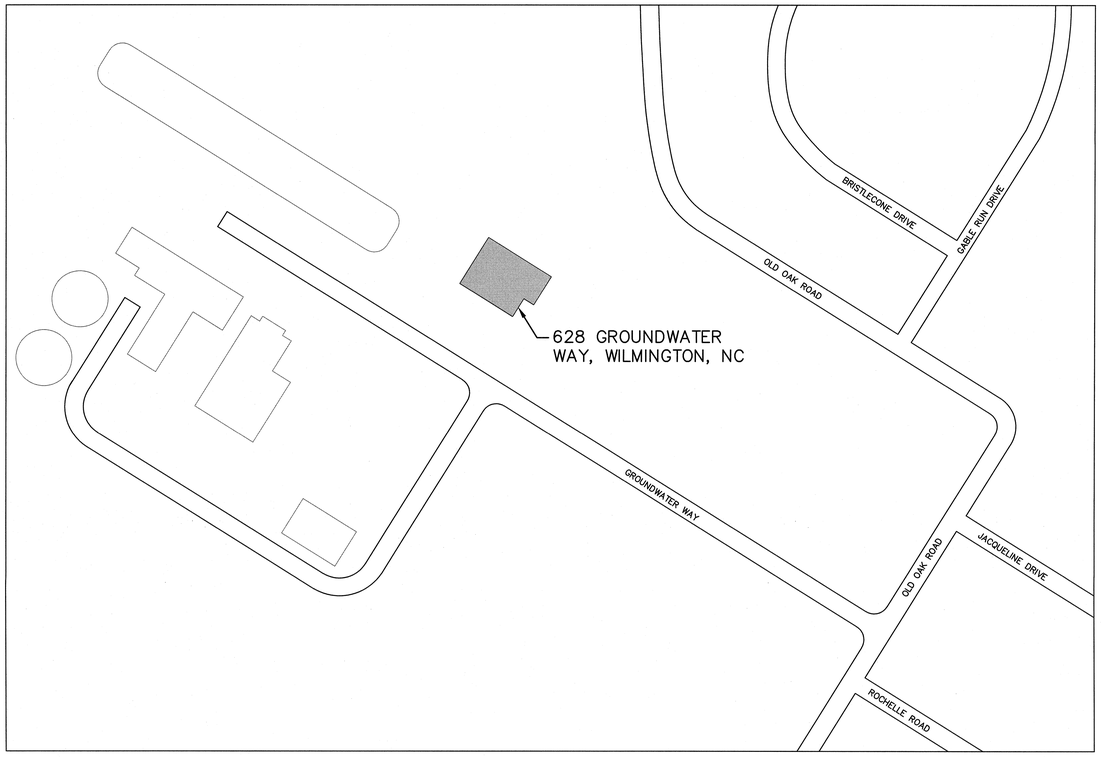

LOCATION MAP
SCALE: NONE

GENERAL NOTES:

1. CONTRACTOR SHALL FIELD VERIFY ALL RELEVANT DIMENSIONS, CLEARANCES, LOCATIONS AND ELEVATIONS PRIOR TO ORDERING, FABRICATION, AND INSTALLATION OF HIS WORK. DISCREPANCIES OR INTERFERENCES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT/ENGINEER AS SOON AS POSSIBLE. THE DRAWINGS DIAGRAMMATICALLY INDICATE THE GENERAL LOCATION OF DUCTS, PIPING AND EQUIPMENT AND DO NOT SHOW ALL SUPPORTS, OFFSETS, FITTINGS, BOLTS, CONNECTIONS, ETC. REQUIRED FOR A COMPLETE SYSTEM. WHILE THE DRAWINGS ARE TO BE FOLLOWED AS CLOSELY AS POSSIBLE, IF IT IS FOUND NECESSARY TO CHANGE THE LOCATION OF ANY WORK TO ACCOMMODATE THE CONDITIONS AT THE BUILDING, SUCH CHANGES SHALL BE MADE WITHOUT ADDITIONAL COST TO THE OWNER, AND AS DIRECTED BY THE ENGINEER. ALL HVAC EQUIPMENT, CONTROLS, AND SPECIALTY ITEMS INCLUDING, BUT NOT NECESSARILY LIMITED TO, FIRE DAMPERS, SMOKE DETECTORS, SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S PUBLISHED INSTALLATION INSTRUCTIONS AND DIAGRAMS.
2. THE SCOPE OF WORK INCLUDES SELECTIVE DEMOLITION OR REMOVAL OF EXISTING CONSTRUCTION AS INDICATED, SPECIFIED, OR NECESSARY TO ACCOMPLISH THE WORK UNDER THIS PROJECT. THE DRAWINGS DEFINE THE SCOPE OF WORK BUT IT IS NOT INTENDED THAT ALL ITEMS OF DEMOLITION WORK BE SPECIFICALLY INDICATED. CONTRACTOR SHALL FIELD VERIFY EXTENT OF DEMOLITION WORK INTENDED.
3. ALL WORK SHALL BE IN ACCORDANCE WITH THE NORTH CAROLINA BUILDING CODE AND LOCAL CODES AND ORDINANCES. THE CONTRACTOR SHALL SECURE ALL NECESSARY REQUIRED PERMITS AND INSPECTIONS FOR THE WORK. CHARGES FOR ALL PERMITS, INSPECTIONS, AND ANY RE-INSPECTIONS SHALL BE THE CONTRACTOR'S RESPONSIBILITY AND SHALL BE INCLUDED IN HIS CONTRACT.
4. THE BUILDING IN WHICH THIS PROJECT OCCURS OPERATES 24 HOURS PER DAY 365 DAYS PER YEAR. WORK UNDER THIS PROJECT SHALL BE ACCOMPLISHED TO ACCOMODATE OWNER'S NEED TO OCCUPY AND USE AREAS TO BE AFFECTED AS MUCH AS POSSIBLE WITH MINIMAL IMPACT TO OPERATIONS. CONTRACTOR SHALL MUTUALLY COORDINATE AND SCHEDULE WORK WITH THE OWNER. CONTRACTOR SHALL COORDINATE HIS WORK WITH THE WORK OF OTHER PROJECTS THAT MAY BE IN PROGRESS IN PARALLEL WITH THIS PROJECT. THE FOLLOWING SPECIFICS SHALL APPLY:
   A. DO NOT TURN "OFF" ANY EQUIPMENT WITHOUT OWNER PRE-APPROVAL.
   B. OWNER USES AN IN-HOUSE "DAILY WORK PERMIT" SYSTEM TO AUTHORIZE, START, AND FINISH WORK EACH DAY, AND TO COMMUNICATE HAZARDS, ACTIVITIES, PRECAUTIONS, AND DOCUMENT PERSONNEL INVOLVED IN THE WORK. CONTRACTOR SHALL COMPLY WITH OWNER DAILY WORK PERMIT SYSTEM.
   C. OPERATING SYSTEMS SHUTDOWN TIME SHALL BE MINIMIZED. NEW OR REPLACEMENT EQUIPMENT SHALL BE STARTED-UP AND OPERATIONAL PRIOR TO ANY DEMOLITION OR REMOVAL OF EXISTING EQUIPMENT TO THE GREATEST EXTENT THAT IS PRACTICAL. COORDINATE WITH OWNER.
5. AS THIS IS A RENOVATION PROJECT, CONTRACTOR IS RESPONSIBLE FOR PROTECTION OF EXISTING FACILITY CONSTRUCTION, SYSTEMS, EQUIPMENT, DUCTWORK, ELECTRICAL SYSTEMS, FINISHES, ETC. FROM DAMAGE DURING BOTH SELECTIVE DEMOLITION AND INSTALLATION OF NEW AND/OR MODIFIED SYSTEMS. WHERE DAMAGE IS CAUSED BY THE CONTRACTOR, SUCH DAMAGE SHALL BE REPAIRED OR REPLACED AT NO ADDITONAL COST TO THE OWNER. THE CONTRACTOR SHALL MAINTAIN ON-GOING ORDER AND CLEANLINESS ON A DAILY BASIS FOR THE DURATION OF THE PROJECT.
6. ALL MATERIALS USED FOR THIS PROJECT SHALL BE NEW AND OF THE HIGHEST QUALITY. ALL MATERIALS SHALL CONFORM TO APPLICABLE MANUFACTURING STANDARDS INCLUDING, BUT NOT NECESSARILY LIMITED TO, ANSI, ASME, MSS, ASTM, ETC.
7. ALL WORKMANSHIP SHALL BE OF THE HIGHEST QUALITY PERFORMED BY TRAINED AND QUALIFIED TRADESMEN CONSISTENT WITH INDUSTRY STANDARDS AND PRACTICES. POOR QUALITY WORKMANSHIP SHALL BE REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
8. PIPING, DUCTWORK, ETC., SHALL NOT BE SUPPORTED FROM BAR JOIST BRIDGING, ROOFDECK, OR OTHER NON-STRUCTURAL BUILDING ELEMENTS. SUPPORT CONNECTIONS TO BAR JOISTS SHALL BE MADE WITHIN 6" OF THE BAR JOIST PANEL POINT. CONTRACTOR SHALL SUPPLY ANY AND ALL SUPPLEMENTARY STRUCTURAL MEMBERS NECESSARY TO SUPPORT HVAC AND PIPING SYSTEMS. SUPPLEMENTARY STEEL CONNECTIONS TO EXISTING BUILDING STRUCTURAL ELEMENTS SUCH AS COLUMNS, BEAMS, BAR JOISTS, AND CONCRETE FLOORS SHALL BE MADE BY STRUCTURAL WELDING (AWS D1.1), BOLTING, OR SUITABLE RIGID ANCHORAGE.
9. WHERE NOT PROVIDED WITH HVAC EQUIPMENT, THE MECHANICAL CONTRACTOR SHALL PROVIDE AND INSTALL REFRIGERANT FOR DIRECT EXPANSION SYSTEMS IN TYPES AND QUANTITIES AS RECOMMENDED BY THE MANUFACTURER. REFRIGERANT MANAGEMENT SPECIALTY ITEMS SUCH AS, BUT NOT NECESSARILY LIMITED TO, SUCTION ACCUMULATORS, SERVICES VALVES, FILTER/DRIERS, ETC. SHALL BE PROVIDED AS RECOMMENDED BY THE MANUFACTURER.
10. THE MECHANICAL CONTRACTOR SHALL PROVIDE FACTORY START-UP SERVICES FOR ALL HVAC EQUIPMENT, VARIABLE FREQUENCY DRIVES, AND VARIABLE SPEED DRIVES.
11. ELECTRICAL WORK FOR THIS PROJECT SHALL BE PERFORMED BY A QUALIFIED ELECTRICAL CONTRACTOR AS A SUB-CONTRACT TO THE MECHANICAL CONTRACTOR OR BY QUALIFIED ELECTRICIANS EMPLOYED BY THE CONTRACTOR. THE CONTRACTOR SHALL PROVIDE ALL MATERIALS AND INSTALLATION OF NEW OR MODIFIED ELECTRICAL SYSTEMS AS REQUIRED. SEE SHEET E0.1 FOR SPECIFIC REQUIREMENTS.
12. THESE DRAWINGS CONTAIN DESIGN DETAILS THAT MAY OR MAY NOT BE REFERENCED ELSEWHERE IN THE DRAWINGS. CONTRACTOR IS REQUIRED TO COMPLY WITH THE DETAILS WHERE SUCH DETAILS APPLY WHETHER REFERENCED OR NOT IN THE DRAWINGS. WHERE THERE IS QUESTION AS TO APPLICABILITY OF DESIGN DETAILS, THE CONTRACTOR SHALL CONTACT THE ENGINEER FOR CLARIFICATION PRIOR TO INSTALLATION OF THE WORK. CLARIFICATION SHALL NOT BE CAUSE FOR ADDITIONAL COSTS TO THE OWNER.
13. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CUTTING AND PATCHING OF EXISTING CONDITIONS IN SUPPORT OF THE WORK REQUIRED UNDER THIS PROJECT. CUTTING OF MAJOR BUILDING STRUCTURAL ELEMENTS, UNLESS INDICATED IN THE DESIGN DRAWINGS, SHALL BE PROHIBITED. PATCHING SHALL RESULT IN RESTORATION OF CONDITIONS TO "AS FOUND" STATE, OR TO A STATE THAT IS EQUIVALENT TO THAT OF ADJACENT CONSTRUCTION. FOR MASONRY OR CONCRETE CUTTING, USE A CUTTING OR BORING MACHINE DESIGNED SPECIFICALLY FOR THIS PURPOSE UTILIZING CARBORUNDUM OR DIAMOND TIPPED CUTTING BLADES. WHERE EXISTING STRUCTURAL FIREPROOFING IS DISTURBED, AFFECTED AREAS SHALL BE RESTORED WITH APPROPRIATE FIELD APPLIED FIREPROOFING TO MATCH.
14. THE MECHANICAL CONTRACTOR SHALL COORDINATE WITH THE ELECTRICAL AND CONTROLS CONTRACTOR TO ASSURE THAT MECHANICAL EQUIPMENT IS PROPERLY CONNECTED AND SHALL CHECK WIRING, DISCONNECTS, ETC. FOR PROPER CONFORMANCE. ANY DAMAGE RESULTING FROM IMPROPER WIRING, CONNECTIONS, FUSING, ETC. SHALL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR. ELECTRICAL WORK SHALL BE PERFORMED BY DULY LICENSED ELECTRICAL TECHNICIANS IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE AND THE NORTH CAROLINA BUILDING CODE. RACEWAY SHALL CONSIST OF UL LISTED RIGID METAL CONDUIT, 3/4" DIAMETER MINIMUM, SIZED PER N.E.C. REQUIREMENTS. DISCONNECTS SHALL BE U.L. LISTED HEAVY DUTY FUSIBLE TYPE WITH CORROSION RESISTANT METAL NEMA ENCLOSURE FOR ENVIRONMENTAL CONDITIONS AT INSTALLED LOCATION. FOR CONNECTIONS TO HVAC EQUIPMENT, PROVIDE 3 FT. MINIMUM LIQUID TIGHT FLEXIBLE METAL CONDUIT FOR OUTDOORS CONDITIONS, AND 3 FT. MINIMUM FLEXIBLE METAL CONDUIT FOR INTERIOR CONDITIONS.
15. HVAC DIRECT DIGITAL CONTROLS SHALL BE PROVIDED WITH FACTORY START-UP AND FULL COMISSIONING SERVICES. THIS SHALL INCLUDE COMPLETE DEMONSTRATION OF THE HVAC SYSTEMS AND CONTROLS TO PERFORM THEIR INTENDED FUNCTION. OWNER SHALL BE NOTIFIED IN ADVANCE OF COMISSIONING WORK. COMPLETE TYPEWRITTEN DOCUMENTATION OF START-UP AND COMISSIONING WORK SHALL BE CERTIFIED AND SUBMITTED TO THE OWNER UPON COMPLETION.
16. HVAC SYSTEMS TESTING, ADJUSTING, AND BALANCING (T.A.B.) SHALL BE COMPLETED BY AN INDEPENDENT COMPANY CETIFIED BY A.A.B.C. OR N.E.B.B. THE T.A.B CONTRACTOR SHALL BE A SUB-CONTRACT TO THE MECHANICAL CONTRACTOR. THE T.A.B. CONTRACTOR SHALL COMPLETE ALL TESTING, ADJUSTING, AND BALANCING IN ACCORDANCE WITH A.A.B.C. OR N.E.B.B. STANDARDS. AIR FLOWS SHALL BE BALANCED TO WITHIN PLUS OR MINUS 10% OF DESIGN AIR FLOWS. UPON COMPLETION, THE T.A.B. CONTRACTOR SHALL COMPILE THE TEST DATA INTO REPORT FORM AND SHALL SUBMIT THE REPORT TO THE OWNER/ENGINEER FOR REVIEW AND APPROVAL. FINAL PAYMENT SHALL BE WITHHELD UNTIL THE T.A.B. REPORT IS APPROVED. ADDITIONAL TESTING, ADJUSTING, AND BALANCING SHALL BE PERFORMED BY THE T.A.B. CONTRACTOR AS REQUIRED AND AT NO ADDITIONAL COST TO THE OWNER UNTIL SATISFACTORY RESULTS ARE OBTAINED AND THE FINAL T.A.B. REPORT IS REVIEWED AND APPROVED.
17. MAINTENANCE DATA: FOR ALL ITEMS REQUIRING MAINTENANCE, THE CONTRACTOR SHALL FURNISH AND DELIVER TO THE OWNER'S REPRESENTATIVE ON THE JOB COMPLETE DATA AS PREPARED BY THE MANUFACTURER COVERING THE DETAILS OF OPERATION AND MAINTENANCE AND COMPLETE PARTS LIST FOR ALL EQUIPMENT SPECIFIED. DATA SHALL BE ASSEMBLED INTO A 3-RING BINDER. INCLUDE VENDOR AND/OR MANUFACTURER'S REPRESENTATIVE CONTACT INFORMATION FOR SERVICE AND SPARE PARTS INFORMATION.
18. AS-BUILT DRAWINGS: THE CONTRACTOR SHALL MAINTAIN, DURING THE COURSE OF CONSTRUCTION, A COMPLETE DETAILED SET OF PLANS MARKED UP WITH ACTUAL INSTALLED CONDITIONS. MARK UPS SHALL INCLUDE SIZES, DIMENSIONS, EQUIPMENT LOCATIONS, ELEVATIONS, ETC. AT COMPLETION OF JOB, THE COMPLETE SET OF MARKED-UP DRAWINGS SHALL BE SUBMITTED TO THE OWNER.
19. THE MECHANICAL CONTRACTOR SHALL GUARANTEE HIS PORTION OF THE WORK FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF SUBSTANTIAL COMPLETION. OWNER AND MECHANICAL CONTRACTOR SHALL MUTUALLY AGREE ON THE DATE OF SUBSTANTIAL COMPLETION WHEN WORK IS COMPLETED AND ACCEPTED BY THE OWNER. THE MECHANICAL CONTRACTOR SHALL SUBMIT A TYPEWRITTEN GUARANTEE SIGNED BY THE MECHANICAL CONTRACTOR TO THE OWNER. THE MECHANICAL CONTRACTOR'S SUBCONRACTORS SHALL ALSO PROVIDE TYPEWRITTEN, SIGNED GUARANTEES FOR THEIR PORTIONS OF THE WORK.
20. ALL DUCT JOINTS SHALL BE SEALED PER S.M.A.C.N.A. SEAL CLASS 'A' REQUIREMENTS.
21. IN AREAS WITH GYPBOARD CEILINGS, HVAC CONTRACTOR SHALL INSTALL EQUIPMENT, DUCTWORK AND PIPE HANGERS PRIOR TO GYPBOARD INSTALLATION.
22. ALL PENETRATIONS THROUGH RATED AND NONRATED WALLS SHALL BE FIRE STOPPED USING PENETRATION DETAILS PROVIDED IN THE DESIGN DRAWINGS.
23. ALL THERMOSTATS AND SWITCHES FOR MECHANICAL SYSTEMS SHALL BE MOUNTED 44" AFF.
24. RETURN AIR DUCTWORK SHALL BE INSTALLED IN SUCH A MANNER THAT THE DUCT MOUNTED SMOKE DETECTORS ARE NO MORE THAN 24" ABOVE LAY-IN CEILING.
25. COORDINATE MECHANICAL DUCTWORK TO AVOID ELECTRICAL PANELS. COORDINATE WITH ELECTRICAL CONTRACTOR.
26. WHERE DUCTWORK CONFIGURATION CAUSES OBSTRUCTIONS FOR SUPPORT PROVISIONS OF OTHER SYSTEMS INSTALLED UNDER DUCTWORK, AS PART OF CONSTRUCTION COORDINATION AMONG CONTRACTORS, MAKE PROVISIONS FOR OTHER CONTRACTORS TO UTILIZE DUCTWORK SUPPORT COMPONENTS. WHERE THIS IS NECESSARY, COORDINATE ADDITIONAL LOADING INTRODUCED BY OTHER SYSTEMS TO INSURE SUPPORT COMPONENTS ARE SUITABLY RATED FOR ALL LOADS TO BE SUPPORTED.

MECHANICAL SYSTEMS, SERVICE SYSTEMS AND EQUIPMENT METHOD OF COMPLIANCE

☒ COMPLIANCE PER CHAPTER 4 NORTH CAROLINA ENERGY CONSERVATION CODE - SECTIONS C403.2, C403.3 AND C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS.
- ☒ C406.2 MORE EFFICIENT HVAC PERFORMANCE
- ☐ C406.3 REDUCED LIGHTING POWER DENSITY
- ☐ C406.4 ENHANCED LIGHTING CONTROLS
- ☐ C406.5 ON-SITE RENEWABLE ENERGY
- ☐ C406.6 DOAS PROVISION FOR CERTAIN HVAC
- ☐ C406.7 HIGH ENERGY SERVICE WATER HEATING

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- ☐ C406.7 HIGH ENERGY SERVICE WATER HEATING

☐ COMPLIANCE PER CHAPTER 4 NORTH CAROLINA ENERGY CONSERVATION CODE - SECTIONS C402.5, C403.2, C404, C405.2, C405.3, C405.5, C405.6 AND C407 TOTAL BUILDING PERFORMANCE.

☐ COMPLIANCE PER ANSI/ASHRAE/IESNA 90.1-2013.

☐ COMPLIANCE PER NORTH CAROLINA SPECIFIC COMCHECK.

