULED OR EQUAL BY OTHER MANUFACTURERS LISTED IN THE SPECIFICATIONS.
- PROVIDE UNITS WITH ECONOMIZER INTAKE HOODS AND DAMPERS. MAXIMUM ECONOMIZER VOLUME SHALL MATCH DESIGN SUPPLY AIR FLOW.
- UNIT COOLING CAPACITIES ARE BASED ON 95°F AMBIENT TEMPERATURE.
- SUPPLEMENTARY ELECTRIC HEAT ELEMENTS ARE RATED FOR 230V/3 PHASE CURRENT, BUT WILL BE RUNNING ON 208V/3 PHASE CURRENT. THE ELECTRIC HEAT CAPACITY MBH GIVEN HAS BEEN DERATED BY 25% FOR THIS VOLTAGE DIFFERENCE. THE ELECTRIC HEATING DRY BULB TEMPERATURE RISE ALSO REFLECTS THE DERATING.

\* PHP3 AND ITS ASSOCIATED WIRING, CONTROLS, DISCONNECT, DUCTWORK, ETC. ARE PART OF BID ALTERNATE #1.

**VENTILATION TABULATION**

UNIT DESIGNATION	ROOM NAMES	NO. OF PEOPLE	ROOM AREA SQ. FEET	OUTDOOR AIRFLOW RATE CFM/PERSON	OUTDOOR AIRFLOW RATE CFM/FT²	MINIMUM OUTSIDE AIRFLOW CFM	OUTSIDE AIR THRU UNIT, CFM	NUMBER OF FLUSHING FIXTURES	EXHAUST AIRFLOW RATE PER FLUSHING FIXTURE	EXHAUST AIRFLOW RATE CFM/FT²	MINIMUM EXHAUST AIRFLOW CFM	EXHAUST CFM
AHU1 / EF1	LOBBY 1102	10	670	5	0.06	90.2						
	CORR. TO TOILETS	0	237	5	0.06	14.22						
	W. TOILET 1103	0	225	5	0.06	13.5	4	50			200	
	M. TOILET 1104	0	225	5	0.06	13.5	4	50			200	
	CORRIDOR 1114	0	954	5	0.06	57.24						
TOTAL REQUIRED						188.66					400	
TOTAL PROVIDED							190					400
AHU3	EQUIPMENT 1111	2	1162	5	0.06	79.72						
	ELECT. 1110	0	80	5	0.06	4.8						
TOTAL REQUIRED						84.52						
TOTAL PROVIDED							90					
AHU4	I.T. 1120	0	90	5	0.06	5.4						
	SECURITY 1121	0	48	5	0.06	2.88						
	BREAKROOM 1122	3	144	5	0.06	23.64						
	POST-PROD. 1123	25	932	10	0.12	361.84						
	BLDG. SERV. 1116	0	85	5	0.06	5.16						
TOTAL REQUIRED						398.92						
TOTAL PROVIDED							400					
AHU5	CLASSROOM 1115	30	880	7.5	0.06	277.8						
	SOUND MIX 1117	2	138	10	0.12	36.56						
	SOUND MIX 1118	2	138	10	0.12	36.56						
TOTAL REQUIRED						350.92						
TOTAL PROVIDED							355					
PHP1 & PHP2	SOUND STAGE 1112	100	3912	10	0.06	1234.72						
	LIGHT LOCK 1113	0	68	5	0.06	4.08						
TOTAL REQUIRED						1238.8						
TOTAL PROVIDED							1250					
PHP3	LIGHT LOCK 1105	0	45	5	0.06	2.7						
	CINEMA 1106	75	1326	5	0.06	454.56						
	LIGHT LOCK 1107	0	45	5	0.06	2.7						
	STAIR 1108	0	150	5	0.06	9						
	PROJ BOOTH 1109	2	100	5	0.06	16						
TOTAL REQUIRED						484.96						
TOTAL PROVIDED							485					
EF2	HOUSEKEEPING 1120		48								2	96
	BREAKROOM 1122	3	144								0.7	100.8
TOTAL REQUIRED												196.8
TOTAL PROVIDED												325

NOTE: THE NUMBER OF PEOPLE IS BASED ON THE OWNER'S ANTICIPATED USAGE OF THE SPACES.

**SPLIT SYSTEM HP SCHEDULE**

Mark	Manufacturer	Model	Description	Total Cooling Capacity	Total Heating Capacity @ 47F	System SEER	Dry CFM	Serves	Voltage/Phase	Minimum Circuit Ampacity	Maximum Overcurrent Protection
IDU1	Mitsubishi Electric	MSZ-GL24NA	Mitsubishi Electric 9000 Btu/h, Wall Mounted, M Series Air Conditioner	9000.0 Btu/h	10900.0 Btu/h		145 to 399 CFM	Projection Booth	208 V/1	1.0 A	
IDU2	Mitsubishi Electric	MSZ-GL24NA	Mitsubishi Electric 9000 Btu/h, Wall Mounted, M Series Air Conditioner	9000.0 Btu/h	10900.0 Btu/h		145 to 399 CFM	Sound Mix 1	208 V/1	1.0 A	
IDU3	Mitsubishi Electric	MSZ-GL24NA	Mitsubishi Electric 9000 Btu/h, Wall Mounted, M Series Air Conditioner	9000.0 Btu/h	10900.0 Btu/h		145 to 399 CFM	Sound Mix 2	208 V/1	1.0 A	
IDU4	Mitsubishi Electric	MSZ-GL24NA	Mitsubishi Electric 24000 Btu/h, Wall Mounted, M Series Air Conditioner	22400.0 Btu/h	27600.0 Btu/h		388 to 738 CFM	I.T.	208 V/1	1.0 A	
ODU1	Mitsubishi Electric	MUZ-GL24NA	Mitsubishi Electric 9000 Btu/h, MUZ Series, Air-Source VRF Heat Pump	9000.0 Btu/h	10900.0 Btu/h	24.6		IDU1	208 V/1	9.0 A	15.0 A
ODU2/3	Mitsubishi Electric	MXZ-2C20NA2	Mitsubishi Electric 1.5 Ton, MXZ Series, Air-Source VRF Heat Pump	18000.0 Btu/h	22000.0 Btu/h	20		IDU2&3	208 V/1	17.2 A	20.0 A
ODU4	Mitsubishi Electric	MUZ-GL24NA	Mitsubishi Electric 24000 Btu/h, MUZ Series, Air-Source VRF Heat Pump	22400.0 Btu/h	27600.0 Btu/h	20.5		IDU4	208 V/1	17.1 A	20.0 A

**DUCTLESS NOTES:**

- MITSUBISHI ELECTRIC OR APPROVED EQUALS BY DAIKIN, EMI, SANYO, OR JOHNSON CONTROLS.
- HEATING AND COOLING CAPACITIES AT AHRI 210/240 TEST.
- PROVIDE BUILT IN CONDENSATE PUMP FOR INDOOR UNITS.
- REFRIGERANT SHALL BE R-410A OR R-134A.
- PROVIDE HIGH WATER SWITCH IN THE DRAIN PAN WHICH WILL TURN THE UNIT OFF IF THE DRAIN BECOMES CLOGGED.
- MAINTAIN FILTERS IN UNITS DURING CONSTRUCTION. AT THE TIME OF OWNER ACCEPTANCE, INSTALL NEW FILTERS IF USING DISPOSABLE TYPE, OR CLEAN IF USING PERMANENT TYPE.
- INDOOR UNIT IS POWERED BY OUTDOOR UNIT.
- MOTOR TYPE DC INVERTER DRIVEN.

**ELECTRIC UNIT HEATER**

Mark	Serves	Manufacturer	Type	Model	BTU/HR	CFM	KW	Motor HP	Volts/Phase	Full Load Amps
UH1	Building Serves	Trane	Unit Heater	UHEC-032A0C0	11,200	400	3.3	1/125	208/3	9.2

**UNIT HEATER NOTES:**

- MANUFACTURER: TRANE OR EQUAL BY QMARK, MARKEL OR CHROMALUX.
- PROVIDE DISCONNECT SWITCH.
- LINE VOLTAGE, INTERNAL THERMOSTAT.
- PROVIDE WITH MOUNTING BRACKETS.