CLIMATE ZONE 3A

EXTERIOR DESIGN CONDITIONS
winter dry bulb: 20°F
summer dry bulb: 95°F DB/80°F WB

INTERIOR DESIGN CONDITIONS
winter dry bulb: 70°F
summer dry bulb: 75°F
relative humidity: 50%

BUILDING HEATING LOAD: BLOCK LOAD = 400 MBH (PAC-108 LAB AREA)

BUILDING COOLING LOAD: BLOCK LOAD = 61 TONS (PAC-108 LAB AREA)

MECHANICAL SPACING CONDITIONING SYSTEM
Unitary:
description of unit:
heating efficiency:
cooling efficiency:
heat output of unit:
cooling output of unit:
} SEE SCHEDULES ON SHEET M0.2

Boiler: N/A
total boiler output. If oversized, state reason.
Chiller: N/A
total chiller capacity. If oversized, state reason.

LIST EQUIPMENT EFFICIENCIES: SEE SCHEDULES ON SHEET M0.2

EQUIPMENT SCHEDULES WITH MOTORS (MECHANICAL SYSTEMS)
motor horsepower:
number of phases:
minimum efficiency:
motor type:
# of poles:
} SEE SCHEDULES ON SHEET M0.2

DESIGNER STATEMENT

To the best of my knowledge and belief, the design of this building complies with the mechanical systems, service systems and equipment requirements of the North Carolina Energy Conservation Code.

SIGNED: _____
NAME: Anthony E. Jacobs, P.E.
TITLE: Professional Engineer

MECHANICAL LEGEND AND ABBREVIATIONS:

- REMOVE EXISTING DUCTWORK
- REMOVE EXISTING PIPING, LINE SYMBOL INDICATES SERVICE
- EXISTING DUCTWORK TO REMAIN
- RECTANGULAR DUCTWORK
- SUPPLY AIR DUCTWORK TURNED DOWN
- SUPPLY AIR DUCTWORK TURNED UP
- RETURN AIR/EXHAUST AIR TURNED DOWN
- RETURN AIR/EXHAUST AIR TURNED UP
- DUCT WITH RUNOUT (TAKE OFF WITH SEPARATE MANUAL DAMPER)
- M.D.
- CEILING RETURN AIR/ EXHAUST AIR REGISTER
- CEILING SUPPLY AIR DIFFUSER
- 1 HOUR WALL DESIGNATION
- R R — REFRIGERANT LINE SET (GAS AND LIQUID)
- C C — AIR CONDITIONING CONDENSATE PIPING
- EXISTING ITEM TO REMAIN
- EXISTING ITEM TO BE REMOVED
- DISCONNECT SWITCH
- (S) SMOKE DETECTOR WITH DUCT ACCESS DOOR, ACCESS DOOR BY THE MECH. CONTR., DETECTOR FURNISHED BY THE ELECT. CONTR. AND INSTALLED BY THE MECH. CONTR. PROVIDE CEILING ACCESS DOOR (16"X16" MIN.) WHERE NECESSARY.
- M MOTOR OPERATOR (120V, 1ø)
- M MOTOR OPERATED DAMPER
- (1) KEYED NOTE SYMBOL
- POINT OF CONNECTION NEW TO EXISTING
- TERMINATION POINT OF DEMOLITION
- (T) THERMOSTAT, TEMPERATURE SENSOR
- F/D WALL FIRE DAMPER
- (*) (CFM) REGISTER, GRILLE, OR DIFFUSER SYMBOL WITH CFM "*" DENOTES EXISTING REGISTER, GRILLE, OR DIFFUSER

℄	CENTERLINE
ø	DIAMETER, ELECTRICAL PHASE
∠	STRUCTURAL ANGLE
A.D.	ACCESS DOOR
AHU	AIR HANDLING UNIT
A.F.F.	ABOVE FINISHED FLOOR
A.F.G.	ABOVE FINISHED GRADE
ARR.	ARRANGEMENT
ATT.	ATTACHMENT
BRKT.	BRACKET
BTUH	BRITISH THERMAL UNITS PER HOUR
C/B	CIRCUIT BREAKER
CFM	CUBIC FEET PER MINUTE
CLG.	CEILING
COND.	CONDENSING, CONDENSER
CONN.	CONNECTION, CONNECTOR
CONC.	CONCRETE, CONCENTRIC
CONT.	CONTINUATION
CONTR.	CONTRACTOR
DEMO.	DEMOLITION
DDC	DIRECT DIGITAL CONTROLS
DET.	DETAIL
EA.	EACH
E.A.T.	ENTERING AIR TEMPERATURE
E.D.B.	ENTERING DRY BULB
E.E.R.	ENERGY EFFICIENCY RATIO
EFF.	EFFICIENCY
EMBED.	EMBEDMENT
ENGR.	ENGINEER
E.S.P.	EXTERNAL STATIC PRESSURE
E.W.B.	ENTERING WET BULB
EX.A.	EXHAUST AIR
EXIST.	EXISTING
FACP	FIRE ALARM CONTROL PANEL
FIN. FL.	FINISHED FLOOR
FIN.	FINISHED
FLEX.	FLEXIBLE
FLGD.	FLANGED
FLR.	FLOOR
FPM	FEET PER MINUTE
GA.	GAUGE
GALV.	GALVANIZED
(H)	HEIGHT
H.P.	HORSEPOWER
IN.W.C.	INCHES WATER COLUMN
INSUL.	INSULATION
ISOL.	ISOLATION
KW	KILOWATT
L.D.B.	LEAVING DRY BULB
L.W.B.	LEAVING WET BULB
MAT'L.	MATERIAL
MAX.	MAXIMUM
MIN.	MINIMUM
M.D.	MANUAL DAMPER WITH LOCKING OPERATOR
M.O.D.	MOTOR OPERATED DAMPER
NEC	NATIONAL ELECTRIC CODE
N.C.	NORMALLY CLOSED
N.O.	NORMALLY OPEN
O.A.	OUTSIDE AIR
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER
PLCS.	PLACES
PROT.	PROTECTION
R.A.	RETURN AIR
R.D.	ROOF DRAIN
RED.	REDUCER
RENOV.	RENOVATION
SCH.	SCHEDULE
S.A.	SUPPLY AIR
SPECS.	SPECIFICATIONS
STL.	STEEL
STN.	STAINLESS
STR.	STRUCTURAL
THRD.	THREADED
TYP.	TYPICAL
VFD (W)	VARIABLE FREQUENCY DRIVE WIDTH
W/	WITH

INDEX OF DRAWINGS

REVISION

DATE	DESCRIPTION

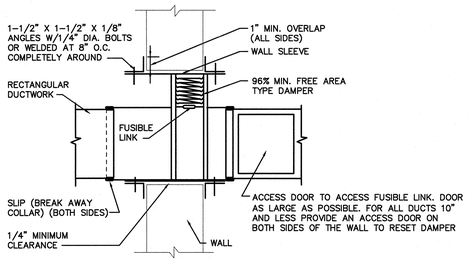
EMD FACILITY HVAC UPGRADES

628 GROUNDWATER WAY
WILMINGTON, NC 28411

CHEATHAM AND ASSOCIATES, P.A.
CONSULTING ENGINEERS
3412 ENTERPRISE DRIVE
WILMINGTON, NORTH CAROLINA 28405
PHONE: (910)452-0150 FAX: (910)452-4211
E-MAIL: OFFICE@CHEATHAMPA.COM
NC LICENSE #C-1073

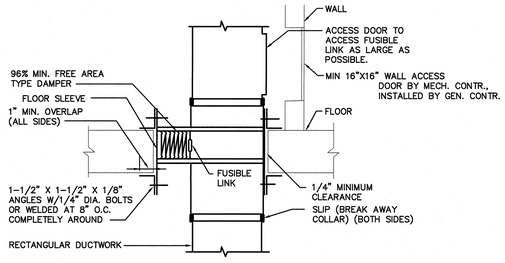
NORTH CAROLINA PROFESSIONAL SEAL 13359 ENGINEER ANTHONY E. JACOBS

DESIGNED BY	AEJ
DRAWN BY	TWT
CHECKED BY	AEJ
JOB NUMBER	18093
SHEET	G0.0
OF	
DATE	OCTOBER 14, 2020



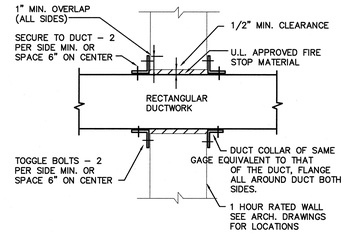
NOTE: DETAIL FOR REFERENCE ONLY. DAMPERS SHALL BE INSTALLED PER MANUFACTURER'S INSTALLATION INSTRUCTIONS.

A M0.1 TYPICAL VERTICAL FIRE DAMPER DETAIL
NO SCALE



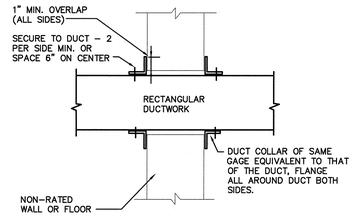
NOTE: DETAIL FOR REFERENCE ONLY. DAMPERS SHALL BE INSTALLED PER MANUFACTURER'S INSTALLATION INSTRUCTIONS.

B M0.1 TYPICAL HORIZONTAL FIRE DAMPER DETAIL
NO SCALE



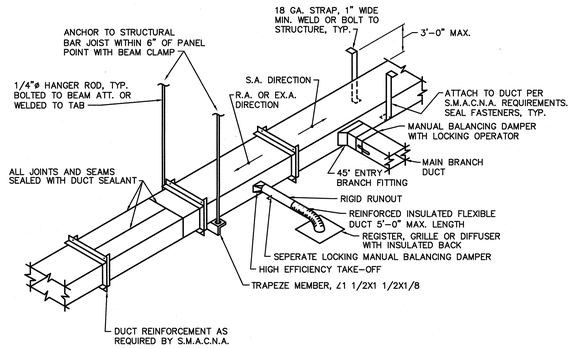
NOTE: DETAIL ONLY FOR THOSE DUCTS 100 SQ. INCHES AND LESS PENETRATING ONE HOUR WALLS THAT ARE NOT INDICATED TO HAVE FIRE DAMPERS.

C M0.1 1 HOUR WALL PENETRATION
NO SCALE



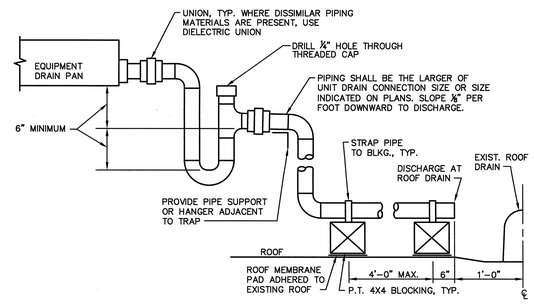
NON-RATED WALLS

D M0.1 WALL PENETRATION DETAIL
NO SCALE



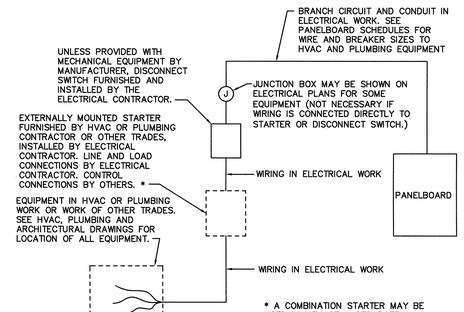
NOTES:
1. REPAIR ANY DISTURBED FIREPROOFING ON EXISTING STRUCTURAL FRAMING.
2. SEE PLANS FOR SPECIFIC DUCT DESIGN REQUIREMENTS.
3. ALL DUCT CONNECTIONS TO HOODS AND EQUIPMENT RIGID.

E M0.1 DUCTWORK DETAIL
SCALE: NONE

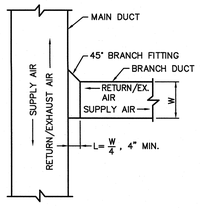


NOTES:
1. MANUALLY PRIME/ FILL TRAP BEFORE START-UP TO FORM INITIAL SEAL
2. SUPPORT DRAIN LINES TO PREVENT SAG, BENDING, ETC.
3. CONDENSATE PIPING MATERIAL SHALL BE TYPE L HARD DRAWN COPPER. WROUGHT FITTINGS, SOLDERED JOINTS.
4. WHERE HVAC EQUIPMENT IS PROVIDED WITH INTERNAL PRE-PIPED TRAP BY THE EQUIPMENT MANUFACTURER, EXTERNAL TRAP IS NOT REQUIRED. PROVIDE UNION ADJACENT TO EQUIPMENT COND. CONN.

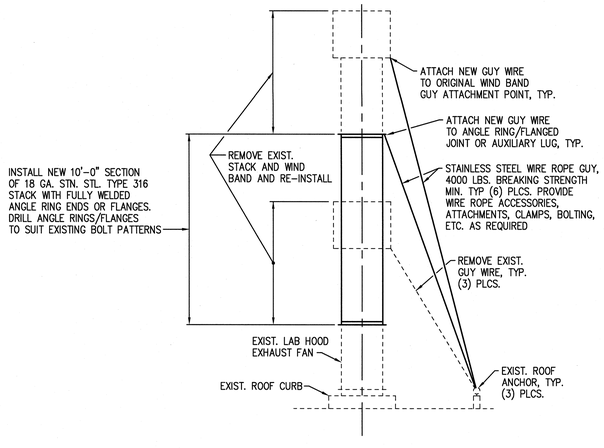
F M0.1 COIL CONDENSATE DRAIN TRAP DETAIL
SCALE: NONE



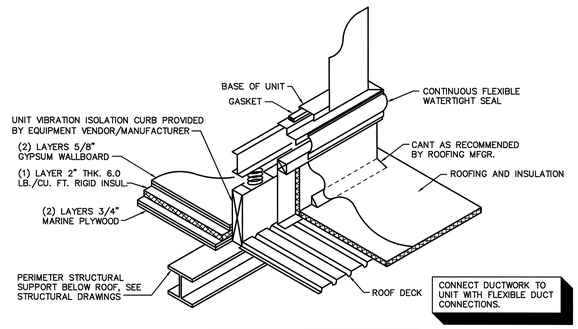
G M0.1 ELECTRICAL CONNECTION TO MECHANICAL EQUIPMENT
NO SCALE



H M0.1 RECTANGULAR DUCTWORK BRANCH DETAIL
SCALE: NONE



J M0.1 LAB EXHAUST FAN STACK EXTENSION DETAIL
SCALE: NONE



K M0.1 TYPICAL ROOFTOP UNIT CURB AND SOUND ATTENUATION DETAIL
NO SCALE

REVISION

DATE	DESCRIPTION

EMD FACILITY HVAC UPGRADES

628 GROUNDWATER WAY
WILMINGTON, NC 28411

CHEATHAM AND ASSOCIATES, P.A.
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NC LICENSE #C-1073

NORTH CAROLINA PROFESSIONAL SEAL 13359 ENGINEER ANTHONY E. JACOBS

DESIGNED BY	AEJ
DRAWN BY	TWT
CHECKED BY	AEJ
JOB NUMBER	18093
SHEET	M0.1
OF	
DATE	OCTOBER 14, 2020

LAB AREA PACKAGED 100% OUTSIDE AIR UNIT SCHEDULE

SYMBOL	SERVING	CFM DESIGN	CFM OPERATING	EXT. S.P. "W.C.(1)	AIR FILTRATION PRIMARY	AIR FILTRATION SECONDARY	DX COOLING (2) CAP., MBH	DX COOLING (2) EDB, °F	DX COOLING (2) EWB, °F	DX COOLING (2) LDB, °F	DX COOLING (2) LWB, °F	NATURAL GAS HEATING (3) INPUT CAP., MBH	NATURAL GAS HEATING (3) EDB, °F	NATURAL GAS HEATING (3) LDB, °F	NATURAL GAS HEATING (3) THERMAL EFF.	ELECTRICAL (4) VOLTS/ø	ELECTRICAL (4) MCA	ELECTRICAL (4) MOCP	EER/ SEER	CONTROL	DESIGN BASIS	REMARKS
PAC-108	LAB ROOMS 157, 158, 159, 160, 161	7700	6050	1.0	2" MERV 8 ANGLED	12" MERV 13 CARTRIDGE	736.7	95	80	53.4	53.4	500.0	20	67	80%	460/3	122	125	12.0	DDC SYSTEM	TRANE HORIZON OUTDOOR AIR UNIT N060	(1)(2)(3)(4)(5)(6)(7)(8)(9)(10)(11)(12)(13)

REMARKS:

(1) ROOF MOUNTED DX COOLING/GAS HEATING UNIT WITH VIBRATION ISOLATION CURB
(2) DISCHARGE AIR TEMPERATURE SENSOR AND CONTROL W/VARIABLE CAPACITY DX SYSTEM ADIABATIC PROPORTIONAL REGULATOR OR DIGITAL SCROLL COMPRESSOR(S)
(3) COATED CONDENSER COILS
(4) INDIRECT FIRED MODULATING GAS HEAT, STAINLESS STEEL HEAT EXCHANGER 10:1 TURNDOWN MIN.
(5) ACTIVE HEAD PRESSURE CONTROL: FAN MOTOR VARIABLE FREQUENCY DRIVE
(6) CORROSION RESISTANT PACKAGE: ALL STAINLESS STEEL INTERNALS, COATED COILS
(7) CONDENSER COIL HAIL GUARDS
(8) 2" DOUBLE WALL INSULATED CABINET CONSTRUCTION
(9) GALVANIZED STEEL EXTERIOR CASING W/FACTORY BAKED ENAMEL FINISH, 1000 HR. SALT SPRAY TESTED PER ASTM B117
(10) MICROPROCESSOR CONTROLS W/BACNET INTERFACE
(11) MOUNTED/WIRED: CONVENIENCE OUTLET, SERVICE LIGHT, CONDENSATE OVERFLOW SWITCH, FROSTAT
(12) FAN INLET AIRFLOW MEASURING RING
(13) ACTIVE SUPPLY FAN FLOW CONTROL: FAN MOTOR VARIABLE FREQUENCY DRIVE (TRANE TR150 SERIES OR EQUAL BY DANFOSS)
(14) DIRECT DRIVE PLENUM FAN WITH W/SHAFT GROUNDING RING
(15) REFRIGERANT: R410A

(1) EXT. S.P. INCLUDES SYSTEM PRESSURE DROP EXTERNAL TO UNIT. INTERNAL COMPONENT PRESSURE DROPS ARE NOT INCLUDED IN THIS FIGURE.
(2) DIRECT EXPANSION COOLING SYSTEM, DUAL CIRCUITED, R410A REFRIGERANT, APR CONTROL, DISCHARGE AIR TEMPERATURE CONTROL. DATA SHOWN BASED ON DESIGN AIRFLOW.
(3) DDC CONTROLS INTERLOCK PREVENTS SIMULTANEOUS OPERATION OF DX COOLING AND GAS HEATING. DATA SHOWN BASED ON DESIGN AIRFLOW.
(4) MCA = MINIMUM CIRCUIT AMPACITY. MOCP = MAXIMUM OVERCURRENT PROTECTION.

ELECTRIC DUCT HEATER SCHEDULE

SYMBOL	ROOM SERVED	DESIGN AIRFLOW (CFM)	SIZE (WxH) (1)	DUCT VELOCITY (FPM)	E.A.T.(°F)	ELECTRICAL KW	ELECTRICAL VOLTS/PHASE	STAGES	DESIGN BASIS	REMARKS
EDH-108-1	157 TOC WORKSTATION	875	8" x 12"	1425	48	8	480/3	SCR (2)	INDEECO	(1)(2)(3)(4)(5)(6)
EDH-108-2	158 TRACE METALS PREP	800	10" x 12"	1400	48	10	480/3	SCR (2)	INDEECO	(1)(2)(3)(4)(5)(6)
EDH-108-3	159 TRACE METALS LAB	2470	16" x 14"	1830	48	15	480/3	SCR (2)	INDEECO	(1)(2)(3)(4)(5)(6)
EDH-108-4	160 TRACE ORGANICS PREP	575	6" x 12"	1280	48	4	480/3	SCR (2)	INDEECO	(1)(2)(3)(4)(5)(6)
EDH-108-5	161 TRACE ORGANICS LAB	1490	10" x 12"	1620	48	6	480/3	SCR (2)	INDEECO	(1)(2)(3)(4)(5)(6)
EDH-108-6	161 TRACE ORGANICS LAB	1490	10" x 12"	1620	48	6	480/3	SCR (2)	INDEECO	(1)(2)(3)(4)(5)(6)

REMARKS:

(1) OPEN COIL, GALVANIZED STEEL CASING, FACTORY MANUFACTURED AND PRE-WIRED (N.E.C.), UL LISTED
(2) 80/20 NI-CHROME GR. A HEATING ELEMENTS WITH CERAMIC BUSHING SUPPORTS
(3) INSULATED NEMA 1 CONTROL CABINET WITH HINGED, LATCHING COVER
(4) DISC TYPE AUTO-RESET THERMAL CUTOUTS, DISC-TYPE MANUAL RESET THERMAL CUT-OUTS
(5) CONTROL POWER TRANSFORMER, DOOR INTERLOCKED DISCONNECT SWITCH, ULTRA LOW RANGE (0.02" S.P.) AIRFLOW SWITCH
(6) QUIET MAGNETIC CONTACTORS, WIRING TERMINAL BLOCK(S), PILOT LIGHTS FOR: HEATER ON, LOW AIRFLOW, EACH STAGE ON

(1) DIMENSIONS ARE INSIDE CLEAR CABINET/DUCT DIMENSIONS. WHERE DIMENSIONS DIFFER FROM DUCT SIZE SHOWN ON DESIGN DRAWINGS, PROVIDE DUCT SIZE TRANSITIONS ON BOTH SIDES OF HEATER.
(2) SCR = SCR-FIRED

LABORATORY EXHAUST FAN SCHEDULE

SYMBOL	SERVING	CFM	E.S.P. IN. W.C.	SPEED RPM	FAN WHEEL TYPE	ELECTRICAL HP	ELECTRICAL VOLTAGE/PHASE	TYPE	DRIVE	DISCHARGE	CONTROL	DESIGN BASIS	REMARKS
FEF-101	LAB EQUIP., AUXILIARY EXH. FOR ROOMS 157, 158, 159, 160, 161	6045	3	1799	INLINE MIXED FLOW	7 1/2	460V/3ϕ	HIGH PLUME DILUTION LAB EXHAUST	BELT	UPBLAST	DDC SYSTEM	GREENHECK VEKTOR MD	(1)(2)(3)(4)(5)(6)(7)(9)(10)

REMARKS:

(1) 1800 RPM TEFC VFD RATED MOTOR
(2) ABB VFD
(3) DRIVE SERVICE FACTOR: 2.0
(4) ROOF CURB
(5) AMCA STD. 210/260 PERFORMANCE TEST W/AMCA CERTIFIED RATINGS SEAL
(6) REGREASABLE L10=200,000 HR. BEARINGS W/EXTENDED LUBE LINES
(7) MOTOR COVER
(8) INLET BYPASS HOUSING, STN. STEEL DAMPER W/LOCKING QUADRANT, 2000 CFM BYPASS AIR
(9) AMCA CLASS C SPARK RESISTANT
(10) NEMA 4X STAINLESS STEEL ELEC. DISCONNECT

REGISTER, GRILLE & DIFFUSER SCHEDULE

SYMBOL	C.F.M.	NECK SIZE	TYPE	RUNOUT SIZE	REMARKS
(*)	–	–	–	–	(1)
(A)	250-400	12"X12"	24"X24" LAY-IN CEILING S.A. DIFFUSER	10"ø	
(B)	175-625	10"X22"	12"x24" LAY-IN CEILING EXHAUST GRILLE	–	(2)
(C)	925-1350	22"X22"	24"x24" LAY-IN CEILING EXHAUST GRILLE	–	(2)

REMARKS:

(1) EXISTING DIFFUSER AND OR GRILLE, SEE PLANS 1/M1.1 AND 1/M2.1.
(2) FULL FACE DUCT CONNECTION W/TRANSITION TO DUCT SIZE. SEE PLANS FOR DUCT SIZE.

REVISION	
DATE	DESCRIPTION

EMD FACILITY HVAC UPGRADES

628 GROUNDWATER WAY

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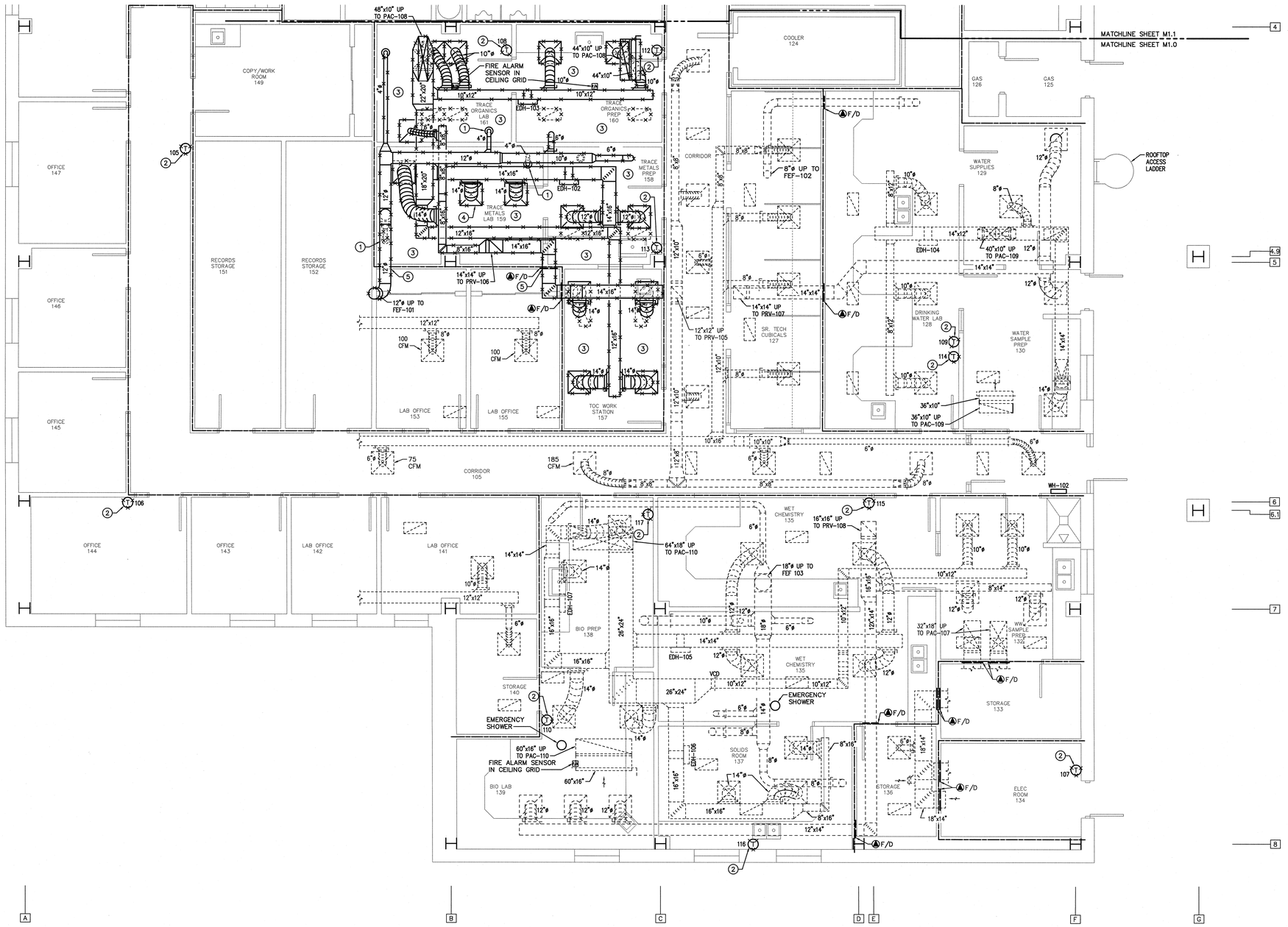
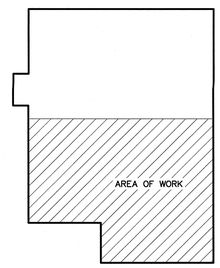


1 M1.0 PARTIAL MECHANICAL PLAN – DEMOLITION
SCALE: 1/4" = 1'-0"

KEYED NOTES: (THIS SHEET ONLY)

1. REMOVE ANY EXISTING SNORKEL EQUIPMENT AND SAVE FOR RE-INSTALLATION IN SAME LOCATION.
2. REMOVE EXISTING HVAC DDC CONTROLS TEMPERATURE/HUMIDITY SENSOR OR THERMOSTAT.
3. REMOVE EXISTING CEILING AS REQUIRED FOR HVAC WORK. CEILING TO BE RE-INSTALLED UPON COMPLETION OF HVAC WORK AND ENGINEER'S FINAL OBSERVATION OF WORK AND ACCEPTANCE. CONTRACTOR TO COORDINATE WITH HVAC T.A.B. WORK FOR ACCESSIBILITY.
4. REMOVE AND SAVE EXISTING S.A. DIFFUSER FOR RE-INSTALLATION IN ROOM 138 BIO PREP. SEE SHEET M2.0.
5. PATCH REMAINING OPENING TO MATCH ADJACENT CONSTRUCTION.



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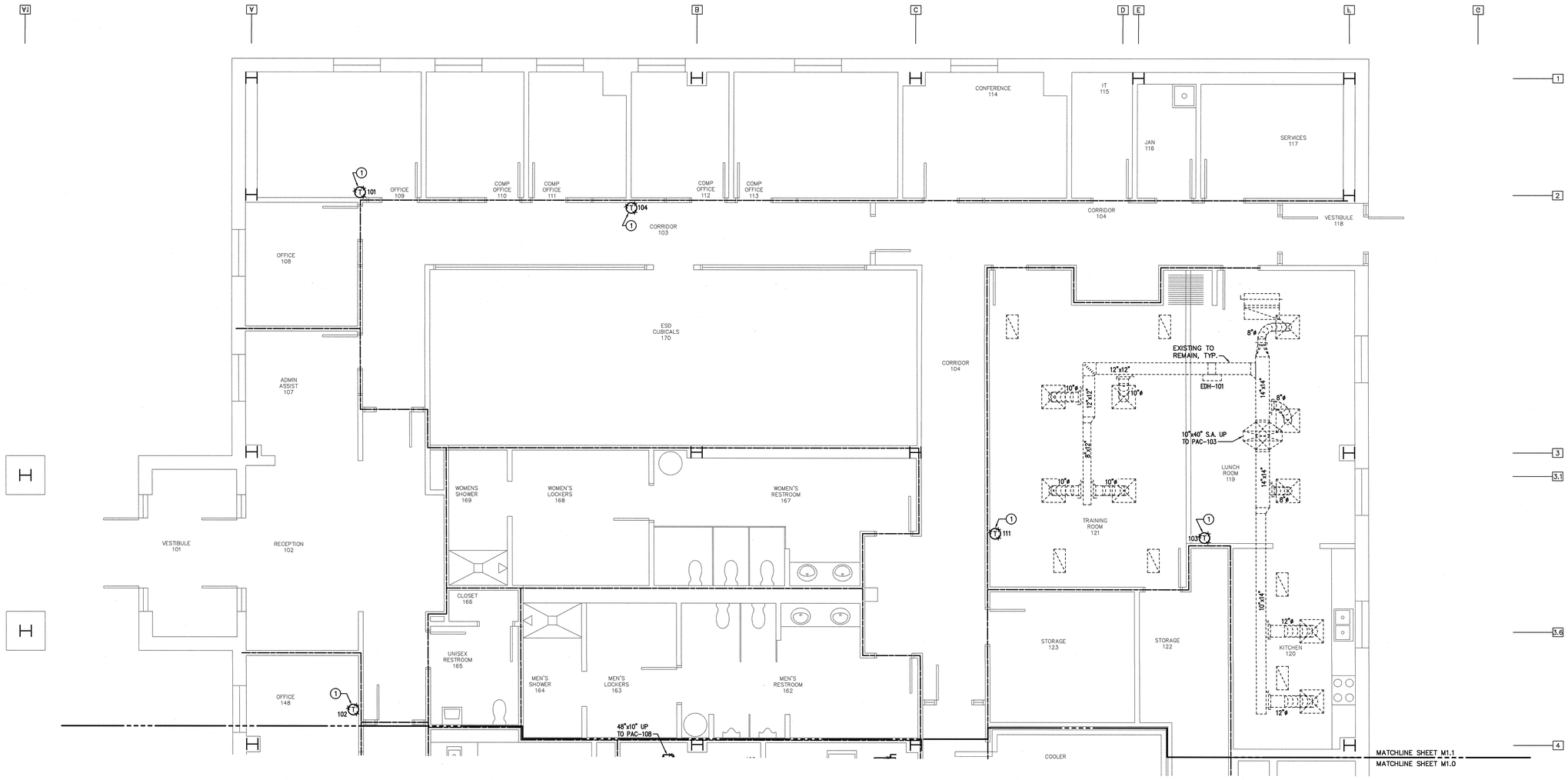
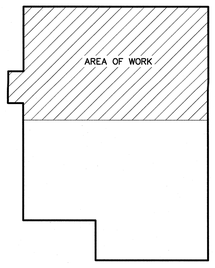


1 / M1.1 PARTIAL MECHANICAL PLAN – DEMOLITION
SCALE: 1/4" = 1'-0"

KEYED NOTES: (THIS SHEET ONLY)

1. REMOVE EXISTING HVAC DDC CONTROLS TEMPERATURE/HUMIDITY SENSOR OR THERMOSTAT.



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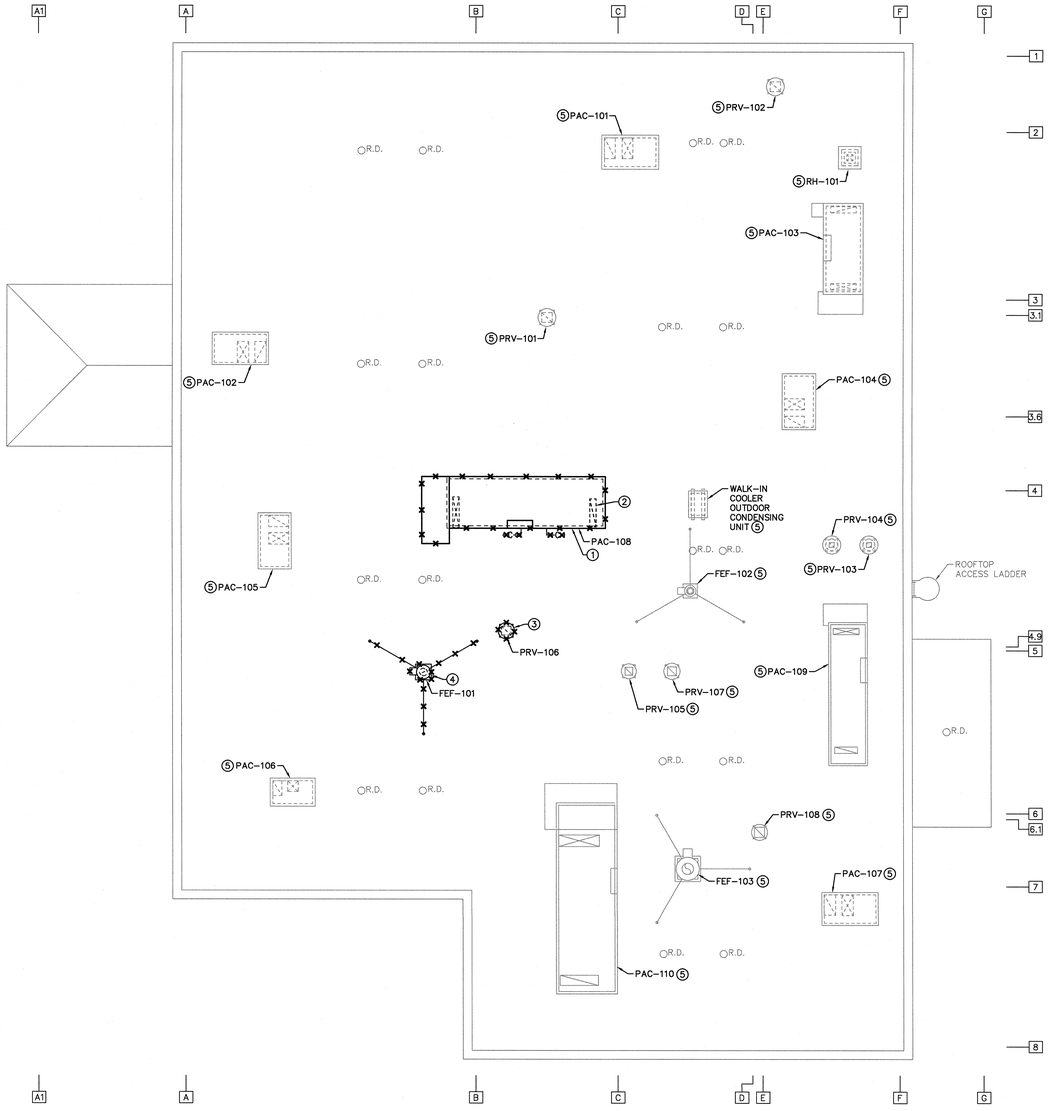
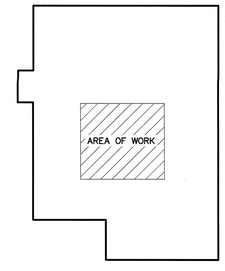


1 / M1.2 ROOF MECHANICAL PLAN – DEMOLITION
SCALE: 1/8" = 1'-0"

KEYED NOTES: (THIS SHEET ONLY)

1. REMOVE EXISTING PACKAGED AIR CONDITIONING UNIT AND ROOF CURB. PATCH REMAINING OPENING IN ROOF AS REQUIRED TO SUIT INSTALLATION OF NEW PAC-108 UNIT.
2. PATCH RETURN AIR OPENING IN ROOF.
3. REMOVE EXISTING POWER ROOF VENTILATOR.
4. REMOVE EXISTING LABORATORY EXHAUST FAN AND ROOF CURB. PATCH REMAINING OPENING IN ROOF TO MATCH ADJACENT CONSTRUCTION.
5. EXISTING EQUIPMENT TO REMAIN.



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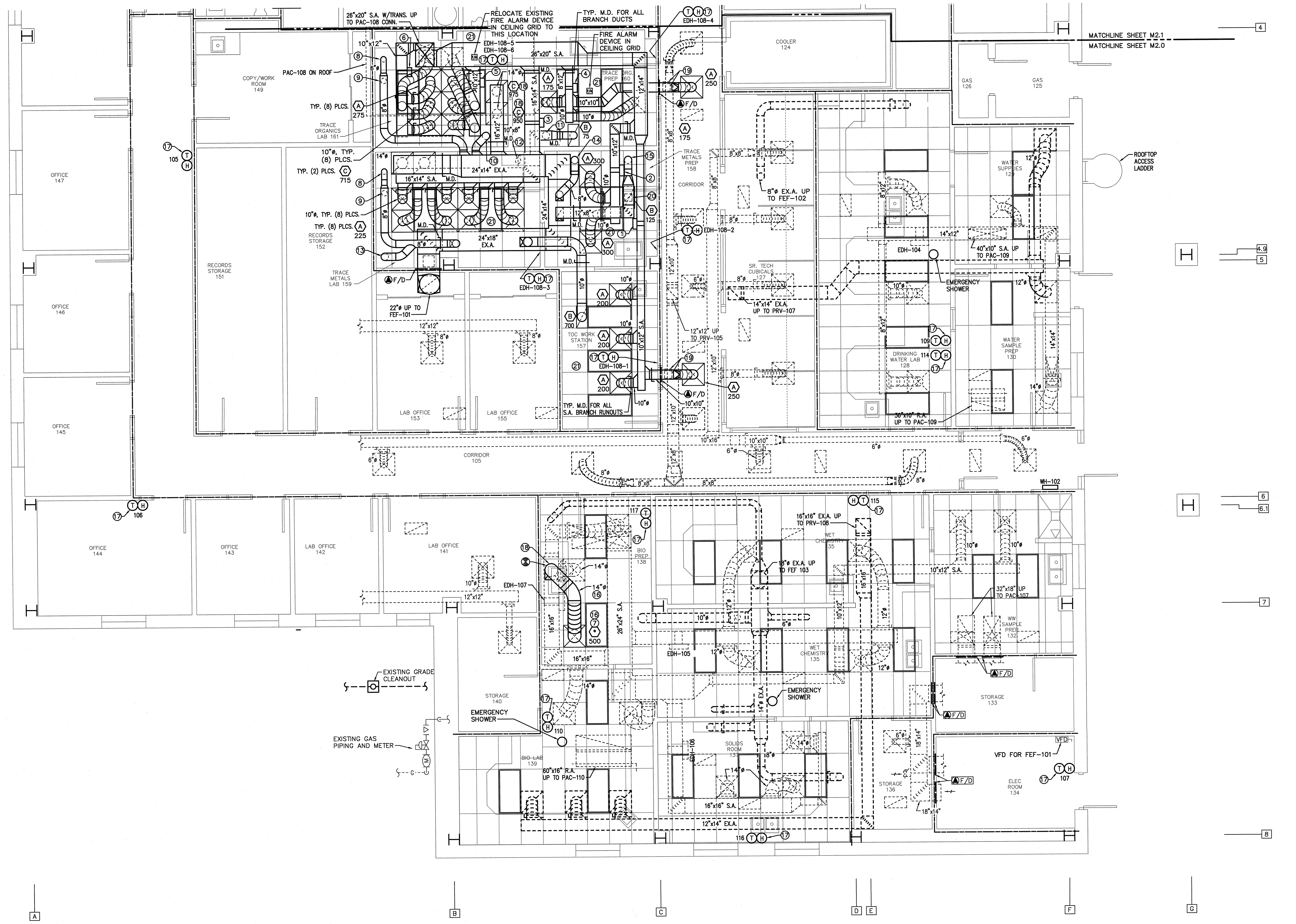


1/M2.0 PARTIAL MECHANICAL PLAN – RENOVATION

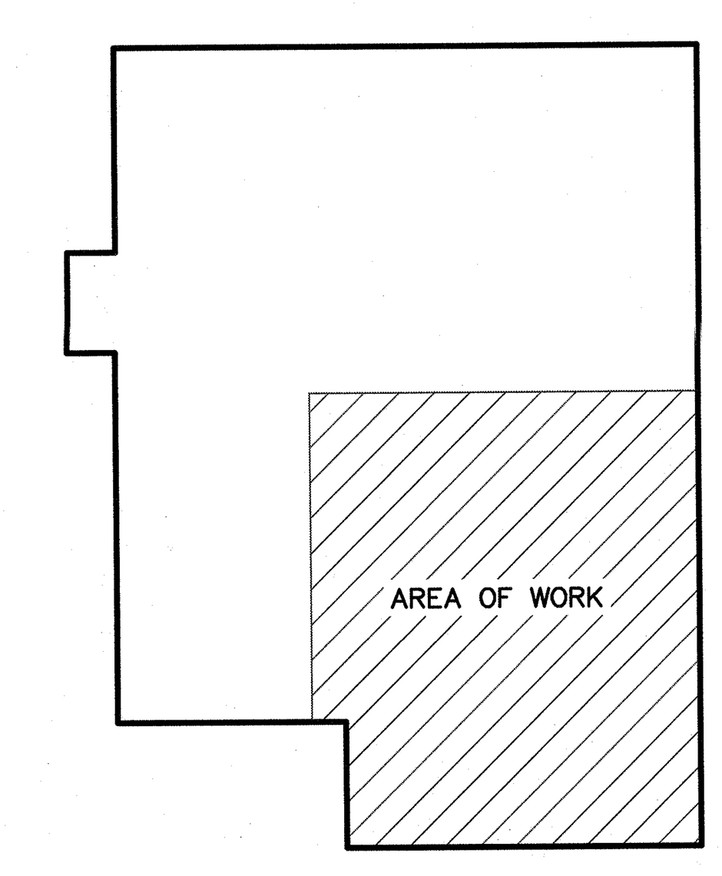
SCALE: 1/4" = 1'-0"

HVAC TEST, ADJUST, AND BALANCE NOTES:

1. LAB SPACE ROOMS 157, 158, 159, 160, 161 SHALL BE BALANCED WITH SPACES NEGATIVELY PRESSURIZED TO CORRIDORS. SEE AIRFLOW AND CONTROL DIAGRAM ON SHEET M3.0. CONFIRM FINAL AIRFLOWS ACHIEVED WITH DESIGN ENGINEER AS ACCEPTABLE.
2. WHERE AIR DEVICE AIRFLOWS ARE NOT SHOWN, REFER TO AIRFLOW AND AND CONTROL DIAGRAM ON SHEET M3.0.