PROJECT TITLE



**UNCW FILM STUDIES**

601 S College Rd, Wilmington, NC, 28403

SHEET TITLE

**MECHANICAL SCHEDULES**

ISSUE BLOCK

Mark Date Description  
PROJECT NO: 2018070.01  
DATE: 09/23/2019  
SCALE:  
DRAWN BY: JWS PROJ MGR: IS

**M602**

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### DIRECT DIGITAL CONTROL (DDC) SYSTEM

The DDC system shall be a complete integrated Direct Digital Control (DDC) Building Automation System (BAS). The system shall consist of a high-speed, peer-to-peer network of DDC controllers and a web-based operator interface. The system shall be robust, flexible, expandable, easy to use, and easily accessible.

Provide all labor, materials, special tools, hardware, software, programming, etc. required for the functional turn-key operation of the complete and fully functional Direct Digital Control Building Automation System to accomplish control and monitoring of the HVAC equipment as shown on the drawings and as indicated in the Sequence of Operation and Input/Output Point Schedules.

### SEQUENCE OF OPERATION

All schedules and temperature, humidity and CO2 setpoints shall be adjustable by facility personnel from the control panel and remotely located central site. No such parameters, which may need adjustment, may be imbedded in the programming.

### Packaged Heat Pump System Control (PHP1 and PHP2) (Tandem Systems)

PHP1 and PHP2 are constant volume packaged heat pump units. The units will operate as a system to serve the Sound Stage. The units will operate in tandem in a lead/lag configuration.

Each unit is equipped with economizer/return air dampers, relief air damper, relief air fan, air filter, cooling/heating DX coil, auxiliary electric heat, and supply air fan.

### Run Conditions - Scheduled:

The system shall run according to a user definable time schedule in the following modes:

- Occupied Mode: The unit shall maintain
  - A 75°F (adj.) cooling setpoint
  - A 70°F (adj.) heating setpoint
  - A 60% RH (adj.) high humidity setpoint
  - A 45% RH (adj.) low humidity setpoint
- Unoccupied Mode (night setback): The unit shall maintain:
  - A 80°F (adj.) cooling setpoint
  - A 60°F (adj.) heating setpoint
  - A 60% RH (adj.) high humidity setpoint
  - A 45% RH (adj.) low humidity setpoint

Alarms shall be provided as follows:

- High Space Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
- Low Space Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).
- High Space Humidity: If the zone humidity is greater than 65% (adj.).

### Tandem Sequence:

The program shall be capable of operating the two heat pumps as a single system as follows:

- One of the heat pumps will be designated as the lead unit and one will be designated as the lag unit.
- The units shall be rotated from lead to lag on a scheduled basis.
- The unit designated as the lag unit shall operate in tandem with the lead unit.
- The program shall allow the operation of the lead and lag units at the same time based upon load requirements. The program shall provide the option to run the lead unit fan continuously or cycled with the cooling and heating. The lag unit fan shall be cycled with cooling and heating. The lag unit will operate 1°F above/below the lead units last stage of cooling or heating.

### System / Roll-up Door Interlock:

The units shall be interlocked with the roll-up door in the space to prevent them from operating if the door is open.

### System Unoccupied Override:

A timed local override control shall allow an occupant to override the schedule and place the system into an occupied mode for an adjustable period of time. At the expiration of this time, control of the system shall automatically return to the schedule.

### Emergency Shutdown:

The unit shall shut down and generate an alarm upon receiving an emergency shutdown signal from the fire alarm.

### High Static Shutdown:

The unit shall shut down and generate an alarm upon receiving a high static shutdown signal.

### System Optimal Start:

The system shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period. The start time shall automatically adjust based on changes in outside air temperature, zone temperatures and prior history.

### Supply Fan:

The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.

Alarms shall be provided as follows:

- Supply Fan Failure: Commanded on, but the status is off.

### Relief Air Fan:

The relief air fan shall operate when its associated heat pump is in the economizer mode and the economizer damper is operating, unless shutdown on safeties. The relief fan shall not energize without its heat pump being in operation. If the heat pump shuts down for any reason, the associated relief fan shall also shut down.

Alarms shall be provided as follows:

- Relief Air Fan Failure: Commanded on, but the status is off.

### Heat/Cool Changeover:

Automatic heat/cool changeover shall be achieved by controlling the reversing valve according to the space temperature.

### Cooling Control:

Upon a rise in space temperature above the active cooling setpoint for 15 seconds, the compressor shall start and the reversing valve shall be energized. When the space temperature falls 1°F below the active cooling setpoint for 15 seconds, the compressor shall stop. The compressor output shall have a 5-minute delay off. The cooling cycle shall be disabled if the fan proof option is enabled and the fan proof is not present.

If more cooling is required than can be provided by the lead unit, the program shall similarly sequence on the lag unit.

The cooling shall be enabled whenever:

- Outside air temperature is greater than 60°F (adj.).
- AND the economizer is disabled or fully open.
- AND the supply fan status is on.

### Heating Control:

Upon a fall in space temperature below the active heating setpoint for 15 seconds, the compressor shall start and the reversing valve shall not energize. If the space temperature continues to fall to 1°F below the active heating setpoint for 10 minutes (adj), the auxiliary electric heat shall start. When the space temperature rises above the active heating setpoint for 15 seconds, the auxiliary heat shall stop. When the space temperature rises to 1°F above the active heating setpoint for 15 seconds, the compressor shall stop and the compressor shall stop and the reversing valve shall be returned to the normal position. During the heat pump heating cycle, the unit's on-board controls shall control the defrost cycle. The compressor output shall have a 5-minute delay off. The heating cycle shall be disabled if the fan proof option is enabled and the fan proof is not present.

If more heating is required than can be provided by the lead unit, the program shall similarly sequence on the lag unit.

The heating shall be enabled whenever:

- Outside air temperature is less than 60°F (adj.).
- AND the space temperature is below setpoint.
- AND the supply fan status is on.

### Damper Control:

The units have economizer outside/return air and relief air dampers.

- The economizer outside and return air dampers shall maintain a minimum adjustable open position during occupied periods to provide minimum OA requirements.
- The remote relief air damper shall be enabled when the unit supply air fan status is proven. The damper shall modulate to maintain space static pressure setpoint of .05 in. H2O (adj.).
- The relief air damper associated with a relief air fan shall be open when the unit is cooling economizing and the relief air fan is operating.
- The economizer outside air damper, and relief air dampers shall close and the return air damper shall open when the unit is off. During unoccupied periods including optimized cool-down/warm-up periods, the economizer OA dampers shall be kept closed except when the OA enthalpy is suitable for cooling economizing.
- Economizer Control: If the system is in the cooling mode and the average space temperature becomes greater than one degree below setpoint and the OA enthalpy is less than the economizer enthalpy setpoint (27.5 BTU/lb. of dry air) (adj.) and the outside air temperature is less than the return air temperature, the outside (economizer), and return air dampers shall modulate to provide "free cooling" by mixing outside and return air as necessary to maintain the discharge setpoint. While under economizer control minimum discharge air temperature shall be 52°F.

The economizer outdoor air dampers, and relief air dampers shall close, and the return air damper shall open whenever:

- Mixed air temperature drops below 40°F (adj.).
- OR on loss of supply fan status.

### Demand Control Ventilation - Carbon Dioxide (CO2) Control:

When in the occupied mode, the controller shall monitor space CO2 levels. The controller shall modulate the economizer damper open on rising CO2 concentrations, overriding normal damper operation to maintain a CO2 setpoint of 900 ppm (adj.). When under CO2 control, the outside air flow shall not exceed the Max. Design OA CFM.

Alarms shall be provided as follows:

- High Zone Carbon Dioxide Concentration: If the highest zone CO2 concentration is greater than 1500 ppm (adj.).

### Mixed Air Temperature:

The controller shall monitor the mixed air temperature and use as required for economizer control.

Alarms shall be provided as follows:

- High Mixed Air Temp: If the mixed air temperature is greater than 90°F (adj.).
- Low Mixed Air Temp: If the mixed air temperature is less than 40°F (adj.).

### Mixed Air Humidity:

The controller shall monitor the mixed air humidity.

### Supply Air Temperature:

The controller shall monitor the supply air temperature.

Alarms shall be provided as follows:

- High Supply Air Temp: If the supply air temperature is greater than 90°F (adj.).
- Low Supply Air Temp: If the supply air temperature is less than 45°F (adj.).

### Space Air Humidity:

The controller shall monitor the space air humidity.

Alarms shall be provided as follows:

- High Space Air Humidity: If the space air humidity is greater than 65% (adj.).

### Space Static Pressure Control:

The controller shall measure the space static pressure and use as required for space static pressure reset.

Alarms shall be provided as follows:

- High Space Static Pressure: If the space static pressure is .05 (adj.) greater than setpoint.
- Low Space Static Pressure: If the space static pressure is .05 (adj.) less than setpoint.

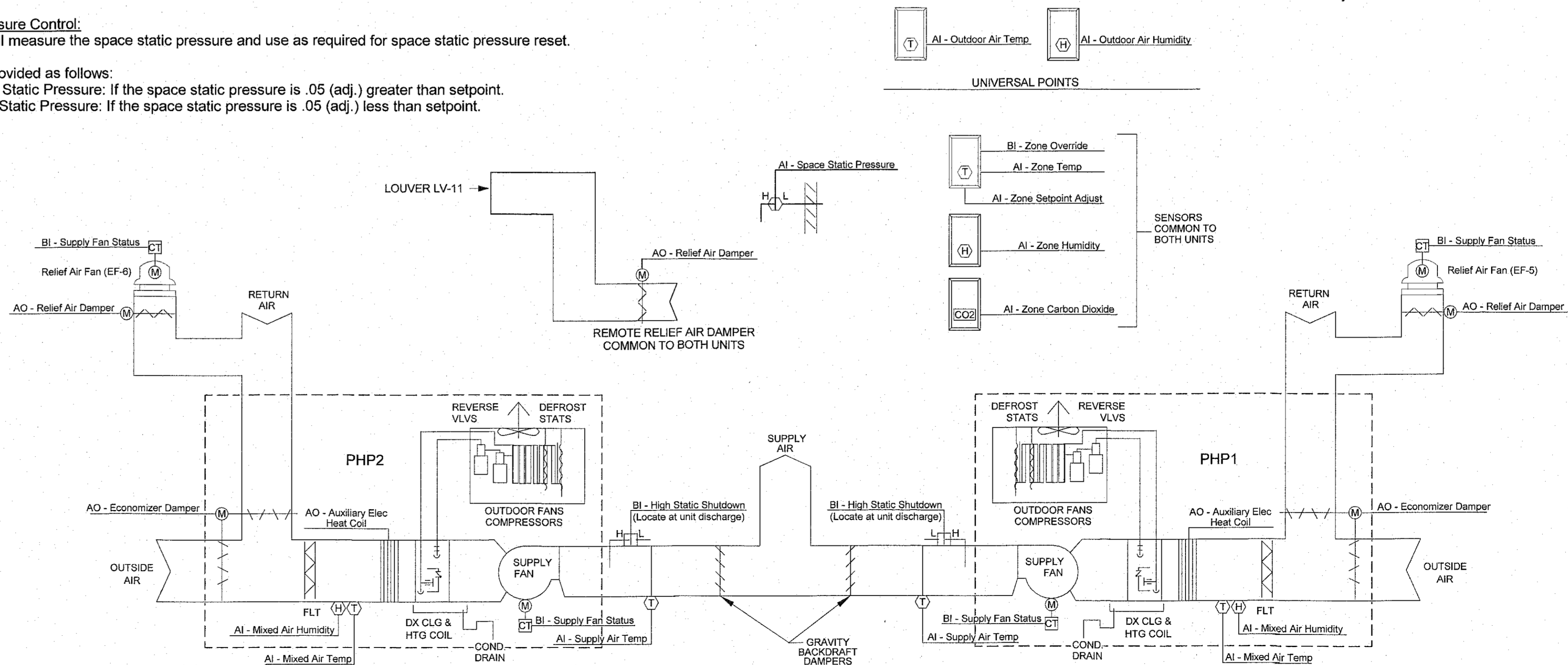
### Assistant Director's Box:

The Assistant Director's (AD) Box is a central location in the Sound Stage for controlling the house lights, "Quiet - Recording" lights, and for temporarily shutting off the HVAC system. Switches shall be provided in this box which will tell the BMS to shut off PHP1, PHP2, EF-5, and EF-6. The BMS shall display the status during shut down as "Turned off by AD". If these systems are not manually turned back on after 2 hours (adjustable), the BMS shall register an alarm. If they are not turned on after an additional 2 hours (adjustable), they shall be returned to automatic control.

PACKAGED HEAT PUMP SYSTEM CONTROL (PHP1 & PHP2) (Tandem Control)	Hardware Points				Software Points							Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm			
Point Name												
Outside Air Humidity (Universal Point)	X							X		X		X
Outside Air Temp (Universal Point)	X							X		X		X
Space Temp (Common to Both Units)	X							X		X		X
Space Humidity (Common to Both Units)	X							X		X		X
Space CO2 (Common to Both Units)	X							X		X		X
Mixed Air Temp	X							X		X		X
Mixed Air Humidity	X							X		X		X
Supply Air Temp	X							X		X		X
Supply Air Static Pressure	X							X		X		X
Economizer Outside/Return Air Damper Position	X							X		X		X
Space Static Pressure	X							X		X		X
Economizer Outside/Return Air Damper	X											
Relief Air Damper		X										
High Static Shutdown			X					X		X		X
Supply Fan Status			X					X		X		X
Relief Fan Status			X					X		X		X
Supply Fan Start/Stop				X				X		X		X
Relief Fan Start/Stop				X				X		X		X
Space Air Humidity Setpoint					X			X		X		X
Space Temp Setpoint					X			X		X		X
Mixed Air Temp Setpoint					X			X		X		X
Zone Carbon Dioxide PPM Setpoint					X			X		X		X
Schedule							X					
Supply Fan Failure										X		
Relief Fan Failure										X		
High Space Humidity										X		
High Mixed Air Temp										X		
Low Mixed Air Temp										X		
High Supply Air Temp										X		
Low Supply Air Temp										X		
High Supply Air Static Pressure										X		
Low Supply Air Static Pressure										X		
High Zone Carbon Dioxide Concentration										X		
High Space Static Pressure										X		
Low Space Static Pressure										X		

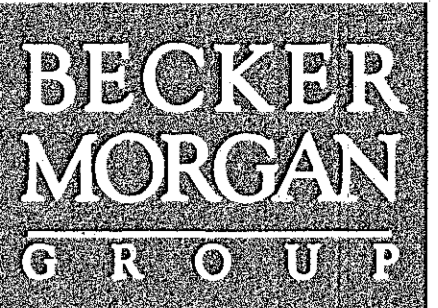
Total Hardware (30) Total Software (59)

Note: Point totals are for both units as a system.



PACKAGED HEAT PUMP SYSTEM CONTROL (TYPICAL FOR PHP-1 & PHP-2) (TANDEM SYSTEMS)

No Scale



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### WOODS ENGINEERING

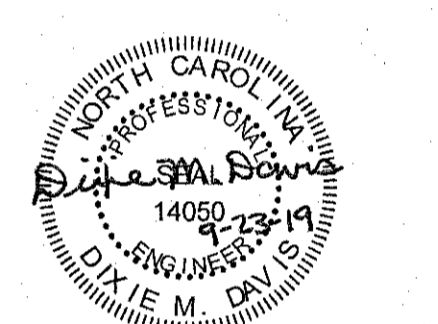
STRUCTURAL ENGINEERING
254 N. FRONT STREET, SUITE 201
WILMINGTON, NC 28401

910-343-8007 fax 910-343-8088

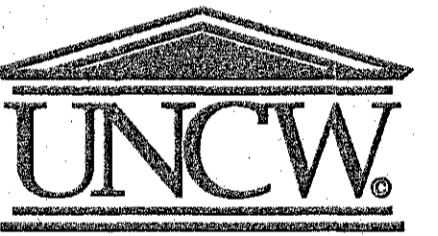
### SUD ASSOCIATES, P.A.

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PROJECT TITLE



### UNCW FILM STUDIES

601 S College Rd, Wilmington, NC, 28403

SHEET TITLE

### DDC CONTROLS, PACKAGED HEAT PUMP CONTROL (PHP1 & PHP2)

ISSUE BLOCK

Mark Date Description

PROJECT NO. 2018070.01

DATE: 09/23/2019

SCALE: 12" = 1'-0"

DRAWN BY: MJS PROJ MGR: IS

### M603

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**Packaged Heat Pump System Control (PHP3)**

PHP3 is a constant volume packaged heat pump unit. The unit is equipped with economizer/return air dampers, relief air damper, relief air fan, air filter, cooling/heating DX coil, auxiliary electric heat, and supply air fan.