KEYED NOTES: (THIS SHEET ONLY)

1. ELECTRIC DUCT HEATER, EDH-108-1.
2. ELECTRIC DUCT HEATER, EDH-108-2.
3. ELECTRIC DUCT HEATER, EDH-108-3.
4. ELECTRIC DUCT HEATER, EDH-108-4.
5. ELECTRIC DUCT HEATER, EDH-108-5.
6. ELECTRIC DUCT HEATER, EDH-108-6.
7. RE-INSTALL EXISTING S.A. DIFFUSER SALVAGED FROM ROOM 159 TRACE METALS LAB DEMO SHOWN ON SHEET M1.0.
8. 6"ø STN. STL. DROP FOR ICP MACHINE. PROVIDE MANUAL DAMPER ABOVE CEILING. TERMINATE AT APPROXIMATE. 6' ABOVE FINISHED FLOOR. PROVIDE REMOVABLE CAPS FOR FUTURE ICP MACHINES IN ROOM 159.
9. 6"ø STN. STL. DROP FOR ICP MACHINE. PROVIDE MANUAL DAMPER ABOVE CEILING. TERMINATE AT APPROXIMATE. 6' ABOVE FINISHED FLOOR. PROVIDE REMOVABLE CAPS FOR FUTURE ICP MACHINES IN ROOM 159.
10. 6"ø STN. STL. DROP TO SNORKEL. PROVIDE DUCT SIZE TRANSITION ADJACENT TO CONNECTION POINT AS REQUIRED TO SUIT SNORKEL EQUIPMENT AND VERIFY CONNECTION POINT ELEVATION WITH OWNER PRIOR TO INSTALLATION. PROVIDE RIGID WALL BRACE ADJACENT TO CONNECTION POINT AND RE-INSTALL SNORKEL EQUIPMENT. PROVIDE MANUAL DAMPER ABOVE CEILING. BALANCE TO 100 CFM.
11. 8"ø STN. STL. DROP TO FUME HOOD. PROVIDE DUCT SIZE TRANSITION ADJACENT TO DUCT/HOOD CONNECTION AS REQUIRED. PROVIDE MANUAL DAMPER ABOVE CEILING. BALANCE TO 375 CFM.
12. 4"ø STN. STL. DROP TO SNORKEL. VERIFY CONNECTION POINT ELEVATION WITH OWNER PRIOR TO INSTALLATION. PROVIDE RIGID WALL BRACE ADJACENT TO CONNECTION POINT AND RE-INSTALL SNORKEL EQUIPMENT. PROVIDE MANUAL DAMPER ABOVE CEILING. BALANCE TO 100 CFM.
13. 8"ø STN. STL. DROP, TERMINATE AT APPROXIMATELY 6" BELOW CEILING WITH 4X4X0.047" STN. STL. WIRE MESH OVER OPENING. PROVIDE MANUAL DAMPER ABOVE CEILING. BALANCE TO 375 CFM. RE-BALANCE TO 100 CFM FOLLOWING FUTURE ICP MACHINE INSTALLATION.
14. 8"ø STN. STL. DROP TO FUME HOOD. PROVIDE DUCT SIZE TRANSITION ADJACENT TO DUCT/HOOD CONNECTION AS REQUIRED. PROVIDE MANUAL DAMPER ABOVE CEILING. BALANCE TO 285 CFM.
15. 8"ø STN. STL. DROP TO FUME HOOD. PROVIDE DUCT SIZE TRANSITION ADJACENT TO DUCT/HOOD CONNECTION AS REQUIRED. PROVIDE MANUAL DAMPER ABOVE CEILING. BALANCE TO 285 CFM.
16. PRIOR TO WORK, MECHANICAL CONTRACTOR SHALL PERFORM GENERAL SERVICE OF PAC-110 TO INCLUDE CLEANING OF ALL COOLING AND HEATING COILS, REMOVE EXISTING FILTERS AND INSTALL CLEAN FILTERS, AND PERFORM GENERAL INSPECTION OF UNIT. MECHANICAL CONTRACTOR SHALL NOTE ITEMS OF CONCERN AND SUMMARIZE ITEMS FOR OWNER CONSIDERATION. PRIOR TO WORK, HVAC T.A.B. CONTRACTOR TO PERFORM AIRFLOW CHECK OF EXISTING PAC-110 SUPPLY AIR SYSTEM DIFFUSERS IN ROOMS 138, 139, 135, 137, AND 132. HVAC T.A.B. CONTRACTOR SHALL ALSO PROVIDE A FULL T.A.B. PROFILE CHECK OF PAC-110 INCLUDING, BUT NOT NECESSARILY LIMITED TO, COMPONENT (FILTERS, COILS, FAN) PRESSURE DROPS OR PRESSURE RISES, AIRFLOW, FAN SPEED, MOTOR VOLTAGE AND AMP DRAW, DX SYSTEM PERFORMANCE (COIL INLET AND OUTLET AIR CONDITIONS), ETC. HVAC T.A.B. CONTRACTOR SHALL SUMMARIZE FINDINGS AND SUBMIT FOR OWNER/ENGINEER REVIEW. UNLESS DIRECTED OTHERWISE BY THE ENGINEER, MECHANICAL CONTRACTOR AND T.A.B. CONTRACTOR SHALL MAKE PAC-110 FAN DRIVE SYSTEM (BELTS, SHEAVES) CHANGES TO OBTAIN INCREASED PAC-110 UNIT AIRFLOW AS REFLECTED BY THE ADDITION OF THE SUPPLY AIR DIFFUSER IN ROOM 138 IN CONJUCTION WITH RESTORATION OF PRE-WORK MEASURED AIRFLOWS FOR THE REMAINING EXISTING SUPPLY AIR DIFFUSERS FOR THE PAC-110 SYSTEM. ENGINEER SHALL BE NOTIFIED PRIOR TO ANY WORK OR PURCHASE/INSTALLATION OF ANY FAN DRIVE SYSTEM PARTS.
17. NEW DDC CONTROLS COMBINATION TEMPERATURE/HUMIDITY SENSOR.
18. MANUAL DAMPER IN RISE.
19. FIRE DAMPER ACCESS DOOR ON BOTTOM AND SIDE OF DUCT.
20. 8"x8" EX.A. DOWN TO CEILING EXHAUST REGISTER WITH MANUAL BALANCING DAMPER IN RISE.
21. RE-INSTALL CEILING (GRID/TILES) FOLLOWING HVAC/T.A.B. WORK AND FINAL OBSERVATION AND ACCEPTANCE. PROVIDE NEW/REPLACEMENT GRID/CEILING TILES AS REQUIRED TO MATCH EXISTING AND ACCOMODATE PROJECT MODIFICATIONS.



KEY PLAN
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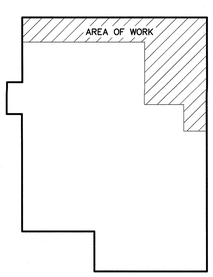
1 M2.1 PARTIAL MECHANICAL PLAN – RENOVATION
SCALE: 1/4" = 1'-0"

KEYED NOTES: (THIS SHEET ONLY)

1. NEW DDC CONTROLS COMBINATION TEMPERATURE/HUMIDITY SENSOR.
2. APPROXIMATE LOCATION OF OPERATOR WORKSTATION. UNLESS OTHERWISE DIRECTED BY OWNER/ENGINEER, REMOVE EXISTING AND INSTALL NEW DDC CONTROLS OPERATOR WORKSTATION (COMPUTER, KEYBOARD, PRINTER) IN SAME LOCATION. WHERE A VIRTUAL SERVER IS TO BE PROVIDED, NEW DDC CONTROLS OPERATOR WORKSTATION IS NOT REQUIRED.



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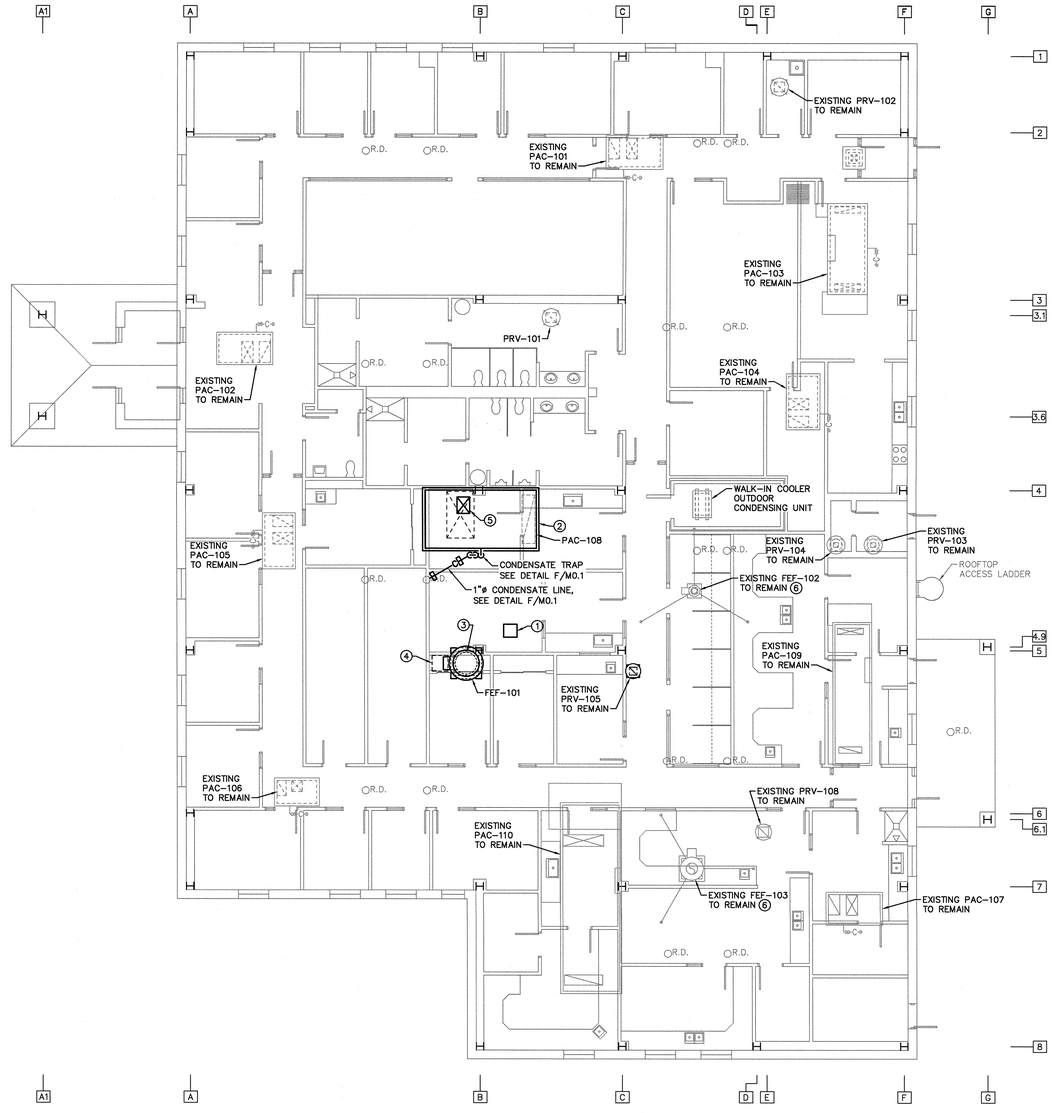


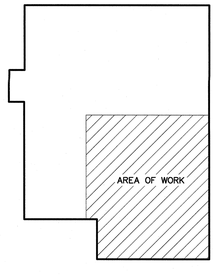
1 M2.2 ROOF MECHANICAL PLAN – RENOVATION
SCALE: 1/8" = 1'-0"

KEYED NOTES: (THIS SHEET ONLY)

1. CAP EXISTING ROOF CURB WITH HEAVY GAUGE GALVANIZED STEEL SHEET METAL CAP WITH 2" RIGID BOARD INSULATION FULLY ADHERED TO INTERIOR SIDE OF CAP. CONFIRM WORK SCOPE WITH OWNER.
2. APPROXIMATE HVAC UNIT ROOF CURB OUTLINE AND LOCATION.
3. INSTALL NEW FAN FEF-101 AND ROOF CURB AT LOCATION SHOWN.
4. PATCH EXISTING ROOF OPENING TO MATCH EXISTING AS REQUIRED.
5. APPROXIMATE SUPPLY DUCT SIZE BELOW ROOF. PROVIDE FULL SIZE CONNECTION TO HVAC UNIT WITH TRANSITION TO DUCT SIZE. PROVIDE HEAVY GAUGE METAL BLANKOFF AT HVAC UNIT CONNECTION AS REQUIRED WHERE INTERFERENCE WITH STRUCTURAL STEEL MAY OCCUR.
6. PROVIDE STACK EXTENSION/MODIFICATIONS PER DETAIL J/M0.1 ON SHEET M0.1.

GENERAL NOTES: (THIS SHEET ONLY)

1. WALL SYSTEMS/LAYOUT SHOWN ARE BELOW ROOF AT FLOOR LEVEL AND ARE FOR REFERENCE ONLY.



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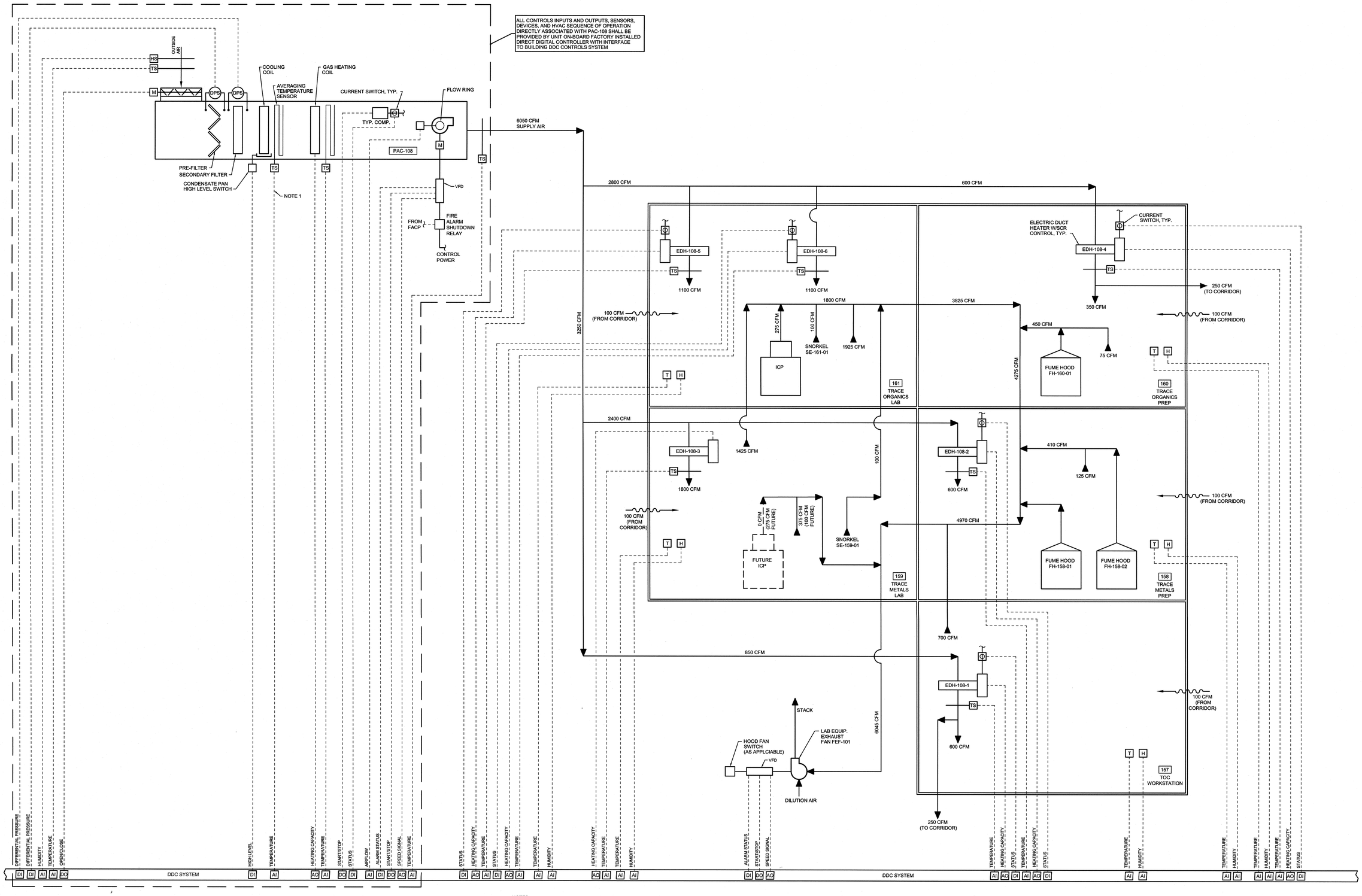
NORTH CAROLINA PROFESSIONAL SEAL 13359 ENGINEER ANTHONY E. JACOBS
Anthony E. Jacobs

DESIGNED BY	AEJ
DRAWN BY	TWT
CHECKED BY	AEJ
JOB NUMBER	18093
SHEET	M2.2
OF	
DATE	OCTOBER 14, 2020



A
M3.0

PAC-108 AIRFLOW AND CONTROL DIAGRAM

SCALE: NONE

NOTES:

1. COORDINATE TEMPERATURE SENSOR AND CONTROL CIRCUIT WITH DX CONDENSING SYSTEM CONTROLS.

HVAC SEQUENCE OF OPERATION:

1. AHU FAN NORMALLY OPERATES 24 HOURS PER DAY, 365 DAYS PER YEAR. DDC SYSTEM SHALL START FAN TO RUN CONTINUOUSLY. FAN OPERATING STATUS AND SPEED SHALL BE REPORTED TO THE DDC SYSTEM BY THE VFD. FAN FLOW RING SHALL SENSE AND INPUT A FLOW SIGNAL TO THE DDC SYSTEM. DDC SYSTEM SHALL OUTPUT A CONTROL SIGNAL TO FAN VFD TO MAINTAIN FLOW SETPOINT. AN ALARM CONDITION SHALL BE REPORTED BY THE DDC SYSTEM FOR AIRFLOW THAT DEVIATES FROM SETPOINT.
2. AIR HANDLING UNIT COOLING COIL DISCHARGE AIR TEMPERAURE SENSOR SHALL SENSE TEMPERATURE AND INPUT A SIGNAL TO THE DDC SYSTEM. AS LONG AS ASSOCIATED AIR HANDLING UNIT IS OPERATING AND AIRFLOW IS PROVEN, DDC SYSTEM SHALL ENERGIZE/MODULATE COOLING SYSTEM COMPRESSORS IN STAGES TO MAINTAIN THE TEMPERATURE SETPOINT.
3. AHU DISCHARGE AIR TEMPERATURE SENSOR SHALL REPORT SUPPLY AIR TEMPERATURE TO DDC SYSTEM. AN ALARM SHALL BE GENERATED FOR TEMPERATURE THAT DEVIATES FROM SETPOINT.
4. AHU FILTER DIFFERENTIAL PRESSURE SWITCH SHALL INDICATE DIRTY FILTER STATUS TO DDC SYSTEM WHEN SETPOINT IS REACHED. AN ALARM CONDITION SHALL BE REPORTED BY THE DDC SYSTEM.
5. COOLING COIL CONDENSATE PAN HIGH LEVEL SWITCH DE-ENERGIZES SUPPLY AIR FAN ON HIGH CONDENSATE PAN LEVEL. THE DDC GENERATES AN ALARM AT THE OPERATOR WORKSTATION.
6. OUTSIDE AIR DUCT TEMPERATURE AND HUMIDITY SENSORS CONTINUOUSLY MONITOR AND REPORT TEMPERATURE AND HUMIDITY TO THE DDC SYSTEM.
7. WHEN SUPPLY AIR TEMPERTATURE FALLS BELOW LOW LIMIT SETPOINT, GAS HEATING SHALL BE ENERGIZED/MODULATED TO MAINTAIN THE SETPOINT. WHEN SETPOINT IS SATISFIED, GAS HEATING SHALL BE DE-ENERGIZED.
8. CURRENT SWITCH ON INDIVIDUAL COMPRESSOR POWER CONDUCTOR(S) SENSES CURRENT TO REPORT OPERATING STATUS TO THE DDC SYSTEM. AN ALARM IS GENERATED AT THE OPERATOR WORKSTATION FOR STATUS DIFFERING FROM COMMANDED STATUS.
9. SPACE TEMPERATURE SENSOR SENSES SPACE TEMPERATURE. ON A FALL IN SPACE TEMPERATURE BELOW SETPOINT, DDC CONTROLLER ENERGIZES ELECTRIC HEAT. SCR CONTROLLER MODULATES ELECTRIC HEAT OUTPUT OF HEATER TO MAINTAIN SETPOINT. WHEN SETPOINT IS SATISFIED, ELECTRIC HEAT IS DE-ENERGIZED.
10. CURRENT SWITCH ON ELECTRIC HEATER POWER CONDUCTOR(S) SENSES CURRENT TO REPORT OPERATING STATUS OF HEATER TO THE DDC SYSTEM.
11. DUCT MOUNTED TEMPERATURE SENSOR DOWNSTREAM OF ELECTRIC HEATER SENSES AIRSTREAM TEMPERATURE AND REPORTS TO THE DDC SYSTEM.
12. FIRE ALARM SHUTDOWN RELAY SHALL DE-ENERGIZE SUPPLY AIR FAN UPON FIRE ALARM SIGNAL. AN ALARM SHALL BE GENERATED AT THE OPERATOR WORKSTATION.
13. LAB EQUIPMENT FANS OPERATE 24 HOURS PER DAY, 365 DAYS PER YEAR. DDC SYSTEM SHALL START FANS TO RUN CONTINUOUSLY IN CONJUNCTION WITH START OF RELATED AHU FAN. FAN OPERATING STATUS SHALL BE REPORTED TO THE DDC SYSTEM BY A CURRENT SWITCH.
14. UPON FAILURE/SHUTDOWN OF ANY AHU FAN OR LAB EXHAUST FAN, REMAINING FANS SHALL AUTOMATICALLY BE SHUTDOWN BY THE DDC SYSTEM. FAN FAILURE/SHUTDOWN SHALL BE ALARMED VIA THE DDC SYSTEM.