**Run Conditions - Scheduled:**

The system shall run according to a user definable time schedule in the following modes:

- **Occupied Mode:** The unit shall maintain
  - A 75°F (adj.) cooling setpoint
  - A 70°F (adj.) heating setpoint
  - A 60% RH (adj.) high humidity setpoint
  - A 45% RH (adj.) low humidity setpoint
- **Unoccupied Mode (night setback):** The unit shall maintain:
  - A 80°F (adj.) cooling setpoint
  - A 60°F (adj.) heating setpoint
  - A 60% RH (adj.) high humidity setpoint
  - A 45% RH (adj.) low humidity setpoint

Alarms shall be provided as follows:

- **High Space Temp:** If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
- **Low Space Temp:** If the zone temperature is less than the heating setpoint by a user definable amount (adj.).
- **High Space Humidity:** If the zone humidity is greater than 65% (adj.).

**System Unoccupied Override:**

A timed local override control shall allow an occupant to override the schedule and place the system into an occupied mode for an adjustable period of time. At the expiration of this time, control of the system shall automatically return to the schedule.

**Emergency Shutdown:**

The unit shall shut down and generate an alarm upon receiving an emergency shutdown signal from the fire alarm.

**High Static Shutdown:**

The unit shall shut down and generate an alarm upon receiving a high static shutdown signal.

**System Optimal Start:**

The system shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period. The start time shall automatically adjust based on changes in outside air temperature, zone temperatures and prior history.

**Supply Fan:**

The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.

Alarms shall be provided as follows:

- **Supply Fan Failure:** Commanded on, but the status is off.

**Relief Air Fan:**

The relief air fan shall operate when the heat pump is in the economizer mode and the economizer damper is operating, unless shutdown on safeties. The relief fan shall not energize without the heat pump being in operation. If the heat pump shuts down for any reason, the relief fan shall also shut down.

Alarms shall be provided as follows:

- **Relief Air Fan Failure:** Commanded on, but the status is off.

**Heat/Cool Changeover:**

Automatic heat/cool changeover shall be achieved by controlling the reversing valve according to the space temperature.

**Cooling Control:**

Upon a rise in space temperature above the active cooling setpoint for 15 seconds, the compressor shall start and the reversing valve shall be energized. When the space temperature falls 1°F below the active cooling setpoint for 15 seconds, the compressor shall stop. The compressor output shall have a 5-minute delay off. The cooling cycle shall be disabled if the fan proof option is enabled and the fan proof is not present.

The cooling shall be enabled whenever:

- Outside air temperature is greater than 60°F (adj.).
- AND the economizer is disabled or fully open.
- AND the supply fan status is on.

**Heating Control:**

Upon a fall in space temperature below the active heating setpoint for 15 seconds, the compressor shall start and the reversing valve shall not energize. If the space temperature continues to fall to 1°F below the active heating setpoint for 10 minutes (adj.), the auxiliary electric heat shall start. When the space temperature rises above the active heating setpoint for 15 seconds, the auxiliary heat shall stop. When the space temperature rises to 1°F above the active heating setpoint for 15 seconds, the compressor shall stop and the reversing valve shall be returned to the normal position. During the heat pump heating cycle, the unit's on-board controls shall control the defrost cycle. The compressor output shall have a 5-minute delay off. The heating cycle shall be disabled if the fan proof option is enabled and the fan proof is not present.

The heating shall be enabled whenever:

- Outside air temperature is less than 60°F (adj.).
- AND the space temperature is below setpoint.
- AND the supply fan status is on.

**Damper Control:**

The unit has economizer outside/return air and relief air dampers.

- The economizer outside and return air dampers shall maintain a minimum adjustable open position during occupied periods to provide minimum OA requirements.
- The remote relief air damper shall be enabled when the unit supply air fan status is proven. The damper shall modulate to maintain space static pressure setpoint of .05 in. H2O (adj.).
- The relief air damper associated with a relief air fan shall be open when the unit is cooling economizing and the relief air fan is operating.
- The economizer outside air damper, and relief air dampers shall close and the return air damper shall open when the unit is off. During unoccupied periods including optimized cool-down/warm-up periods, the economizer OA dampers shall be kept closed except when the OA enthalpy is suitable for cooling economizing.
- **Economizer Control:** If the system is in the cooling mode and the average space temperature becomes greater than one degree below setpoint and the OA enthalpy is less than the economizer enthalpy setpoint (27.5 BTU/lb. of dry air) (adj.) and the outside air temperature is less than the return air temperature, the outside (economizer), and return air dampers shall modulate to provide "free cooling" by mixing outside and return air as necessary to maintain the discharge setpoint. While under economizer control minimum discharge air temperature shall be 52°F.

The economizer outdoor air dampers, and relief air dampers shall close, and the return air damper shall open whenever:

- Mixed air temperature drops below 40°F (adj.)
- OR on loss of supply fan status.

**Demand Control Ventilation - Carbon Dioxide (CO2) Control:**

When in the occupied mode, the controller shall monitor space CO2 levels. The controller shall modulate the economizer damper open on rising CO2 concentrations, overriding normal damper operation to maintain a CO2 setpoint of 900 ppm (adj.). When under CO2 control, the outside air flow shall not exceed the Max. Design OA CFM.

Alarms shall be provided as follows:

- **High Zone Carbon Dioxide Concentration:** If the highest zone CO2 concentration is greater than 1500 ppm (adj.).

**Mixed Air Temperature:**

The controller shall monitor the mixed air temperature and use as required for economizer control.

Alarms shall be provided as follows:

- **High Mixed Air Temp:** If the mixed air temperature is greater than 90°F (adj.).
- **Low Mixed Air Temp:** If the mixed air temperature is less than 40°F (adj.).

**Mixed Air Humidity:**

The controller shall monitor the mixed air humidity.

**Supply Air Temperature:**

The controller shall monitor the supply air temperature.

Alarms shall be provided as follows:

- **High Supply Air Temp:** If the supply air temperature is greater than 90°F (adj.).
- **Low Supply Air Temp:** If the supply air temperature is less than 45°F (adj.).

**Space Air Humidity:**

The controller shall monitor the space air humidity.

Alarms shall be provided as follows:

- **High Space Air Humidity:** If the space air humidity is greater than 65% (adj.).

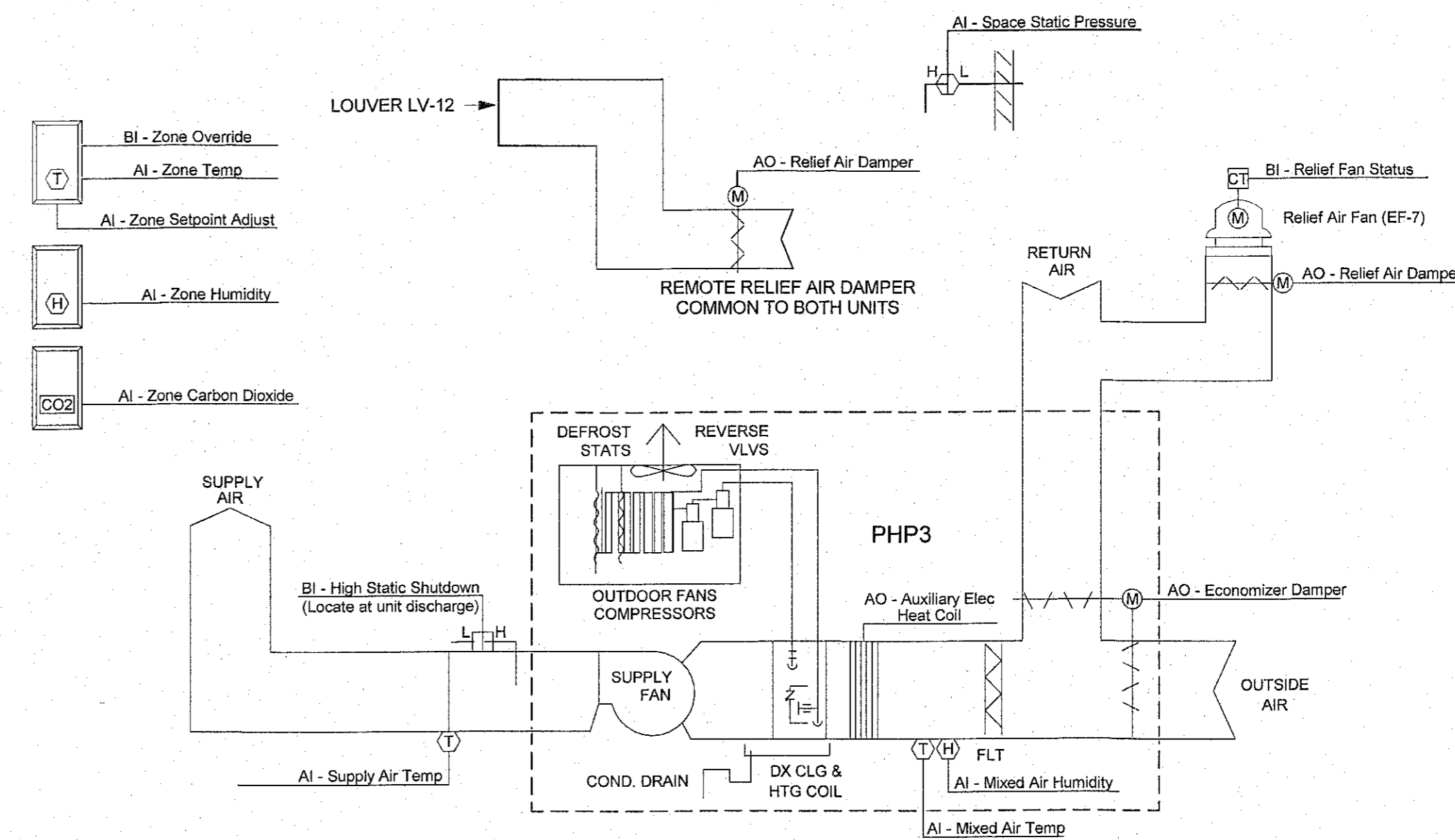
**Space Static Pressure Control:**

The controller shall measure the space static pressure and use as required for space static pressure reset.

Alarms shall be provided as follows:

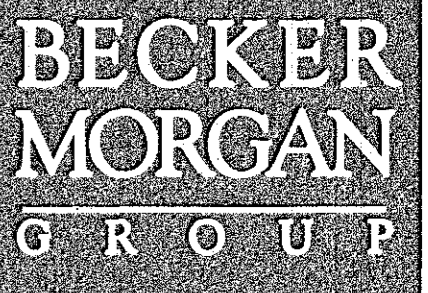
- **High Space Static Pressure:** If the space static pressure is .05 (adj.) greater than setpoint.
- **Low Space Static Pressure:** If the space static pressure is .05 (adj.) less than setpoint.

PACKAGED HEAT PUMP CONTROL (PHP3)	Hardware Points						Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm			
Space Temp	X							X		X		
Space Humidity	X							X		X		
Space CO2	X							X		X		
Mixed Air Temp	X							X		X		
Mixed Air Humidity	X							X		X		
Supply Air Temp	X							X		X		
Supply Air Static Pressure	X							X		X		
Economizer Outside/Return Air Damper Position	X							X		X		
Economizer Outside/Return Air Damper Position	X							X		X		
Space Static Pressure		X						X		X		
Relief Air Damper		X						X		X		
High Static Shutdown			X					X		X		
Supply Fan Status			X					X		X		
Relief Fan Status			X					X		X		
Supply Fan Start/Stop				X				X		X		
Relief Fan Start/Stop				X				X		X		
Space Air Humidity Setpoint					X			X		X		
Space Temp Setpoint					X			X		X		
Mixed Air Temp Setpoint					X			X		X		
Zone Carbon Dioxide PPM Setpoint					X			X		X		
Schedule							X					
Supply Fan Failure									X			
Relief Fan Failure									X			
High Space Humidity									X			
High Mixed Air Temp									X			
Low Mixed Air Temp									X			
High Supply Air Temp									X			
Low Supply Air Temp									X			
High Supply Air Static Pressure									X			
Low Supply Air Static Pressure									X			
High Zone Carbon Dioxide Concentration									X			
High Space Static Pressure									X			
Low Space Static Pressure									X			
Total Hardware ( 16 )                      Total Software ( 37 )												



PACKAGED HEAT PUMP SYSTEM CONTROL (PHP-3)

No Scale



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**WOODS ENGINEERING**

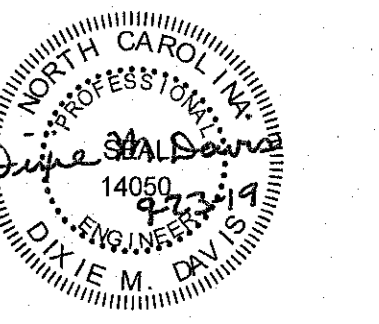
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910-343-8007 fax 910-343-8088

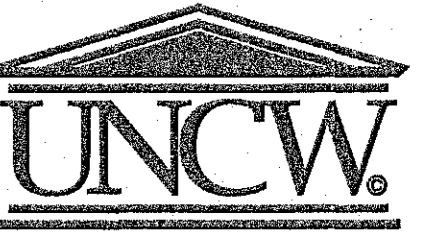
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PROJECT TITLE



**UNCW FILM STUDIES**

601 S College Rd, Wilmington, NC, 28403

SHEET TITLE

**PACKAGED HEAT PUMP SYSTEM CONTROL (PHP3)**

ISSUE BLOCK

Mark Date Description

PROJECT NO: 2018070.01

DATE: 09/23/2019

SCALE: 12" = 1'-0"

DRAWN BY: MJS PROJ MGR: IS

**M604**

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**Fire Alarm Monitoring**

The DDC System shall monitor the Fire Alarm System for the Fire Alarm Status, Supervisory Status and Trouble Status via dry contacts in the Fire Alarm System. The DDC System will use these inputs as a notification of Fire Alarm Conditions and will generate HVAC alarms to the BAS.

Fire Alarm Monitoring	Hardware Points					Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm		
Fire Alarm Status			X						X		
Supervisory Status			X						X		
Trouble Status			X						X		
Totals	0	0	3	0	0	0	0	0	3		
	Total Hardware ( 3 )					Total Software ( 3 )					

**Split Heat Pump System Control (AHU4/CU4)**

AHU4/CU4 is a constant volume split heat pump system. The system is comprised of the outdoor condensing unit (compressor, fan, and coil), and the indoor air handling unit (economizer/return air dampers, air filter, cooling/heating DX coil, auxiliary electric heat, and supply air fan.

The system is also equipped with a remote relief air fan.

**Run Conditions - Scheduled:**

The system shall run according to a user definable time schedule in the following modes:

- Occupied Mode: The unit shall maintain
  - A 75°F (adj.) cooling setpoint
  - A 70°F (adj.) heating setpoint
  - A 60% RH (adj.) high humidity setpoint
  - A 45% RH (adj.) low humidity setpoint
- Unoccupied Mode (night setback): The unit shall maintain:
  - A 80°F (adj.) cooling setpoint
  - A 60°F (adj.) heating setpoint
  - A 60% RH (adj.) high humidity setpoint
  - A 45% RH (adj.) low humidity setpoint

Alarms shall be provided as follows:

- High Space Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
- Low Space Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).
- High Space Humidity: If the zone humidity is greater than 65% (adj.).

**System Unoccupied Override:**

A timed local override control shall allow an occupant to override the schedule and place the system into an occupied mode for an adjustable period of time. At the expiration of this time, control of the system shall automatically return to the schedule.

**Emergency Shutdown:**

The unit shall shut down and generate an alarm upon receiving an emergency shutdown signal from the fire alarm.

**System Optimal Start:**

The system shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period. The start time shall automatically adjust based on changes in outside air temperature, zone temperatures and prior history.

**Supply Fan:**

The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.

Alarms shall be provided as follows:

- Supply Fan Failure: Commanded on, but the status is off.

**Relief Air Fan:**

The relief air fan shall operate when the heat pump is in the economizer mode and the economizer damper is operating, unless shutdown on safeties. The relief fan shall not energize without the heat pump being in operation. If the heat pump shuts down for any reason, the relief fan shall also shut down.

Alarms shall be provided as follows:

- Relief Air Fan Failure: Commanded on, but the status is off.

**Heat/Cool Changeover:**

Automatic heat/cool changeover shall be achieved by controlling the reversing valve according to the space temperature.