REVISION

DATE	DESCRIPTION

FACILITY HVAC UPGRADES

EMD FA

628 GROUNDWATER WAY

WILMINGTON, NC 28411

CHEATHAM AND ASSOCIATES, P.A.
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3412 ENTERPRISE DRIVE
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NORTH CAROLINA PROFESSIONAL SEAL 13359 ENGINEER ANTHONY E. JACOBS

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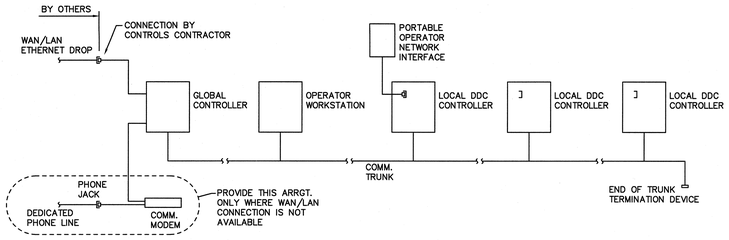
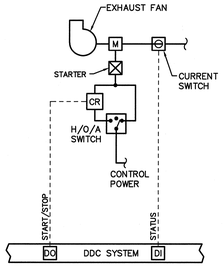


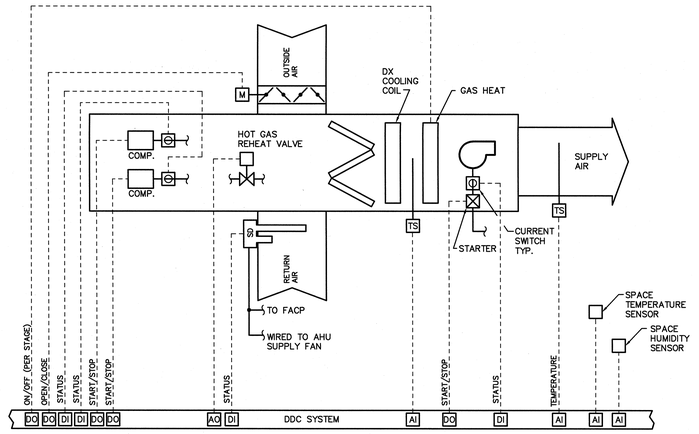
A M3.1 TYPICAL DDC SYSTEM LAYOUT
SCALE: NONE



HVAC SEQUENCE OF OPERATION:
1. H/O/A SWITCH CONTROLS FAN OPERATION. IN 'O' POSITION, FAN IS DE-ENERGIZED. IN 'H' POSITION, FAN IS ENERGIZED TO OPERATE CONTINUOUSLY. IN 'A' POSITION, FAN IS ENERGIZED/DE-ENERGIZED BY A DDC CONTROL SYSTEM RELAY.
2. FOR NORMAL (OCCUPIED) OPERATION, FAN IS ENERGIZED BY DDC SYSTEM TO OPERATE CONTINUOUSLY. NORMAL OPERATION IS SCHEDULED AT THE OPERATOR WORKSTATION. FOR UN-OCCUPIED OPERATION, THE DDC CONTROL SYSTEM DE-ENERGIZES THE FAN.
3. WHEN ANY LAB AREA HVAC SYSTEM IS IN OPERATION, OR, WHEN ANY OFFICE AREA HVAC SYSTEM IS IN NORMAL (OCCUPIED) OPERATION, THE FAN SHALL BE ENERGIZED. OTHERWISE, THE FAN SHALL BE DE-ENERGIZD.
4. CURRENT SWITCH ON MOTOR POWER SUPPLY REPORTS FAN OPERATING STATUS TO THE DDC SYSTEM. WHEN OPERATING STATUS IS DIFFERENT THAN DDC COMMAND, AN ALARM SHALL BE REPORTED AT THE OPERATOR WORKSTATION.

FAN PRV-101 ONLY

B M3.1 TYPICAL DDC CONTROLLED EXHAUST FAN CONTROL DIAGRAM
SCALE: NONE



NOTE: DDC CONTROLS CONTRACTOR SHALL VERIFY EXISTING DDC POINTS AND ADJUST TO SUIT EXISTING CONDITIONS AND REQUIRED SEQUENCE OF OPERATION.

D M3.1 TYPICAL PACKAGED ROOFTOP UNIT (OFFICE AREA) CONTROL DIAGRAM
SCALE: NONE

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EMD FACILITY HVAC UPGRADES

628 GROUNDWATER WAY

WILMINGTON, NC 28411

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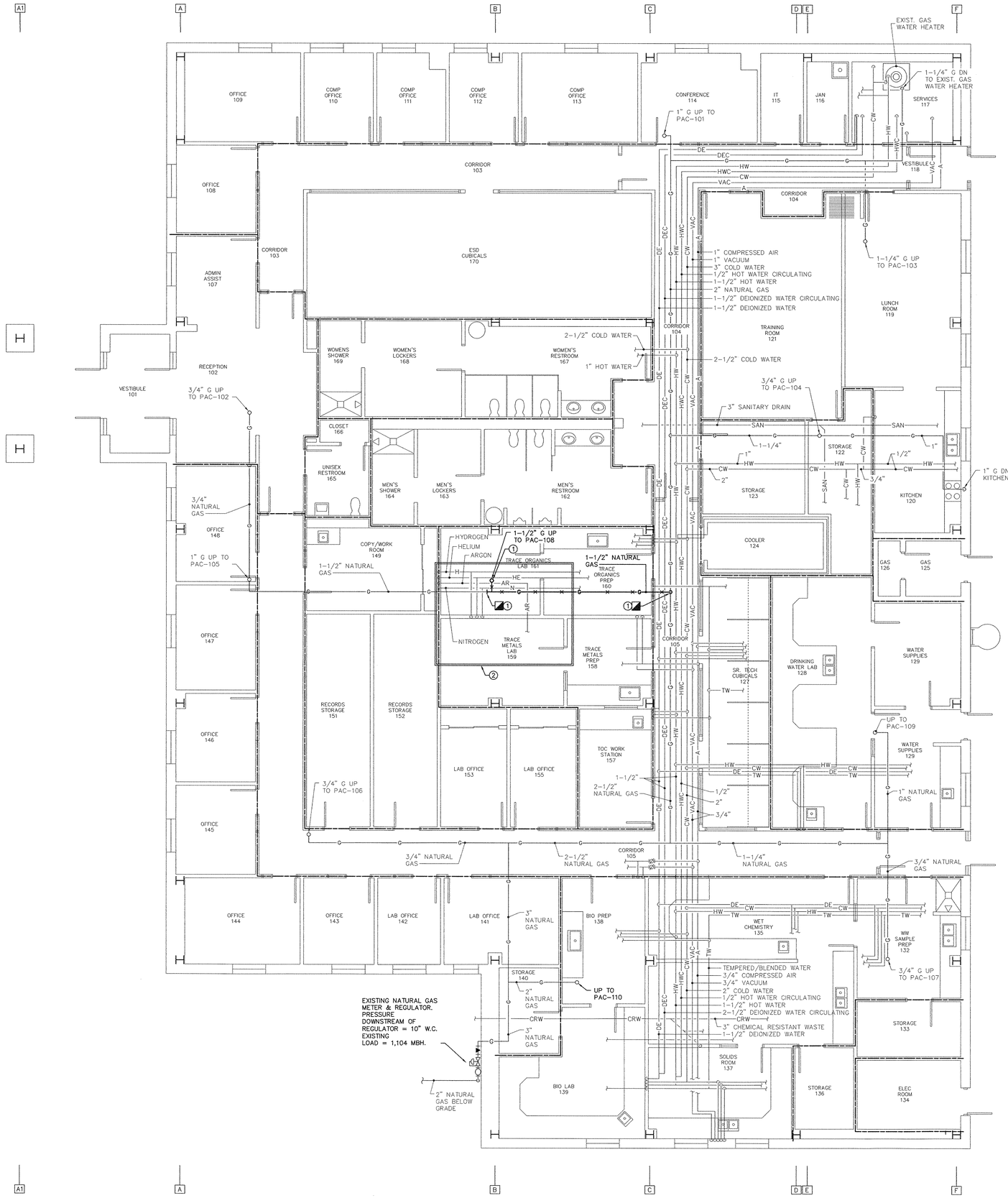

LEGEND

X X X	PIPING TO BE REMOVED (LINE SYMBOL INDICATES SERVICE)
C	EXISTING NATURAL GAS PIPING TO REMAIN
G	NATURAL GAS PIPING
CW	EXISTING COLD WATER PIPING TO REMAIN
HW	EXISTING HOT WATER PIPING TO REMAIN
HWC	EXISTING HOT WATER CIRCULATING PIPING TO REMAIN
TW	EXISTING TEMPERED WATER PIPING TO REMAIN
DE	EXISTING DEIONIZED WATER PIPING TO REMAIN
DEC	EXISTING DEIONIZED WATER CIRCULATING PIPING TO REMAIN
SAN	EXISTING SANITARY WASTE PIPING TO REMAIN
VAC	EXISTING VACUUM PIPING TO REMAIN
A	EXISTING COMPRESSED AIR PIPING TO REMAIN
H	EXISTING HYDROGEN PIPING TO REMAIN
HE	EXISTING HELIUM PIPING TO REMAIN
N	EXISTING NITROGEN PIPING TO REMAIN
AR	EXISTING ARGON PIPING TO REMAIN
	TERMINATION POINT OF DEMOLITION
	POINT OF NEW CONNECTION TO EXISTING

KEYED NOTES: (THIS SHEET ONLY)

1. REMOVE 1-1/2" NATURAL GAS PIPE AS SHOWN ON PLAN AND UP TO EXISTING PAC-108 ON ROOF. PATCH ROOF PENETRATION WATER TIGHT. GAS PIPING TO BE RECONNECTED.
2. REWORK EXISTING PIPING IN INDICATED AREA AS REQUIRED FOR NEW MECHANICAL WORK. SEE MECHANICAL DRAWINGS. CONTRACTOR SHALL FIELD VERIFY AND MATCH EXISTING PIPING SIZE AND MATERIALS (STEEL, STAINLESS STEEL, COPPER, ETC.).

GENERAL NOTES:

1. EXISTING INFORMATION IS BASED ON A FIELD SURVEY AND EXISTING PLANS. SOME INFORMATION PRESENTED IS ESTIMATED OR ASSUMED BASED ON EXPERIENCE. CONTRACTOR SHALL FIELD VERIFY CONDITIONS DURING THE COURSE OF WORK AND ALERT THE ARCHITECT AND/OR ENGINEER OF DIFFERENCES BETWEEN FIELD CONDITIONS AND THE DEMOLITION DRAWINGS THAT WILL PREVENT ANY PORTIONS OF THE PLUMBING SCOPE OF WORK FROM BEING INSTALLED AS DESIGNED.

1 / P1.0 PIPING PLAN – DEMOLITION
SCALE: 3/16" = 1'-0"

4' 2' 0 4' 8' 12'
SCALE: 3/16"=1'-0"

REVISION	
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EMD FACILITY HVAC UPGRADES

628 GROUNDWATER WAY
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NORTH CAROLINA PROFESSIONAL SEAL 043164 ENGINEER CASEY D GILMAN

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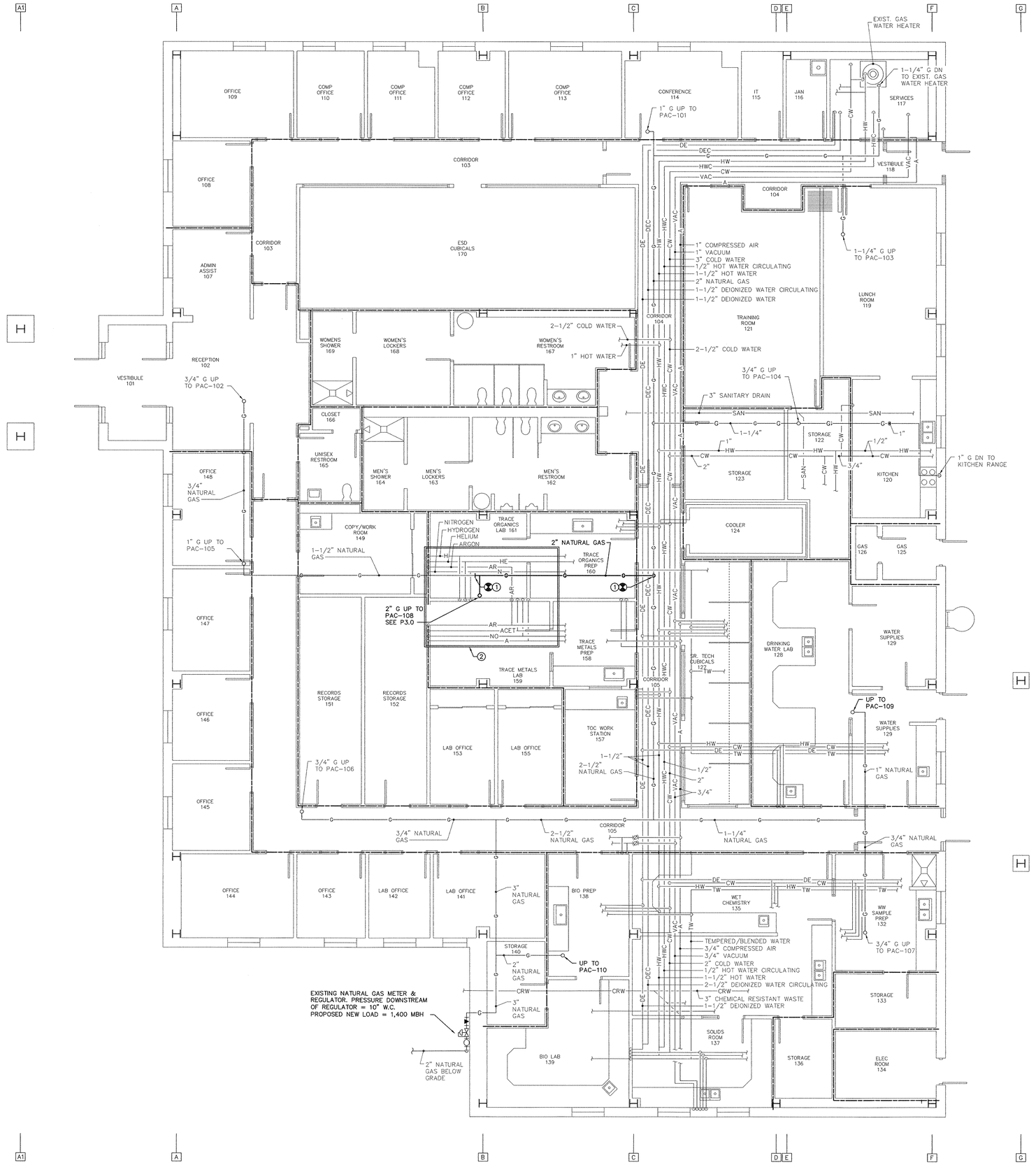
SHEET	P1.0
DATE	OCTOBER 14, 2020



KEYED NOTES: (THIS SHEET ONLY)

1. INSTALL NEW 2" NATURAL GAS PIPE AS SHOWN ON PLAN AND UP TO NEW PAC-108 ON ROOF.
2. REWORK EXISTING PIPING IN INDICATED AREA AS REQUIRED FOR NEW MECHANICAL WORK. SEE MECHANICAL DRAWINGS. CONTRACTOR SHALL FIELD VERIFY AND MATCH EXISTING PIPING SIZE AND MATERIALS (STEEL, STAINLESS STEEL, COPPER, ETC.).

GENERAL NOTES:

1. EXISTING INFORMATION IS BASED ON A FIELD SURVEY AND EXISTING PLANS. SOME INFORMATION PRESENTED IS ESTIMATED OR ASSUMED BASED ON EXPERIENCE. CONTRACTOR SHALL FIELD VERIFY CONDITIONS DURING THE COURSE OF WORK AND ALERT THE ARCHITECT AND/OR ENGINEER OF DIFFERENCES BETWEEN FIELD CONDITIONS AND THE DEMOLITION DRAWINGS THAT WILL PREVENT ANY PORTIONS OF THE PLUMBING SCOPE OF WORK FROM BEING INSTALLED AS DESIGNED.