**Cooling Control:**

Upon a rise in space temperature above the active cooling setpoint for 15 seconds, the compressor shall start and the reversing valve shall be energized. When the space temperature falls 1°F below the active cooling setpoint for 15 seconds, the compressor shall stop. The compressor output shall have a 5-minute delay off. The cooling cycle shall be disabled if the fan proof option is enabled and the fan proof is not present.

The cooling shall be enabled whenever:

- Outside air temperature is greater than 60°F (adj.).
- AND the economizer is disabled or fully open.
- AND the supply fan status is on.

**Heating Control:**

Upon a fall in space temperature below the active heating setpoint for 15 seconds, the compressor shall start and the reversing valve shall not energize. If the space temperature continues to fall to 1°F below the active heating setpoint for 10 minutes (adj.), the auxiliary electric heat shall start. When the space temperature rises above the active heating setpoint for 15 seconds, the auxiliary heat shall stop. When the space temperature rises to 1°F above the active heating setpoint for 15 seconds, the compressor shall stop and the compressor shall stop and the reversing valve shall be returned to the normal position. During the heat pump heating cycle, the unit's on-board controls shall control the defrost cycle. The compressor output shall have a 5-minute delay off. The heating cycle shall be disabled if the fan proof option is enabled and the fan proof is not present.

The heating shall be enabled whenever:

- Outside air temperature is less than 60°F (adj.).
- AND the space temperature is below setpoint.
- AND the supply fan status is on.

**Damper Control:**

The unit has economizer outside/return air and relief air dampers.

- The economizer outside and return air dampers shall maintain a minimum adjustable open position during occupied periods to provide minimum OA requirements.
- The relief air damper shall be open when the unit is cooling economizing.
- The economizer outside air damper, and relief air damper shall close and the return air damper shall open when the unit is off. During unoccupied periods including optimized cool-down/warm-up periods, the economizer OA dampers shall be kept closed except when the OA enthalpy is suitable for cooling economizing.
- Economizer Control: If the system is in the cooling mode and the average space temperature becomes greater than one degree below setpoint and the OA enthalpy is less than the economizer enthalpy setpoint (27.5 BTU/lb. of dry air) (adj.) and the outside air temperature is less than the return air temperature, the outside (economizer), and return air dampers shall modulate to provide "free cooling" by mixing outside and return air as necessary to maintain the discharge setpoint. While under economizer control minimum discharge air temperature shall be 52°F.

The economizer outdoor air dampers, and relief air damper shall close, and the return air damper shall open whenever:

- Mixed air temperature drops below 40°F (adj.)
- OR on loss of supply fan status.

**Mixed Air Temperature:**

The controller shall monitor the mixed air temperature and use as required for economizer control.

Alarms shall be provided as follows:

- High Mixed Air Temp: If the mixed air temperature is greater than 90°F (adj.).
- Low Mixed Air Temp: If the mixed air temperature is less than 40°F (adj.).

**Mixed Air Humidity:**

The controller shall monitor the mixed air humidity.

**Supply Air Temperature:**

The controller shall monitor the supply air temperature.

Alarms shall be provided as follows:

- High Supply Air Temp: If the supply air temperature is greater than 90°F (adj.).
- Low Supply Air Temp: If the supply air temperature is less than 45°F (adj.).

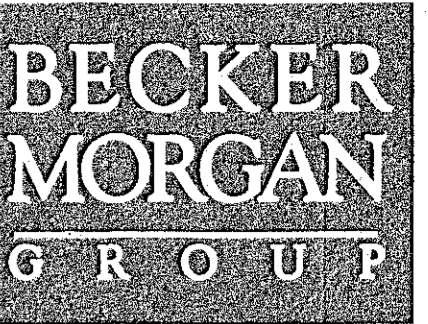
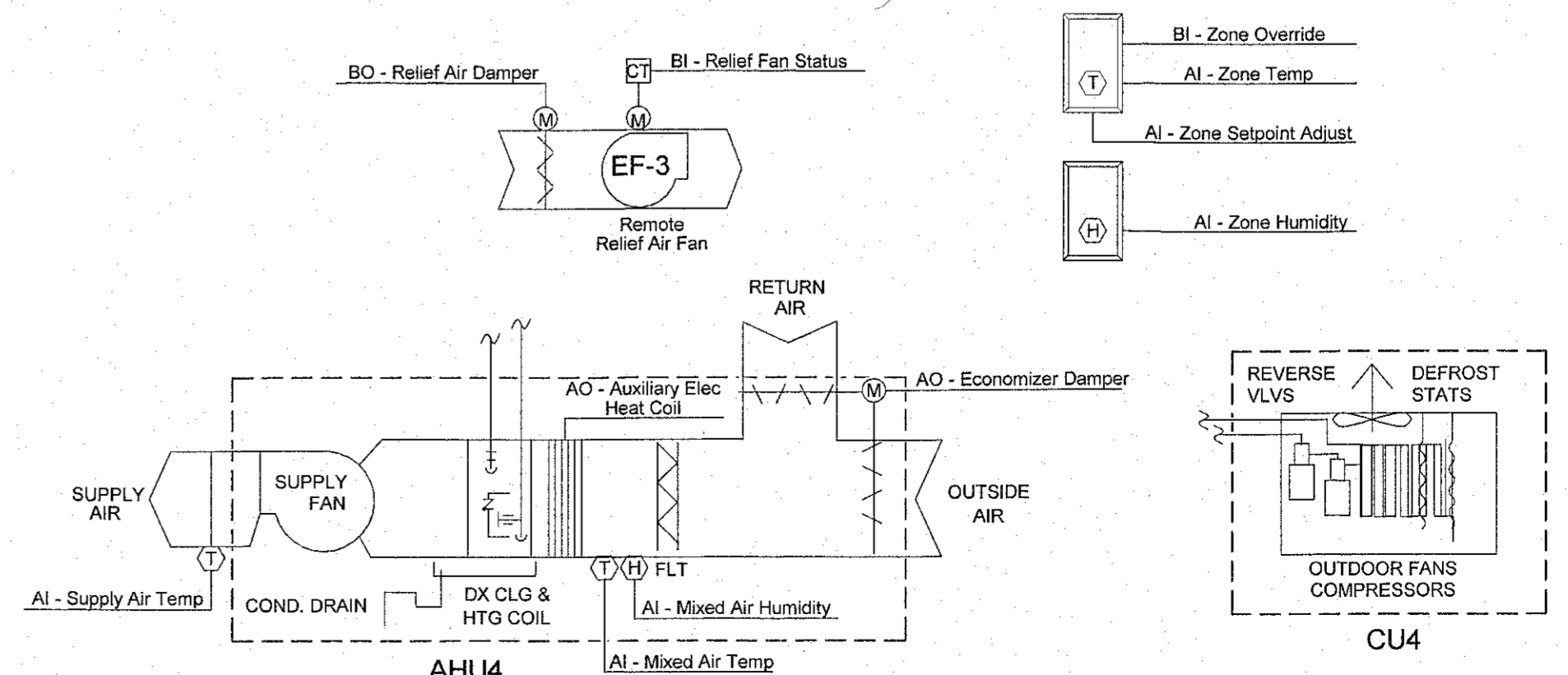
**Space Air Humidity:**

The controller shall monitor the space air humidity.

Alarms shall be provided as follows:

- High Space Air Humidity: If the space air humidity is greater than 65% (adj.).