1 / P2.0 PIPING PLAN – RENOVATION
SCALE: 3/16" = 1'-0"

4' 2' 0 4' 8' 12'
SCALE: 3/16"=1'-0"

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EMD FACILITY HVAC UPGRADES

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SHEET	P2.0
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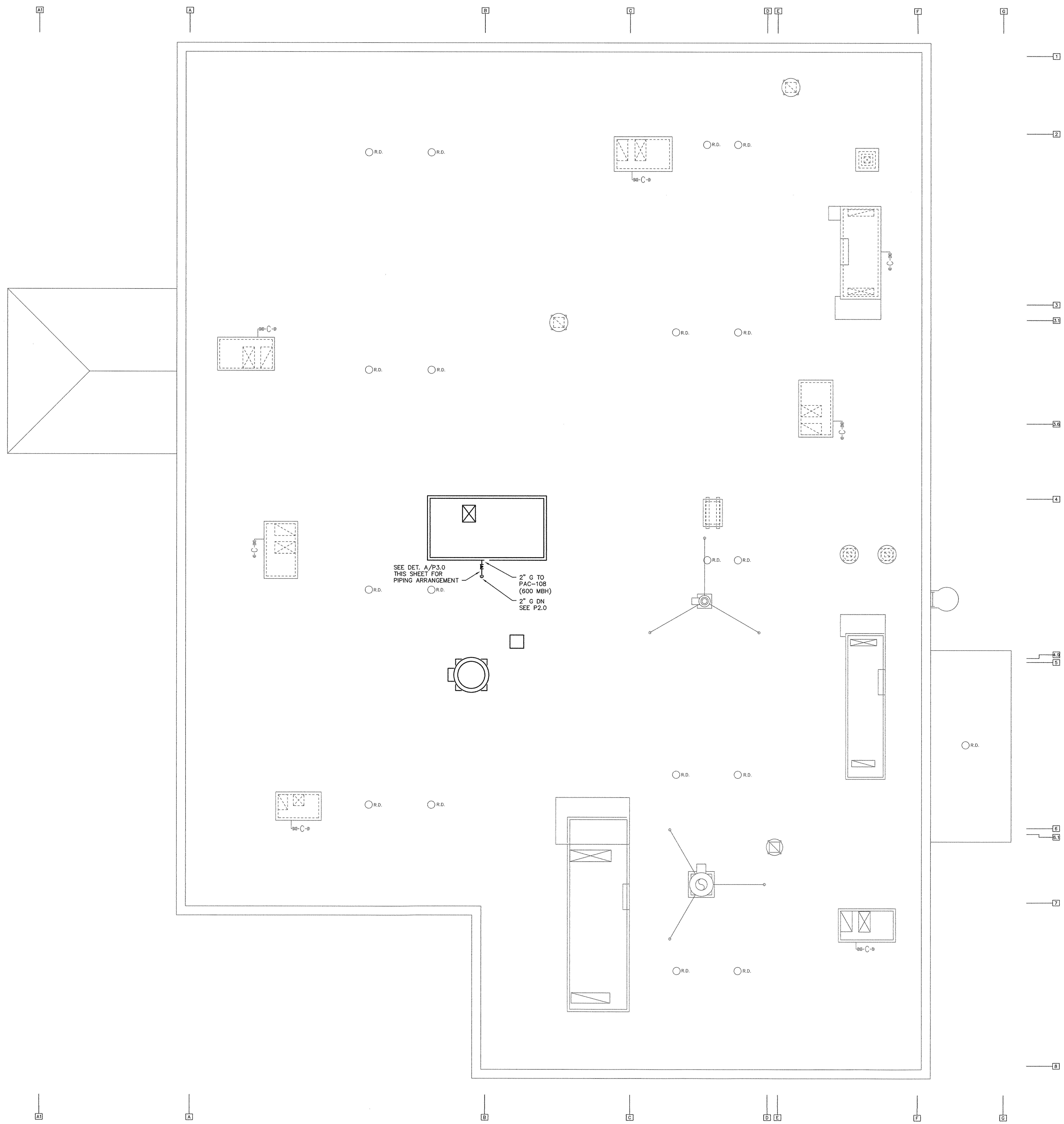
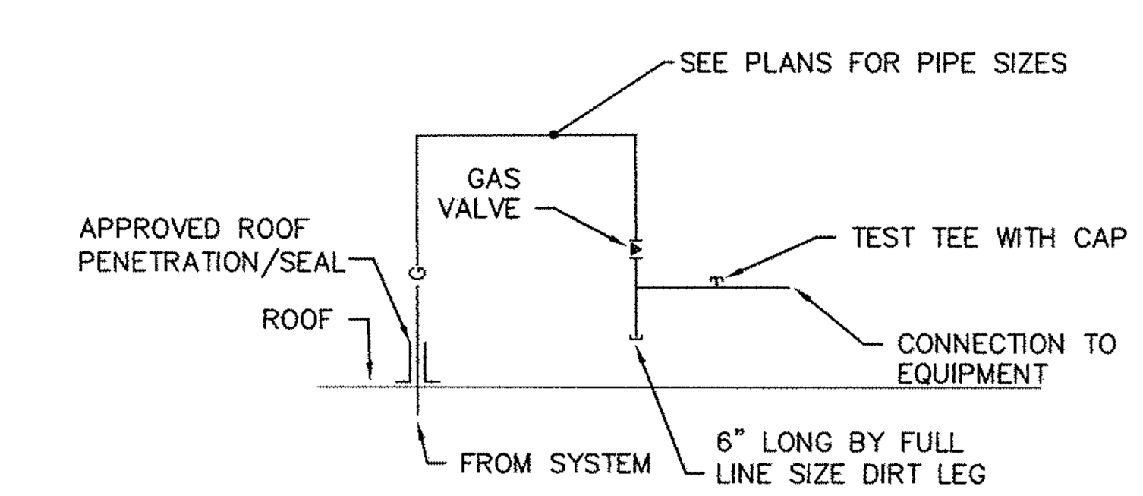


1 / P2.0 PIPING PLAN – ROOF
SCALE: 3/16" = 1'-0"

SCALE: 3/16"=1'-0"



A / P3.0 TYPICAL ROOFTOP HVAC GAS PIPING CONNECTION
NO SCALE

GENERAL NOTES:

1. EXISTING INFORMATION IS BASED ON A FIELD SURVEY AND EXISTING PLANS. SOME INFORMATION PRESENTED IS ESTIMATED OR ASSUMED BASED ON EXPERIENCE. CONTRACTOR SHALL FIELD VERIFY CONDITIONS DURING THE COURSE OF WORK AND ALERT THE ARCHITECT AND/OR ENGINEER OF DIFFERENCES BETWEEN FIELD CONDITIONS AND THE DEMOLITION DRAWINGS THAT WILL PREVENT ANY PORTIONS OF THE PLUMBING SCOPE OF WORK FROM BEING INSTALLED AS DESIGNED.

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 043164 CASEY D. GILMAN

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ELECTRICAL NOTES

1. ELECTRICAL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND REQUIREMENTS OF THE LOCAL AUTHORITY HAVING JURISDICTION.
2. PERMITS FOR ELECTRICAL WORK SHALL BE OBTAINED BY AND PAID BY THE ELECTRICAL CONTRACTOR. THE ELECTRICAL CONTRACTOR SHALL PAY FOR ANY ADDITIONAL FEES FOR INSPECTIONS, TESTS, AND OTHER SERVICES AS REQUIRED FOR THE COMPLETION OF THE WORK.
3. THE ELECTRICAL CONTRACTOR AND ANY OF HIS SUBCONTRACTORS SHALL VISIT THE PROJECT SITE TO WITNESS EXISTING CONDITIONS AND BECOME FAMILIAR WITH THE SCOPE OF THE WORK REQUIRED PRIOR TO SUBMITTING PROPOSALS. WORK REQUIRED BY EXISTING JOB CONDITIONS NOT INDICATED ON DRAWINGS SHALL BE INCLUDED IN THE BID.
4. THE DRAWINGS AND SPECIFICATIONS ARE INTENDED TO RESULT IN THE PRODUCTION OF A COMPLETE AND FUNCTIONAL ELECTRICAL SYSTEM. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL MATERIAL, LABOR, EQUIPMENT, AND OTHER SERVICES AS NECESSARY TO COMPLETE THE WORK.
5. DISCREPANCIES IN THE DRAWINGS AND SPECIFICATIONS THAT WILL AFFECT THE WORK SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER, AND/OR OWNER PRIOR TO SUBMITTING PROPOSALS.
6. UNLESS NOTED OTHERWISE, ALL MATERIALS AND EQUIPMENT SHALL BE NEW AND INCLUDE A 3RD PARTY LABEL (I.E.: UL, CSA, ETL, ETC.) LISTING APPROVAL FOR ITS INSTALLED APPLICATION.
7. REVIEW PLANS OF OTHER TRADES FOR COORDINATION OF WORK AND FOR RELATED AND ADJOINING WORK.
8. REVIEW COMPLETE PLAN SET FOR CONSTRUCTION TYPE, FINISHES, HEADROOM, ROOF FINISHES, CEILINGS, ETC. REVIEW COMPLETE PLAN SET FOR PROJECT PHASING AND STAGING.
9. COORDINATE DEVICE AND EQUIPMENT MOUNTING HEIGHTS WITH OTHER DISCIPLINE DRAWINGS, CASEWORK DETAILS & SUBMITTALS, EQUIPMENT DETAILS & SUBMITTALS, ETC.
10. PENETRATIONS OF FIRE-RATED WALLS, FLOORS, CEILINGS, AND PARTITIONS SHALL BE FIRE STOPPED IN ACCORDANCE WITH REQUIREMENTS OF THE STATE BUILDING CODE. COORDINATE WORK TO INSURE THAT FIRE STOPPING IS COMPLETED.
11. PENETRATIONS OF SMOKE PARTITIONS SHALL BE SEALED IN ACCORDANCE WITH REQUIREMENTS OF THE STATE BUILDING CODE. COORDINATE WORK TO INSURE THAT SMOKE PARTITION SEALING IS COMPLETED.
12. PENETRATIONS OF EXTERIOR BUILDING WALLS, FLOORS, OR ROOFS SHALL BE SEALED WATERTIGHT. INTERIORS OF RACEWAY PENETRATIONS THROUGH EXTERIOR WALLS SHALL BE SEALED WITH NON-HARDENING ELECTRICAL PUTTY.
13. CUTTING AND PATCHING TO INSTALL DEVICES AND EQUIPMENT SHALL BE PERFORMED WITH FINISHES RESTORED TO THEIR ORIGINAL CONDITION. SUCH WORK SHALL BE COMPLETED TO A DEGREE THAT IS ACCEPTABLE TO THE ENGINEER, AND/OR OWNER..
14. COORDINATE PRECISE LOCATION OF HVAC EQUIPMENT WITH THE MECHANICAL CONTRACTOR.
15. FOR HVAC EQUIPMENT, VERIFY CIRCUIT BREAKER RATINGS, FUSE RATINGS, AND WIRE SIZES. IF RATINGS DIFFER FROM THOSE INDICATED ON THE DRAWINGS, NOTIFY THE ENGINEER, AND OWNER FOR DIRECTION. PROVIDE OVERCURRENT PROTECTION IN ACCORDANCE WITH EQUIPMENT MANUFACTURER NAMEPLATE DATA. IF THE EQUIPMENT LISTING LABEL REQUIRES FUSED PROTECTION, ENSURE THAT FUSES IN A FUSED DISCONNECT SWITCH AT THE EQUIPMENT ARE SIZED AS INDICATED ON THE EQUIPMENT LABEL.
16. VERIFY PROPER SIZING OF OVERLOAD DEVICES IN STARTERS BASED ON EQUIPMENT NAMEPLATE DATA.
17. IF HORSEPOWER OR LOAD RATINGS OF EQUIPMENT DIFFER FROM THOSE INDICATED ON THE DRAWINGS, NOTIFY THE ENGINEER, AND OWNER FOR DIRECTION.
18. PROVIDE NATIONAL ELECTRICAL CODE REQUIRED CLEARANCES FOR ALL ELECTRICAL EQUIPMENT. COORDINATE RESOLUTION OF CONFLICTS WITH OTHER TRADES.
19. PRIOR TO ORDERING LIGHT FIXTURES, CONTRACTOR SHALL VERIFY TYPE OF CEILING OR WALL BY REVIEW OF FINISH SCHEDULES AND PROVIDE SUITABLE TRIM AND APPURTENANCES TO MOUNT FIXTURES IN TYPE OF CEILING OR WALL INDICATED.
20. RECESSED LIGHT FIXTURES INSTALLED IN CEILINGS HAVING INSULATION INSTALLED OVER CEILING AND FIXTURES (AS INDICATED IN PLANS, OR FOUND AS EXISTING CONDITIONS) SHALL BE U.L. RATED FOR DIRECT CONTACT WITH INSULATION.
21. RECESSED LIGHT FIXTURES INSTALLED IN FIRE RATED CEILING SHALL BE U.L. RATED FOR USE IN FIRE RATED CEILINGS OR SHALL BE INSTALLED WITH "TENTING' IN ACCORDANCE WITH RATING REQUIREMENTS OF THE CEILING ASSEMBLY.
22. EXIT AND EMERGENCY LIGHTS SHALL BE CONNECTED TO THE NEAREST UNSWITCHED CIRCUIT THAT SERVES LIGHT FIXTURES WITHIN THE SAME SPACE.
23. NO MOUNTING HARDWARE SHALL BE ATTACHED TO ROOF DECKS. ATTACHMENTS SHALL BE MADE TO THE ROOF SUPPORTING STRUCTURE.
24. WHERE WORKING IN EXISTING BUILDINGS, FACILITIES, OR STRUCTURES; PROTECT AND MAINTAIN IN OPERATION EXISTING LIFE SAFETY SYSTEMS, PUBLIC ADDRESS SYSTEMS, ELECTRICAL SYSTEMS, ETC. IF SHUTDOWNS ARE REQUIRED, NOTIFY THE ENGINEER, AND OWNER FOR COORDINATION WELL IN ADVANCE OF ANY SYSTEM SHUTDOWN. WHERE AN OUTAGE OF EXTENDED DURATION IS NOT ACCEPTABLE TO THE OWNER, PROVIDE TEMPORARY CONNECTIONS AS REQUIRED TO MAINTAIN SERVICE.
25. WHERE WORKING IN EXISTING BUILDINGS, FACILITIES, OR STRUCTURES; WORK MAY BE REQUIRED TO BE PERFORMED WHILE REMAINING OCCUPIED BY OWNER STAFF. WORK SHALL BE COORDINATED WITH THE OWNER TO MINIMIZE DISRUPTION TO THE OWNER.
26. WHERE WORKING IN EXISTING BUILDINGS, FACILITIES, OR STRUCTURES; EXISTING ABANDONED CIRCUITS USED TO CONNECT NEW LOADS IN THE SAME AREA SHALL BE CLEARLY IDENTIFIED ON AS-BUILT MARK-UP DRAWINGS WITH REGARD TO PANEL-CIRCUIT AND CIRCUITRY ROUTING CONFIGURATION.
27. ABANDONED CIRCUITRY (RACEWAY & CONDUCTORS) SHALL BE REMOVED IN ITS ENTIRETY FROM ITS SOURCE. ABANDONED LOW VOLTAGE CABLING SHALL BE REMOVED IN ITS ENTIRETY UNLESS OTHERWISE NOTED.
28. PANEL BUS MATERIAL: COPPER.
29. SHARED NEUTRAL CONDUCTORS SHALL NOT BE USED UNLESS SPECIFICALLY INDICATED SO ON HOMERUN CIRCUITRY DESIGNATIONS.
30. PANEL BREAKER CONFIGURATIONS SHALL BE INSTALLED AS INDICATED ON THE PANEL SCHEDULES OR AS NOTED. BREAKER POSITION REVISIONS WILL NOT BE ACCEPTED UNLESS APPROVED IN WRITING BY THE ENGINEER.
31. LOAD CIRCUITS SHALL BE INSTALLED AS INDICATED ON THE DRAWINGS. CIRCUITRY REVISIONS WILL NOT BE ACCEPTED UNLESS APPROVED IN WRITING BY THE ENGINEER.

ABBREVIATIONS

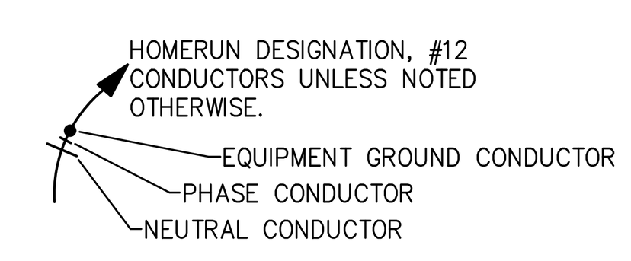
ADA	AMERICAN DISABILITIES ACT
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLER UNIT
AIC	AMPS INTERRUPTING CAPABILITY
BKR	BREAKER
C	CONDUIT
C/B	CIRCUIT BREAKER
CLG	CEILING
CKT	CIRCUIT
CU	COPPER
DDC	DIRECT DIGITAL CONTROL
DIA	DIAMETER
DWG	DRAWING
EC	ELECTRICAL CONTRACTOR
EDH	ELECTRIC DUCT HEATER
EMT	ELECTRICAL METALLIC TUBING
ENCL	ENCLOSED
EXSTG	EXISTING
FACP	FIRE ALARM CONTROL PANEL
FACU	FIRE ALARM CONTROL UNIT
FEF	FAN EXHAUST
G	EQUIPMENT GROUND
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
HP	HORSEPOWER
K	KILO (THOUSAND)
LED	LIGHT EMITTING DIODE
LTG	LIGHTING
LTS	LIGHTS
mA	MILLI AMP
MC	MECHANICAL CONTRACTOR
MCB	MAIN CIRCUIT BREAKER
MFR	MANUFACTURER
MLO	MAIN LUG ONLY
N/A	NOT APPLICABLE
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOC.
NTS	NOT TO SCALE
P	PHASE OR POLE
PAC	PACKAGED AIR CONDITIONER
PC	PLUMBING CONTRACTOR
PH	PHASE
PNL	PANEL
PVC	POLYVINYL CHLORIDE
REC	RECEPTACLE
RECPT	RECEPTACLE
REQ.	REQUIRED
S.S.	STAINLESS STEEL
SYS	SYSTEM
S/N	SOLID NEUTRAL
TSP	TWISTED SHIELDED PAIR
TYP	TYPICAL
UL	UNDERWRITERS LABORATORY
UNO	UNLESS NOTED OTHERWISE
UON	UNLESS OTHERWISE NOTED
V	VOLTS
VA	VOLT-AMPS
VFD	VARIABLE FREQUENCY DRIVE
W	WATTS
W	WIRE
W/	WITH
WP	WEATHERPROOF

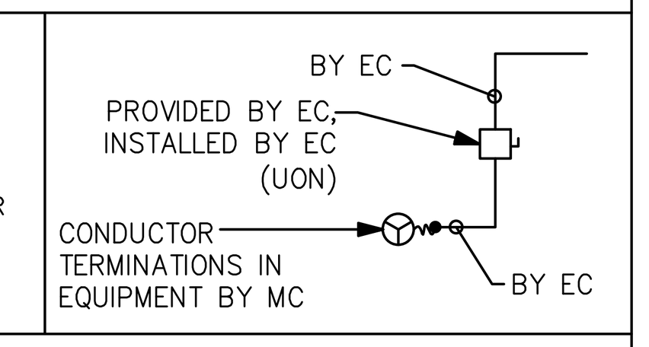
LUMINAIRE SCHEDULE

CALLOUT	SYMBOL	DESCRIPTION	LAMP	BALLAST	VOLTS	MOUNTING	MANUFACTURER / MODEL	NOTES	CALLOUT
B2		2x4, ARCHITECTURAL LENSED, INDIRECT	(1) 40W LED	LED DIMMABLE DRIVER	120V 1P 2W	RECESSED	COLUMBIA #LCAT SERIES DAYBRITE #2EV SERIES METALUX #24CZ SERIES	4300 NOMINAL LUMENS. 3500K COLOR TEMPERATURE.	B2
B2E		2x4, ARCHITECTURAL LENSED, INDIRECT, INTEGRAL BATTERY BACKUP	(1) 40W LED	LED DIMMABLE DRIVER	120V 1P 2W	RECESSED	COLUMBIA #LCAT SERIES DAYBRITE #2EV SERIES METALUX #24CZ SERIES	4300 NOMINAL LUMENS. 3500K COLOR TEMPERATURE. 1400 LUMEN EMERGENCY BATTERY PACK.	B2
B4		2x4, ARCHITECTURAL LENSED, INDIRECT	(1) 67W LED	LED DIMMABLE DRIVER	120V 1P 2W	RECESSED	COLUMBIA #LCAT SERIES DAYBRITE #2EV SERIES METALUX #24CZ SERIES	6800 NOMINAL LUMENS. 3500K COLOR TEMPERATURE.	B4
B4E		2x4, ARCHITECTURAL LENSED, INDIRECT, INTEGRAL BATTERY BACKUP	(1) 67W LED	LED DIMMABLE DRIVER	120V 1P 2W	RECESSED	COLUMBIA #LCAT SERIES DAYBRITE #2EV SERIES METALUX #24CZ SERIES	6800 NOMINAL LUMENS. 3500K COLOR TEMPERATURE. 1400 LUMEN EMERGENCY BATTERY PACK.	B4

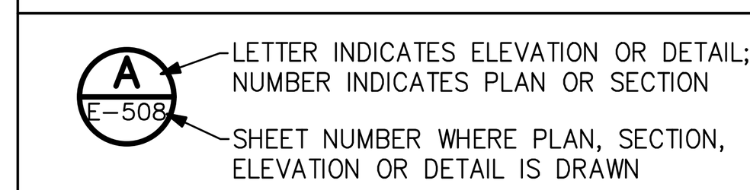
MISC. ELECTRICAL SYMBOL LEGEND

SYMBOL	DESCRIPTION
	EQUIPMENT CONNECTION
	SAFETY SWITCH DISCONNECT, HEAVY-DUTY, NON-FUSED, NEMA 1 INSIDE, NEMA 4X OUTSIDE (UNO), AMPERAGE AS INDICATED OR BASED ON SUPPLY CIRCUIT BREAKER RATING.
	SAFETY SWITCH DISCONNECT, HEAVY-DUTY, FUSED AT NAMEPLATE RATING OF EQUIPMENT SERVED, NEMA 1 INSIDE, NEMA 4X OUTSIDE (UNO), AMPERAGE AS INDICATED OR BASED ON SUPPLY CIRCUIT BREAKER RATING.
	PANELBOARD, SEE PANEL SCHEDULE
F	FIRE ALARM SYSTEM HORN/STROBE DEVICE
R	FIRE ALARM SYSTEM REMOTE INDICATOR DEVICE
S	FIRE ALARM SYSTEM SMOKE DETECTOR DEVICE





1 HR FIREWALL



RECEPTACLE LEGEND

SYMBOL	VOLTS	DESCRIPTION
DDC	120V 1P 2W	J-BOX LOCATED ABOVE CLG FOR DDC OR MECHANICAL CONTROL POWER SOURCE

JUNCTION BOX SCHEDULE

SYMBOL	DESCRIPTION	NOTES
	JUNCTION BOX	AS A MINIMUM, SIZE BASED ON REQUIREMENTS OF NEC

4HA

ROOM: RM #134 | VOLTS: 480V 3P 3W | AIC: 18,000
MOUNTING: SURFACE | BUS AMPS: 250 | MAIN BKR: MLO
FED FROM: MCC-1 | NEUTRAL: NONE | LUGS: STANDARD
NOTE:

CKT #	CKT BKR	CIRCUIT DESCRIPTION	LOAD KVA A	LOAD KVA B	LOAD KVA C	CKT #	CKT BKR	CIRCUIT DESCRIPTION	LOAD KVA A	LOAD KVA B	LOAD KVA C
1	15/3	EDH-108-1	2.67			2	15/3	EDH-108-6	2		
3	|			2.67		4	|			2	
5	|				2.67	6	|				2
7	25/3	EDH-108-3	5			8	15/3	EDH-108-5	2		
9	|			5		10	|			2	
11	|				5	12	|				2
13	20/3	SPARE	0			14	20/3	SPARE	0		
15	|			0		16	|			0	
17	|				0	18	|				0
19	20/3	SPARE	0			20	20/3	SPARE	0		
21	|			0		22	|			0	
23	|				0	24	|				0
25	30/3	SPARE	0			26	30/3	SPARE	0		
27	|			0		28	|			0	
29	|				0	30	|				0
31	-/3	SPACE	0			32	-/3	SPACE	0		
33	|			0		34	|			0	
35	|				0	36	|				0
37	-/3	SPACE	0			38	-/3	SPACE	0		
39	|			0		40	|			0	
41	|				0	42	|				0
								TOTAL CONNECTED KVA BY PHASE	11.7	11.7	11.7
								TOTAL CONNECTED AMPS BY PHASE	42.1	42.1	42.1

	CONN KVA	CALC KVA			CALC KVA
HEATING	35	35	(100%)	TOTAL LOAD	35
				BALANCED 3-PHASE LOAD	42.1 A

REVISION

DATE	DESCRIPTION

EMD FACILITY HVAC UPGRADES

628 GROUNDWATER WAY
WILMINGTON, NC 28411

CHEATHAM AND ASSOCIATES, P.A.
CONSULTING ENGINEERS
3412 ENTERPRISE DRIVE
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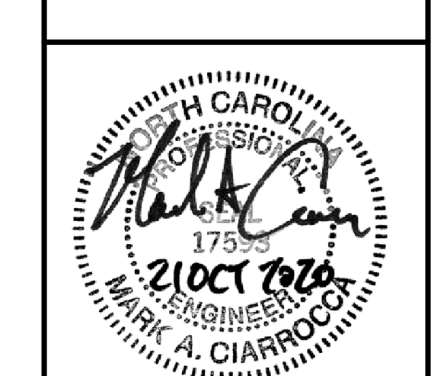
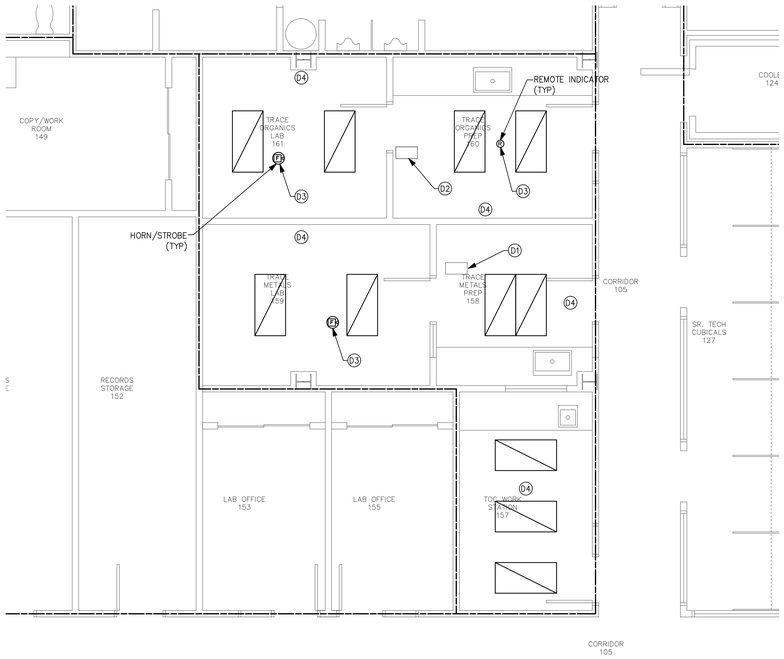


DESIGNED BY	K.FORTIER
DRAWN BY	K.FORTIER
CHECKED BY	M.CIARROCCA
JOB NUMBER	18093
SHEET	E0.1
DATE	OCTOBER 14, 2020



1 E1.1 ELECTRICAL DEMOLITION PLAN
SCALE: 1/4" = 1'-0"

GENERAL LIGHTING DEMOLITION NOTES:

1. ALL LIGHT FIXTURES SHOWN ARE TO BE REMOVED & REPLACED. EXISTING CIRCUITRY IS TO BE LEFT IN PLACE FOR RECONNECTION TO REPLACEMENT LIGHT FIXTURES.

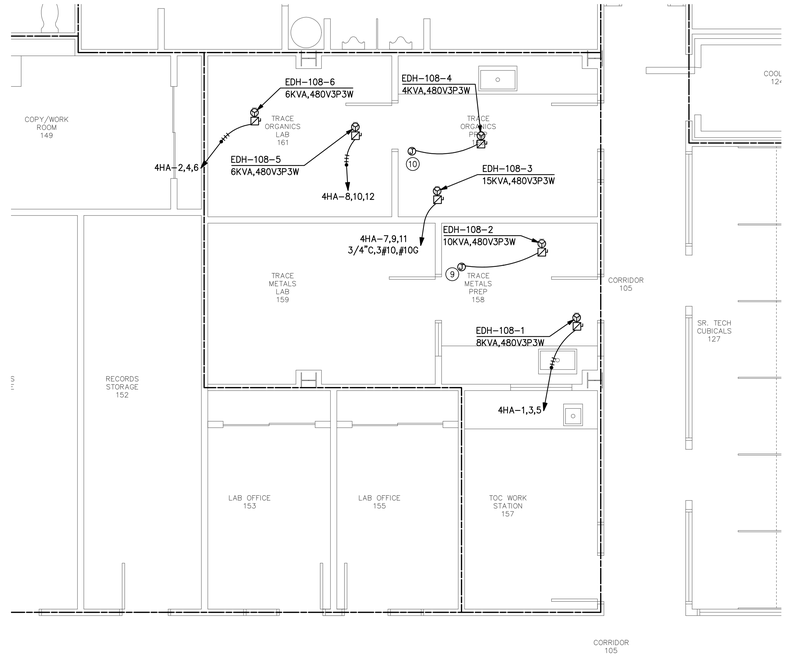
KEYED NOTES DEMOLITION:

(D1) DISCONNECT EXISTING ¾"C,3#12,#12G DUCT HEATER CIRCUITRY AT EXISTING EDH-102. CONNECT TO NEW JUNCTION BOX FOR EXISTING CONDUCTORS TO REMAIN. CIRCUITRY IS TO BE EXTENDED TO NEW DUCT HEATER IN NEW WORK PHASE.

(D2) DISCONNECT EXISTING ¾"C,3#12,#12G DUCT HEATER CIRCUITRY AT EXISTING EDH-103. CONNECT TO NEW JUNCTION BOX FOR EXISTING CONDUCTORS TO REMAIN. CIRCUITRY IS TO BE EXTENDED TO NEW DUCT HEATER IN NEW WORK PHASE.

(D3) FIRE ALARM DEVICE TO REMAIN. DEVICE SHALL BE TEMPORARILY SUPPORTED AND PROTECTED DURING DEMOLITION AND CONSTRUCTION PHASE & REINSTALLED IN NEW CEILING.

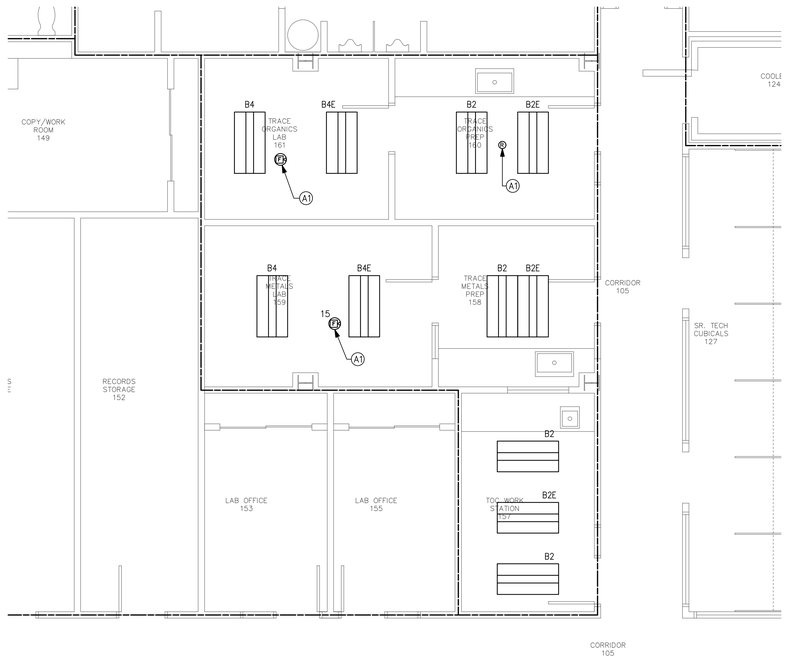
(D4) TO ACCMMODATE CEILING REMOVAL & REPLACEMENT, FIELD VERIFY EXISTING ELECTRICAL DEVICES TO REMAIN. TEMPORARILY SUPPORT & REINSTALL ELECTRICAL DEVICES IN NEW CEILING.



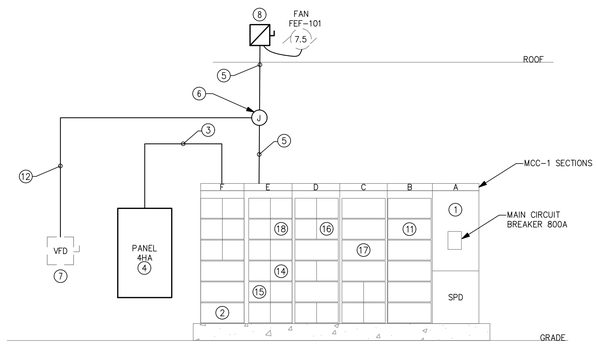
2 E1.1 ELECTRICAL POWER PLAN
SCALE: 1/4" = 1'-0"

KEYED NOTES:

(A1) EXISTING FIRE ALARM DEVICE TO BE RE-INSTALLED IN CEILING.



3 E1.1 ELECTRICAL LIGHTING & AUXILIARY SYSTEMS PLAN
SCALE: 1/4" = 1'-0"



A E1.1 ELECTRICAL RISER DIAGRAM – PANEL 4HA
SCALE: N/A

KEYED NOTES:

(1) MCC-1 IS MANUFACTURED BY CUTLER-HAMMER (TYPE-FREEDOM SERIES 2100). 480V,3PH,3W,800A,65KAIC.

(2) PROVIDE (1) 3P/250A CIRCUIT BREAKER, DOOR & HARDWARE FOR INSTALLATION IN THIS AVAILABLE SPACE. COORDINATE WITH MANUFACTURER.

(3) 2 ½"C,3#250KCM,#4G.

(4) SEE SHEET #E0.1 FOR PANEL SCHEDULE.

(5) EXISTING ¾"C, NEW 3#10,#10G.

(6) NEW JUNCTION BOX FOR INTERCEPTING EXISTING RACEWAY.

(7) VFD BY MECHANICAL CONTRACTOR.

(8) SAFETY SWITCH 600V,3P,30A,NEMA-4X. FUSED AT NAMEPLATE.

(9) PROVIDE ¾"C,3#12,#12G, FROM JUNCTION BOX TO EDH-108-2. RE-LABEL OVERCURRENT DEVICE IN MCC-1.

(10) PROVIDE ¾"C,3#12,#12G, FROM JUNCTION BOX TO EDH-108-4. RE-LABEL OVERCURRENT DEVICE IN MCC-1.

(11) LOCATION OF STARTER FOR EXISTING FAN FEF-101.

(12) ¾"C,3#10(LINE SIDE),3#10(LOAD SIDE),#10G. FOR FAN FEF-101.

(13) PROVIDE ¾"X8' PLYWOOD FOR EXTENDING THE EXISTING EQUIPMENT BACKBOARD SUPPORT.

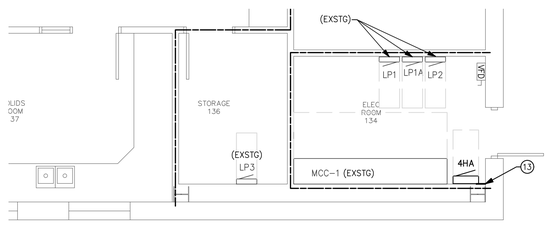
(14) CIRCUIT BREAKER FOR EXISTING EDH-102 & NEW EDH-108-2. PROVIDE NEW LABEL.

(15) CIRCUIT BREAKER FOR EXISTING EDH-103 & NEW EDH-108-4. PROVIDE NEW LABEL

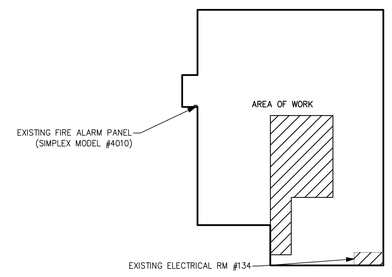
(16) CIRCUIT BREAKER FOR EXISTING PAC-108. REPLACE 100A/3P CIRCUIT BREAKER WITH 125A/3P CIRCUIT BREAKER FOR NEW PAC-108.

(17) CIRCUIT BREAKER FOR EXISTING PRV-108. RELABEL AS "SPARE".

(18) REPLACE EXISTING SPARE 20A/3P CIRCUIT BREAKER WITH NEW 30A/3P CIRCUIT BREAKER TO NEW FAN FEF-101.



4 E1.1 ELECTRICAL ROOM #134
SCALE: 1/4" = 1'-0"



GRAPHIC SCALE: ¼"=1'-0"
0 1 2 4 8

KEY PLAN
NO SCALE

REVISION	
DATE	DESCRIPTION

EMD FACILITY HVAC UPGRADES

628 GROUNDWATER WAY
WILMINGTON, NC 28411

CHEATHAM AND ASSOCIATES, P.A.
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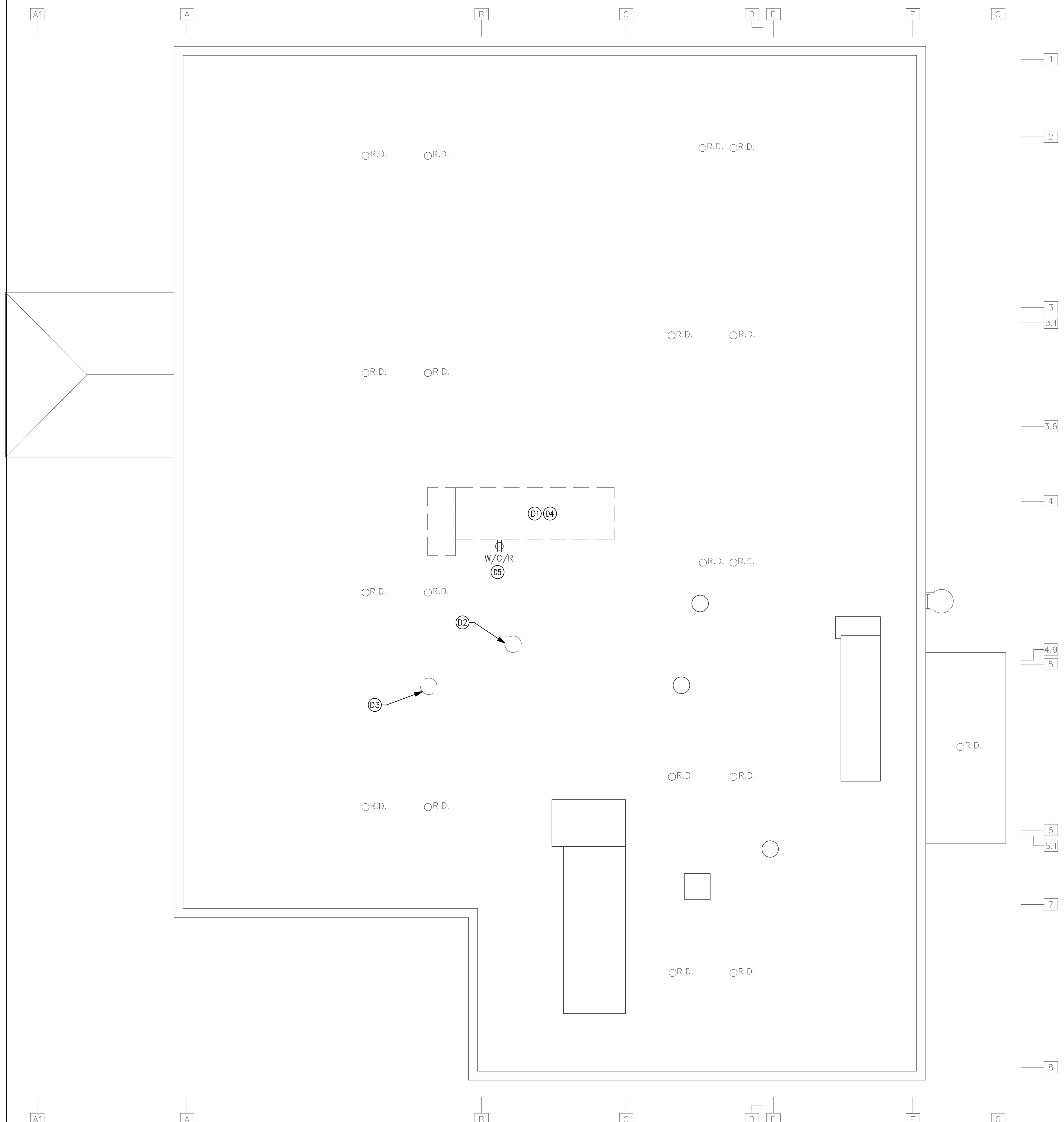
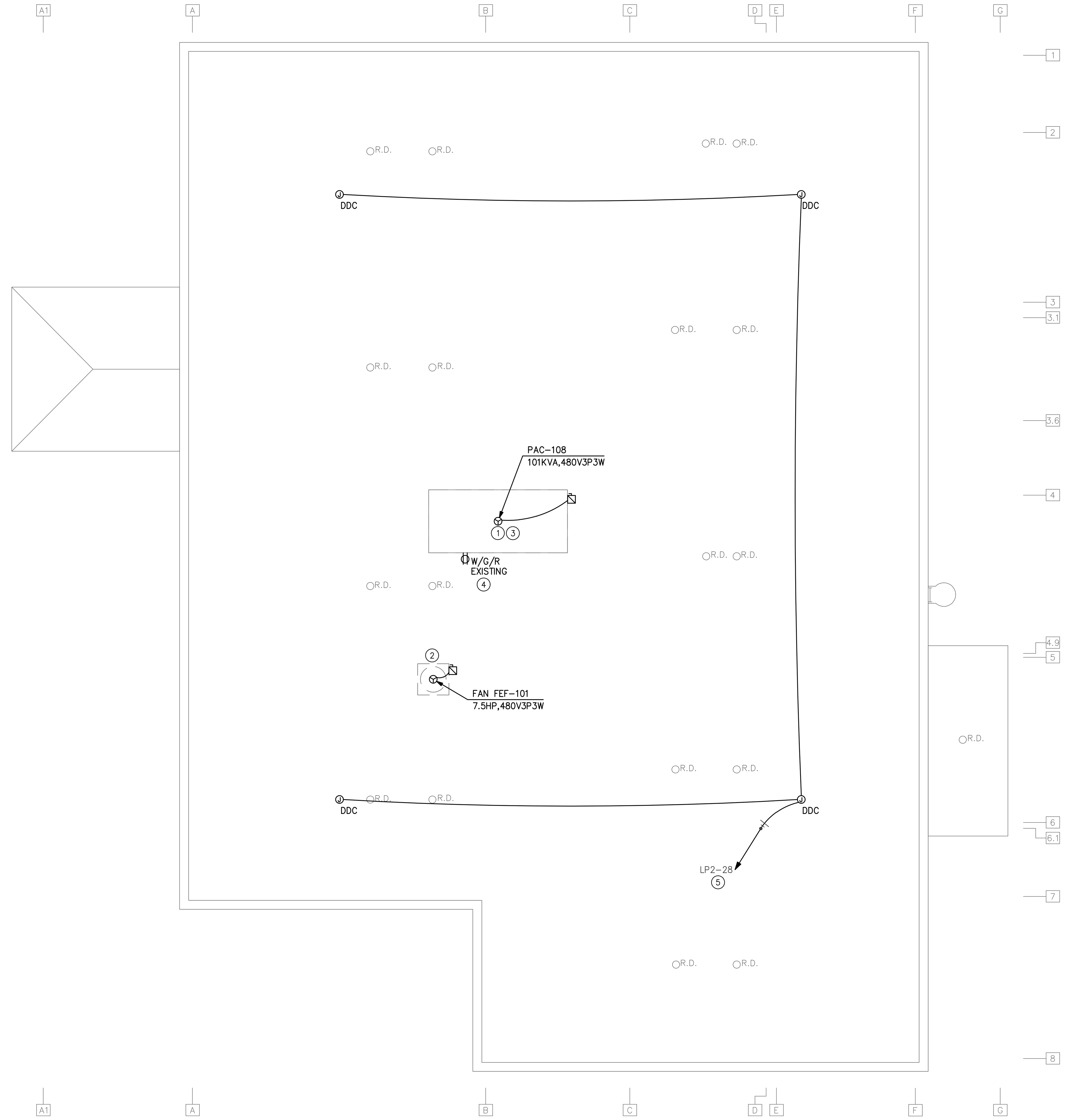
NC LICENSE #C-1073

NORTH CAROLINA REGISTERED PROFESSIONAL ENGINEER 17052 MARK A. CIARROCCA
21 OCT 2020

DESIGNED BY	K.FORTIER
DRAWN BY	K.FORTIER
CHECKED BY	M.CIARROCCA
JOB NUMBER	18093
SHEET	E1.1
DATE	OCTOBER 14, 2020



1 ELECTRICAL ROOF DEMOLITION PLAN
E2.1
SCALE: 1/8" = 1'-0"



2 ELECTRICAL ROOF CONSTRUCTION PLAN
E2.1
SCALE: 1/8" = 1'-0"

NOTES:

1. ELECTRICAL CIRCUITRY PERMANENTLY BEING REMOVED DURING DEMOLITION WORK SHALL HAVE THEIR CIRCUIT BREAKER COMPARTMENTS IN MCC-1 RELABELED AS "SPARE".