SPLIT HEAT PUMP SYSTEM CONTROL (AHU4/CU4)	Hardware Points					Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm		
Space Temp	X							X		X	
Space Humidity	X							X		X	
Space CO2	X							X		X	
Mixed Air Temp	X							X		X	
Mixed Air Humidity	X							X		X	
Supply Air Temp	X							X		X	
Supply Air Static Pressure	X							X		X	
Economizer Outside/Return Air Damper Position	X							X		X	
Economizer Outside/Return Air Damper		X						X		X	
Relief Air Damper		X						X		X	
High Static Shutdown			X					X	X	X	
Supply Fan Status			X					X		X	
Relief Fan Status			X					X		X	
Supply Fan Start/Stop				X				X		X	
Relief Fan Start/Stop				X				X		X	
Space Air Humidity Setpoint					X			X		X	
Space Temp Setpoint					X			X		X	
Mixed Air Temp Setpoint					X			X		X	
Schedule							X				
Supply Fan Failure									X		
Relief Fan Failure									X		
High Space Humidity									X		
High Mixed Air Temp									X		
Low Mixed Air Temp									X		
High Supply Air Temp									X		
Low Supply Air Temp									X		
High Supply Air Static Pressure									X		
Low Supply Air Static Pressure									X		
Totals	8	2	3	2	3	0	1	18	10	18	
	Total Hardware ( 15 )					Total Software ( 32 )					



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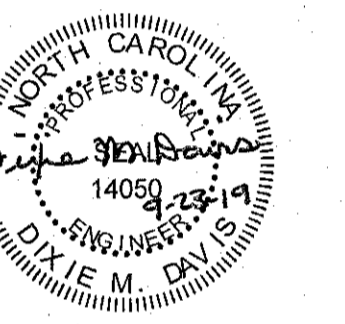
910-343-8007 fax 910-343-8088

**SUD ASSOCIATES, P.A.**

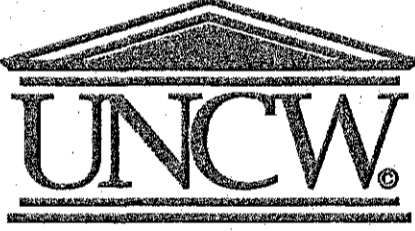
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PROJECT TITLE



**UNCW FILM STUDIES**

601 S College Rd, Wilmington, NC, 28403

SHEET TITLE

**SPLIT HEAT PUMP SYSTEM CONTROL (AHU4/CU4) AND FIRE ALARM MONITORING**

ISSUE BLOCK

Mark	Date	Description
PROJECT NO:	2018070.01	
DATE:	09/23/2019	
SCALE:	12" = 1'-0"	
DRAWN BY:	MJS	PROJ MGR: IS

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**Water Flow Meter**

**Water Meter:**

The controller shall monitor the water meter for water consumption on a continual basis. These values shall be made available to the system at all times.

Alarm shall be generated as follows:

- Meter Failure: Sensor reading indicates a loss of signal from the water meter.

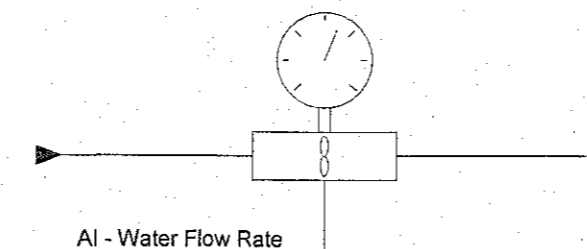
**Peak Demand History:**

The controller shall monitor and record the peak (high and low) demand readings from the water meter. These readings shall be recorded on a daily, month-to-date, and year-to-date basis.

**Usage History:**

The controller shall monitor and record water meter readings so as to provide a water consumption history. Usage readings shall be recorded on a daily, month-to-date, and year-to-date basis.

Point Name	Hardware Points					Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm		
Water Flow Rate	X										
Demand								X		X	
Peak Today								X		X	
Peak Month-to-Date								X		X	
Peak Year-to-Date								X		X	
Usage Today								X		X	
Usage Month-to-Date								X		X	
Usage Year-to-Date								X		X	
Meter Failure									X		
Totals	1	0	0	0	0	0	0	7	1	7	



**WATER FLOW METER**

NO SCALE

**Split System Heat Pump Control (ODU1 / IDU1, ODU2 / IDU2, IDU3 & IDU4)**

The split heat pump systems consist of an outdoor condensing unit and associated indoor terminal units. ODU1 has one indoor unit (IDU1), and ODU2 has three associated indoor units (IDU2, IDU3 & IDU4).

The heat pump systems will be scheduled through the DDC system, and controlled locally by thermostats furnished with the systems from the manufacturer.

**Run Conditions - Scheduled:**

The system shall run according to a user definable time schedule.

**System Unoccupied Override:**

A timed local override control shall allow an occupant to override the schedule and place the system into an occupied mode for an adjustable period of time. At the expiration of this time, control of the system shall automatically return to the schedule.

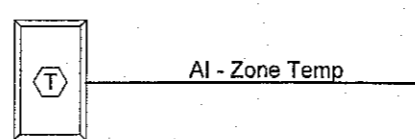
**Zone Temperature:**

The DDC System shall monitor the zone temperature.

Alarms shall be provided as follows:

- High Zone Temperature: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.)
- Low Zone Temperature: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).

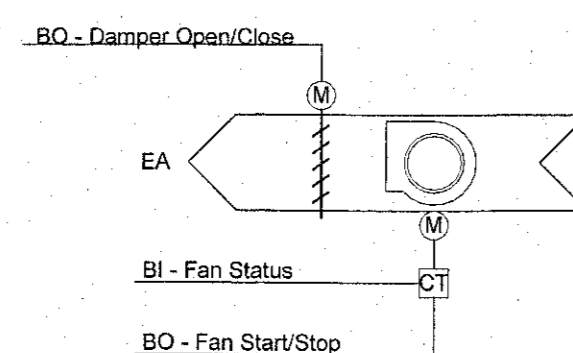
Point Name	Hardware Points					Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm		
System Start/Stop				X				X		X	
Schedule								X			
Zone Temp	X							X		X	
High Zone Temp									X		
Low Zone Temp									X		
Totals	1	0	0	1	0	0	1	2	2	2	



**SPLIT SYSTEM HEAT PUMP MONITORING (ODU1/IDU1, ODU2/IDU2, 3, & 4)**

NO SCALE

Point Name	Hardware Points					Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm		
Fan Status			X					X		X	
Fan Start/Stop			X					X		X	
Damper Open/Close			X					X		X	
Schedule							X				
Fan Failure									X	X	
Fan in Hand									X		
Fan Runtime Exceeded									X		
Totals	0	0	1	2	0	0	1	3	3	4	



**EXHAUST FAN CONTROL - EF-1, EF-2 & EF-4**

No Scale

**Exhaust Fan Control - EF-1, EF-2 & EF-4**

**Run Conditions - Scheduled:**

The fan shall run according to a user definable schedule. EF-1 schedule shall match AHU-1 schedule. EF-2 schedule shall match AHU-4 schedule. EF-4 schedule shall match AHU-5 schedule.

**Fan:**

The fan shall have a user definable (adj.) minimum runtime.

**Fan Status:**

The controller shall monitor the fan status.

Alarms shall be provided as follows:

- Fan Failure: Commanded on, but the status is off.
- Fan in Hand: Commanded off, but the status is on.
- Fan Runtime Exceeded: Fan status runtime exceeds a user definable limit (adj.).

**Damper:**

The damper shall open whenever the fan is called to operate.

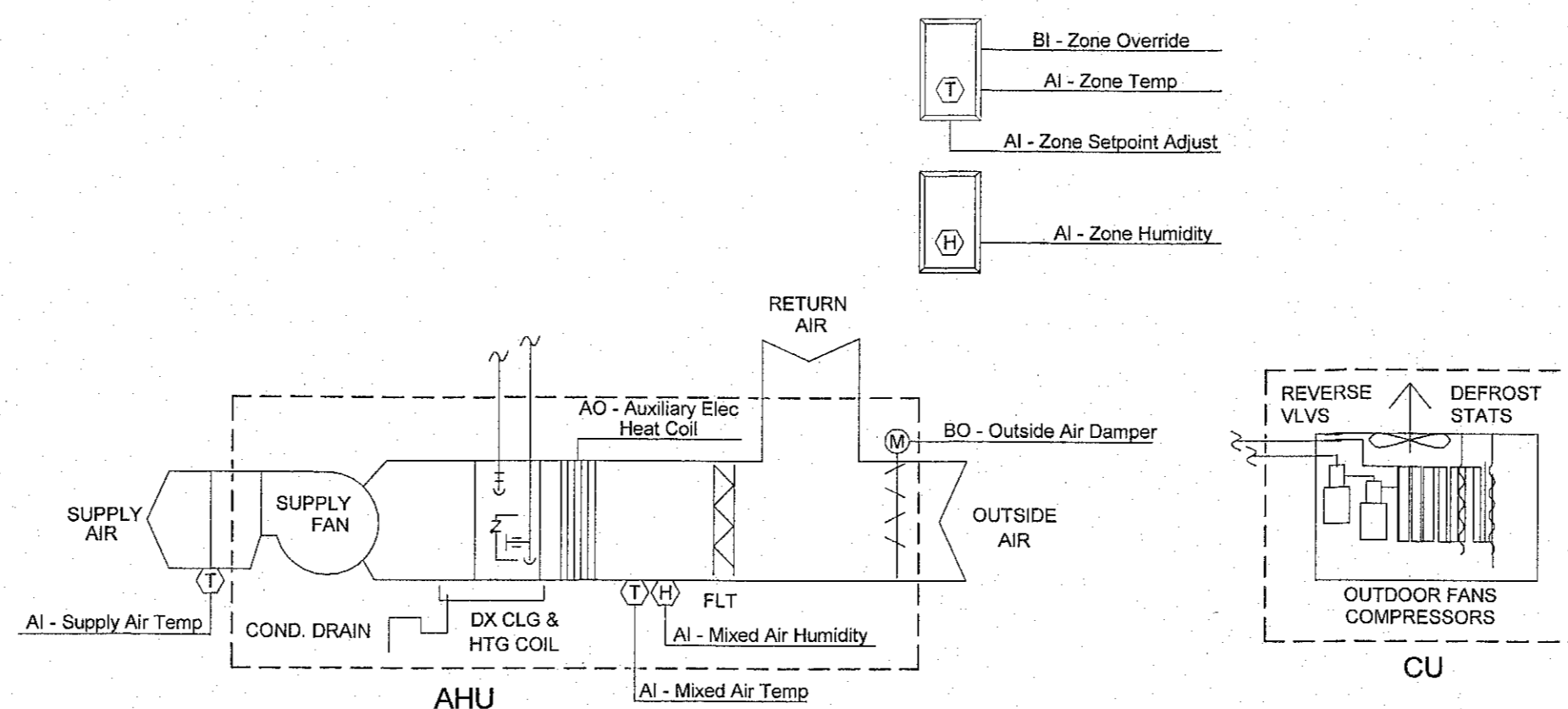
**Damper Status:**

The controller shall monitor the damper position.

Alarms shall be provided as follows:

- Damper Failure: Commanded open, but closed or commanded closed but open.

Point Name	Hardware Points					Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm		
Space Temp	X							X		X	
Space Humidity	X							X		X	
Supply Air Temp	X							X		X	
Outside Air Damper Position	X							X		X	
Outside Air Damper				X				X		X	
Supply Fan Status			X					X		X	
Supply Fan Start/Stop			X					X		X	
Space Temp Setpoint					X			X		X	
Schedule							X				
Supply Fan Failure									X		
High Space Humidity									X		
High Supply Air Temp									X		
Low Supply Air Temp									X		
Totals	4	0	1	2	1	0	1	8	4	8	



**SPLIT HEAT PUMP SYSTEM CONTROL (TYPICAL OF AHU1/CU1, AHU-3/CU3 & AHU5/CU5)**

No Scale

**Split Heat Pump System Control (Typical of AHU1/CU1, AHU3/CU3 and AHU5/CU5)**

AHU1/CU1, AHU3/CU3 and AHU5/CU5 are constant volume split heat pump systems. The systems are comprised of an outdoor condensing unit (compressor, fan, and coil), and an indoor air handling unit, return air dampers, air filter, cooling/heating DX coil, auxiliary electric heat, and supply air fan.

**Run Conditions - Scheduled:**

The system shall run according to a user definable time schedule in the following modes:

- Occupied Mode: The unit shall maintain
  - A 75°F (adj.) cooling setpoint
  - A 70°F (adj.) heating setpoint
  - A 60% RH (adj.) high humidity setpoint
  - A 45% RH (adj.) low humidity setpoint
- Unoccupied Mode (night setback): The unit shall maintain:
  - A 80°F (adj.) cooling setpoint
  - A 60°F (adj.) heating setpoint
  - A 60% RH (adj.) high humidity setpoint
  - A 45% RH (adj.) low humidity setpoint

Alarms shall be provided as follows:

- High Space Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.)
- Low Space Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.)
- High Space Humidity: If the zone humidity is greater than 65% (adj.)

**System Unoccupied Override:**

A timed local override control shall allow an occupant to override the schedule and place the system into an occupied mode for an adjustable period of time. At the expiration of this time, control of the system shall automatically return to the schedule.

**Emergency Shutdown:**

The unit shall shut down and generate an alarm upon receiving an emergency shutdown signal from the fire alarm.

**System Optimal Start:**

The system shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period. The start time shall automatically adjust based on changes in outside air temperature, zone temperatures and prior history.

**Supply Fan:**

The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.

Alarms shall be provided as follows:

- Supply Fan Failure: Commanded on, but the status is off.

**Heat/Cool Changeover:**

Automatic heat/cool changeover shall be achieved by controlling the reversing valve according to the space temperature.

**Cooling Control:**

Upon a rise in space temperature above the active cooling setpoint for 15 seconds, the compressor shall start and the reversing valve shall be energized. When the space temperature falls 1°F below the active cooling setpoint for 15 seconds, the compressor shall stop. The compressor output shall have a 5-minute delay off. The cooling cycle shall be disabled if the fan proof option is enabled and the fan proof is not present.

The cooling shall be enabled whenever:

- Outside air temperature is greater than 60°F (adj.).
- AND the economizer is disabled or fully open.
- AND the supply fan status is on.

**Heating Control:**

Upon a fall in space temperature below the active heating setpoint for 15 seconds, the compressor shall start and the reversing valve shall not energize. If the space temperature continues to fall to 1°F below the active heating setpoint for 15 seconds, the auxiliary electric heat shall start. When the space temperature rises above the active heating setpoint for 15 seconds, the auxiliary heat shall stop. When the space temperature rises to 1°F above the active heating setpoint for 15 seconds, the compressor shall stop and the compressor shall stop and the reversing valve shall be returned to the normal position. During the heat pump heating cycle, the unit's on-board controls shall control the defrost cycle. The compressor output shall have a 5-minute delay off. The heating cycle shall be disabled if the fan proof option is enabled and the fan proof is not present.

The heating shall be enabled whenever:

- Outside air temperature is less than 60°F (adj.).
- AND the space temperature is below setpoint.
- AND the supply fan status is on.

**Damper Control:**

The units have an outside air damper.

- The outside air damper shall maintain a minimum adjustable open position during occupied periods to provide minimum OA requirements.
- The outside air damper shall close when the unit is off.
- During unoccupied periods including optimized cool-down/warm-up periods, the OA damper shall be kept closed.

**Supply Air Temperature:**

The controller shall monitor the supply air temperature.

Alarms shall be provided as follows:

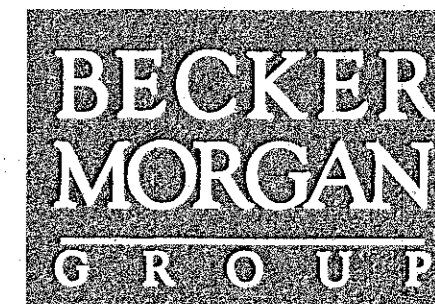
- High Supply Air Temp: If the supply air temperature is greater than 90°F (adj.)
- Low Supply Air Temp: If the supply air temperature is less than 45°F (adj.)

**Space Air Humidity:**

The controller shall monitor the space air humidity.

Alarms shall be provided as follows:

- High Space Air Humidity: If the space air humidity is greater than 65% (adj.).



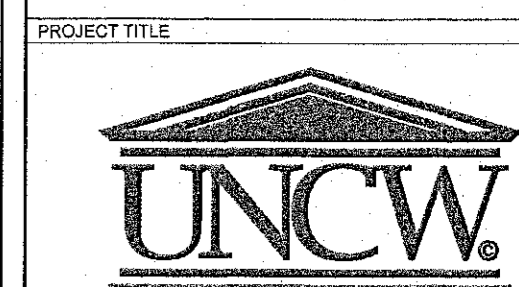
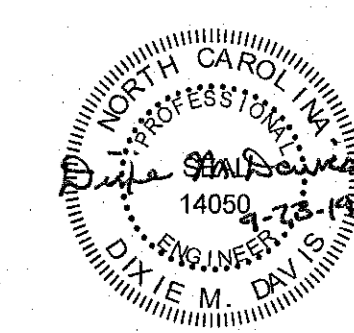
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**UNCW FILM STUDIES**

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**PROJECT TITLE**  
**UNCW FILM STUDIES**  
**SHEET TITLE**  
**DDC CONTROLS, SPLIT SYSTEM HEAT PUMP SYSTEMS, WATER METER, EXHAUST FANS**

Mark	Date	Description

PROJECT NO: 2018070.01  
DATE: 09/23/2019  
SCALE: 1/2" = 1'-0"  
DRAWN BY: MJS PROJ MGR: IS

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