KEYED NOTES (DEMOLITION):

D1 DISCONNECT CIRCUITRY FROM PAC #108 TO ACCOMMODATE REMOVAL. REMOVE ABANDONED 1¼"C,3#2,#8G CIRCUITRY BACK TO MCC-1.

D2 DISCONNECT CIRCUITRY FROM PRV-106 TO ACCOMMODATE REMOVAL. REMOVE ABANDONED 3/4"C,3#12,#12G CIRCUITRY BACK TO MCC-1.

D3 DISCONNECT CIRCUITRY FROM FEF #101 TO ACCOMMODATE REMOVAL. REMOVE EXISTING CONDUCTORS 3#12,#12G BACK TO MCC-1, LEAVING EXISTING ¾"C TO BE RE-USED.

D4 EXISTING FIRE ALARM SYSTEM SHUTDOWN CONTROL (MONITOR MODULE, DUCT DETECTOR & ASSOCIATED WIRING) SHALL BE LOCATED & DISCONNECTED FROM EXISTING ROOF TOP UNIT. IT SHALL BE SECURED & PROTECTED DURING THE RENOVATION PHASE, FOR INSTALLATION IN THE NEW WORK PHASE.

D5 EXISTING ROOFTOP RECEPTACLE SHALL BE REMOVED DURING THE DEMOLITION WORK PHASE. IT SHALL BE RE-INSTALLED DURING NEW WORK PHASE.

KEYED NOTES NEW WORK:

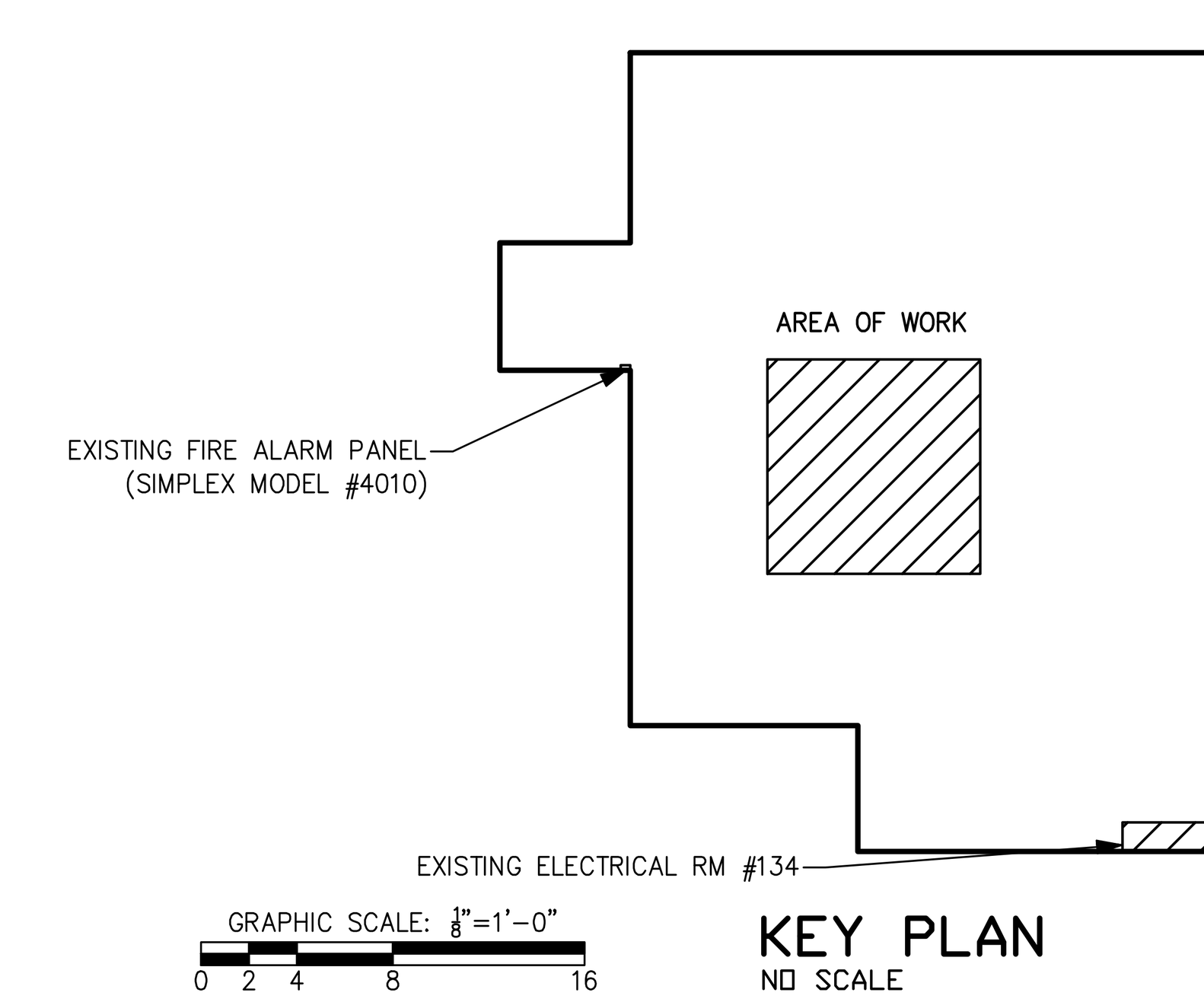
1. RESUPPLY NEW PAC-108 FROM MCC-1 WITH NEW CIRCUITRY 1½"C,3#1,#6G.

2. RESUPPLY NEW FEF-101 FROM MCC-1 WITH NEW 3#10,#10G IN EXISTING 3/4"C.

3. EXISTING FIRE ALARM SYSTEM SHUTDOWN CONTROL: REMOVE & RE-INSTALL MONITOR MODULE, DUCT DETECTOR & ASSOCIATED CIRCUTRY FOR THE NEW ROOF TOP HVAC UNIT. FIRE ALARM INSTALLER SHALL BE FACTORY CERTIFIED FOR THE INSTALLATION & TESTING OF THE FIRE ALARM SYSTEM. SEE KEY PLAN FOR FIRE ALARM SYSTEM PANE LOCATION.

4. EXISTING ROOFTOP RECEPTACLE TO BE REMOVED TO ACCOMMODATE DEMOLITION & THEN RE-INSTALLED.

5. DDC CONTROL POWER CIRCUITRY UNDER THE ROOF IN THE CEILING CAVITY. CONNECT TO EXISTING SPARE CIRCUIT BREAKER (#28) IN PANEL LP2.



KEY PLAN
NO SCALE

REVISION	
DATE	DESCRIPTION

EMD FACILITY HVAC UPGRADES
628 GROUNDWATER WAY
WILMINGTON, NC 28411

CHEATHAM AND ASSOCIATES, P.A.
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NC LICENSE #C-1073

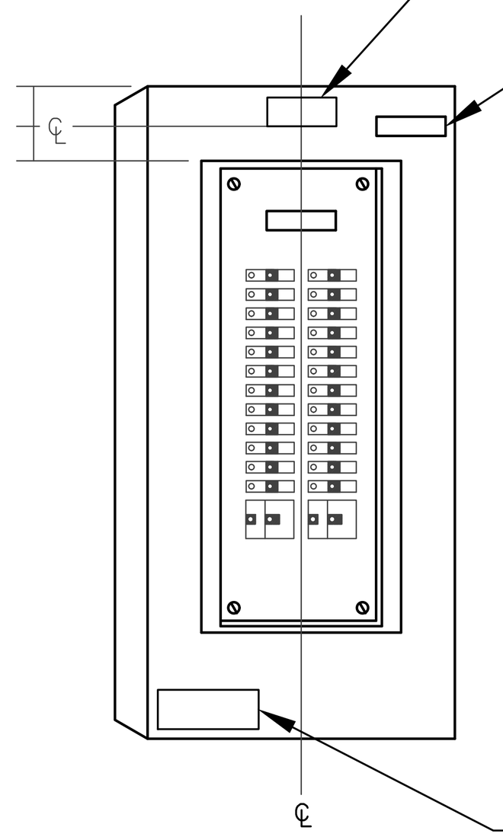
NORTH CAROLINA PROFESSIONAL ENGINEER MARK A. CIARROCCA 21 OCT 2020

DESIGNED BY	K.FORTIER
DRAWN BY	K.FORTIER
CHECKED BY	M.CIARROCCA
JOB NUMBER	18093
SHEET	E2.1
DATE	OCTOBER 14, 2020

PANEL IDENTIFICATION LABEL

B / E5.1

COLOR CODE LABEL



COLOR CODE:	
PHASE "A"	BLACK
PHASE "B"	RED
PHASE "C"	BLUE
NEUTRAL	WHITE
EQUIPMENT GROUND	GREEN

NOTES:
1. ENGRAVED LABELS SHALL FEATURE BLACK LETTERS ON WHITE BACKGROUND, UNLESS SPECIFIED OTHERWISE.
2. FOR APPLICATIONS OTHER THAN NEMA 1 ENCLOSURES, PROVIDE DUPLICATE ID LABELS INSIDE ENCLOSURES.
3. PANEL DESIGNATION: 1/4" HIGH TEXT, MINIMUM.
4. VOLTAGE CONFIGURATION & SOURCE: 1/8" HIGH TEXT, MININUM.
5. COLOR CODE LABEL: PRINTED LABEL IS ACCEPTABLE. SEE SPECIFICATIONS FOR COLOR CODE REQUIREMENTS.

WARNING

Arc Flash and Shock Hazard.
Appropriate PPE Required.
Failure to Comply Can Result in Death or Injury.
Refer to NFPA 70 E.

A / E5.1 TYPICAL PANELBOARD IDENTIFICATION
NO SCALE

PANELBOARD/SWITCHBOARD

PANEL DESIGNATION → PANEL: P2
SOURCE DESIGNATION → SOURCE: PANEL "P1"/CKT #
RATING DESIGNATION → RATING: 225 AMPS
VOLTAGE & PHASE DESIGNATION → VOLTAGE: 120/208V,3PH,4W

EQUIPMENT SAFETY SWITCH/ENCLOSED CIRCUIT BREAKER/MOTOR STARTER/VFD

EQUIPMENT DESIGNATION → ENCL C/B: #1
SOURCE DESIGNATION → SOURCE: PANEL"P"/CKT #
RATING DESIGNATION → RATING: 200 AMPS
VOLTAGE & PHASE DESIGNATION → VOLTAGE: 480/277V,3PH,4W

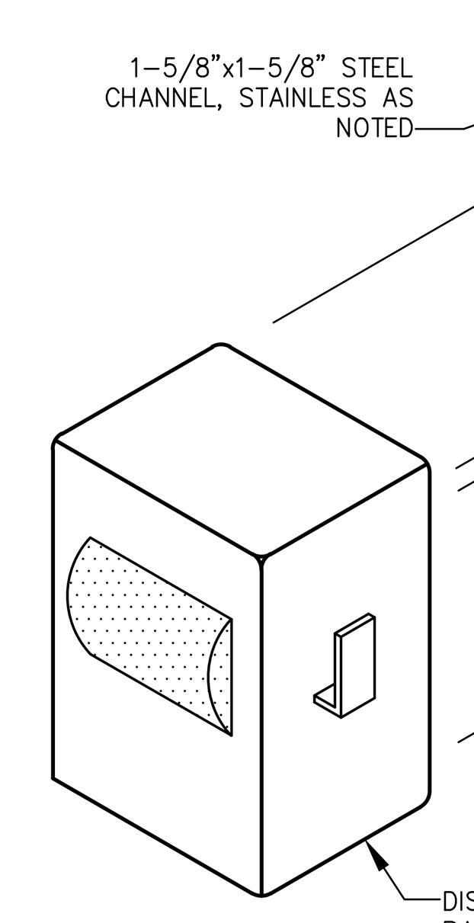
DISCONNECT

DISCONNECT DESIGNATION → DISCONNECT: DOAS #1
SOURCE DESIGNATION → SOURCE: PANEL"4M"/CKT #
RATING DESIGNATION → RATING: 200 AMPS
VOLTAGE & PHASE DESIGNATION → VOLTAGE: 480V,3PH,3W

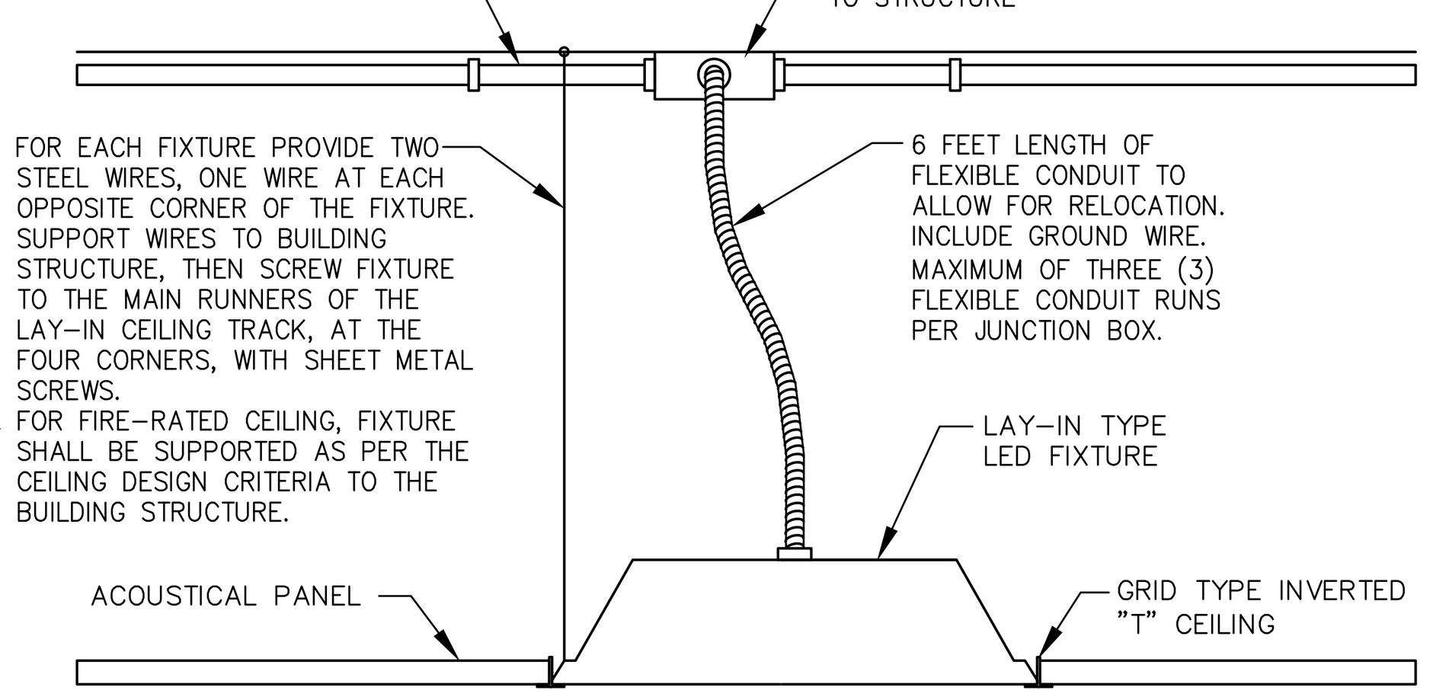
HEIGHT AS REQUIRED (TYPICAL)
LENGTH AS REQUIRED (TYPICAL)

NOTES:
1. ENGRAVED PLASTIC FOR NAMEPLATE.
2. HIGH PERFORMANCE, DOUBLE COATED TAPE WITH ADHESIVE TO ATTACH LABELS. DESIGN BASIS: 3M #06383 OR APPROVED EQUIVALENT.
3. 3/8" ENGRAVED LETTERS EQUIPMENT NAME DESIGNATION AND 1/4" ENGRAVED LETTERS ON ALL OTHER DESIGNATIONS.

B / E5.1 TYPICAL NAMEPLATE DETAILS
NO SCALE



C / E5.1 EQUIPMENT MOUNTING DETAIL
NO SCALE



1. FOR EACH FIXTURE PROVIDE TWO STEEL WIRES, ONE WIRE AT EACH OPPOSITE CORNER OF THE FIXTURE. SUPPORT WIRES TO BUILDING STRUCTURE, THEN SCREW FIXTURE TO THE MAIN RUNNERS OF THE LAY-IN CEILING TRACK, AT THE FOUR CORNERS, WITH SHEET METAL SCREWS.
2. FOR FIRE-RATED CEILING, FIXTURE SHALL BE SUPPORTED AS PER THE CEILING DESIGN CRITERIA TO THE BUILDING STRUCTURE.

D / E5.1 LIGHT FIXTURE MOUNTING DETAIL
SCALE: N/A

WARNING

Arc Flash and Shock Hazard.
Appropriate PPE Required.
Failure to Comply Can Result in Death or Injury.
Refer to NFPA 70 E.

PROVIDE ARC FLASH LABELS FOR ALL ELECTRICAL EQUIPMENT.

E / E5.1 GENERIC ARC FLASH LABEL FOR ALL ELECTRICAL EQUIPMENT
NO SCALE

REVISION	
DATE	DESCRIPTION

EMD FACILITY HVAC UPGRADES
628 GROUNDWATER WAY
WILMINGTON, NC 28411

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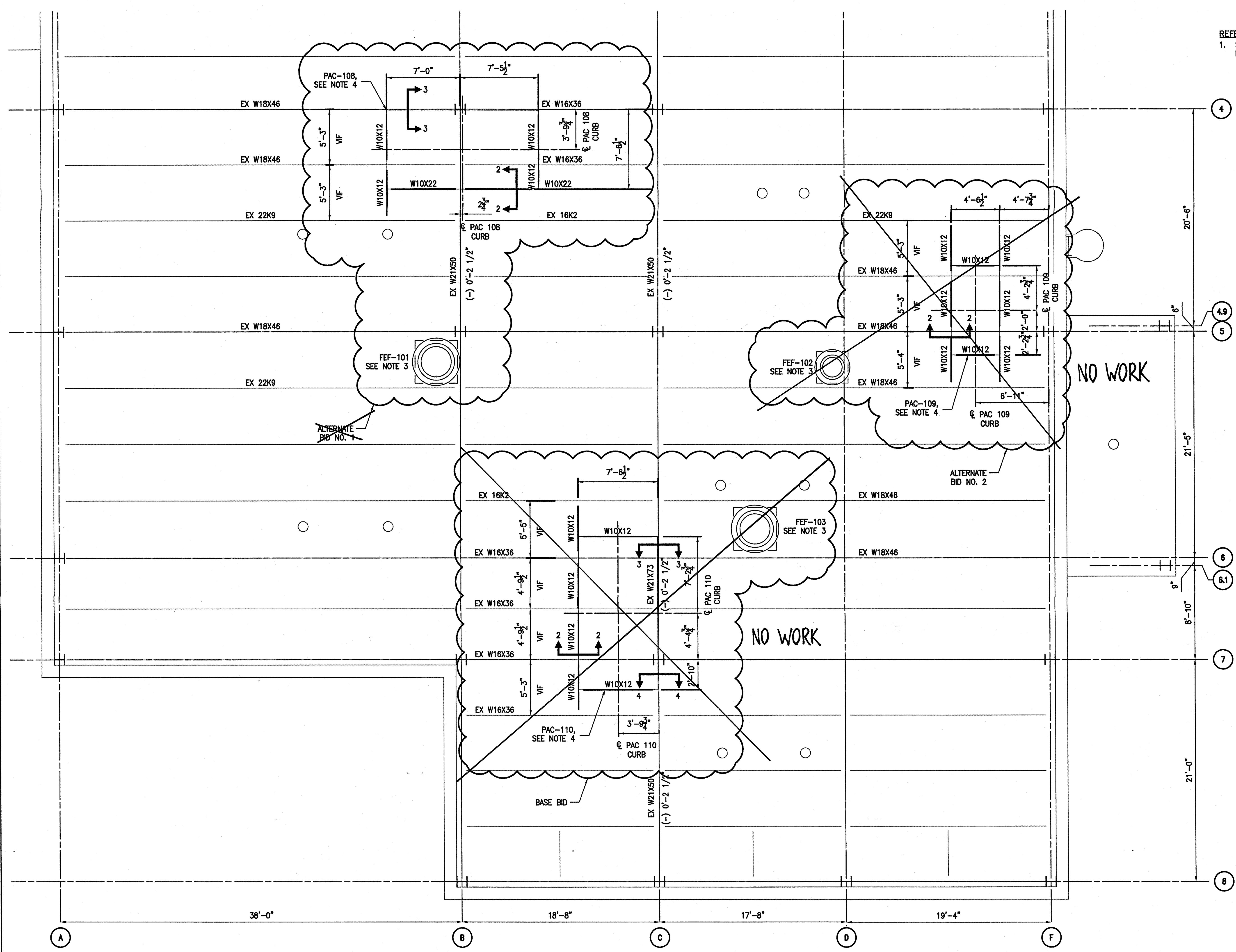
NC LICENSE #C-1073

NORTH CAROLINA PROFESSIONAL SEAL 17593 M. A. CIARROCCA 21 OCT 2020

DESIGNED BY	K.FORTIER
DRAWN BY	K.FORTIER
CHECKED BY	M.CIARROCCA
JOB NUMBER	18093
SHEET	E5.1
DATE	OCTOBER 14, 2020



1 NEW ROOF MECHANICAL SUPPORT FRAMING PLAN

SCALE: 3/16" = 1'-0"

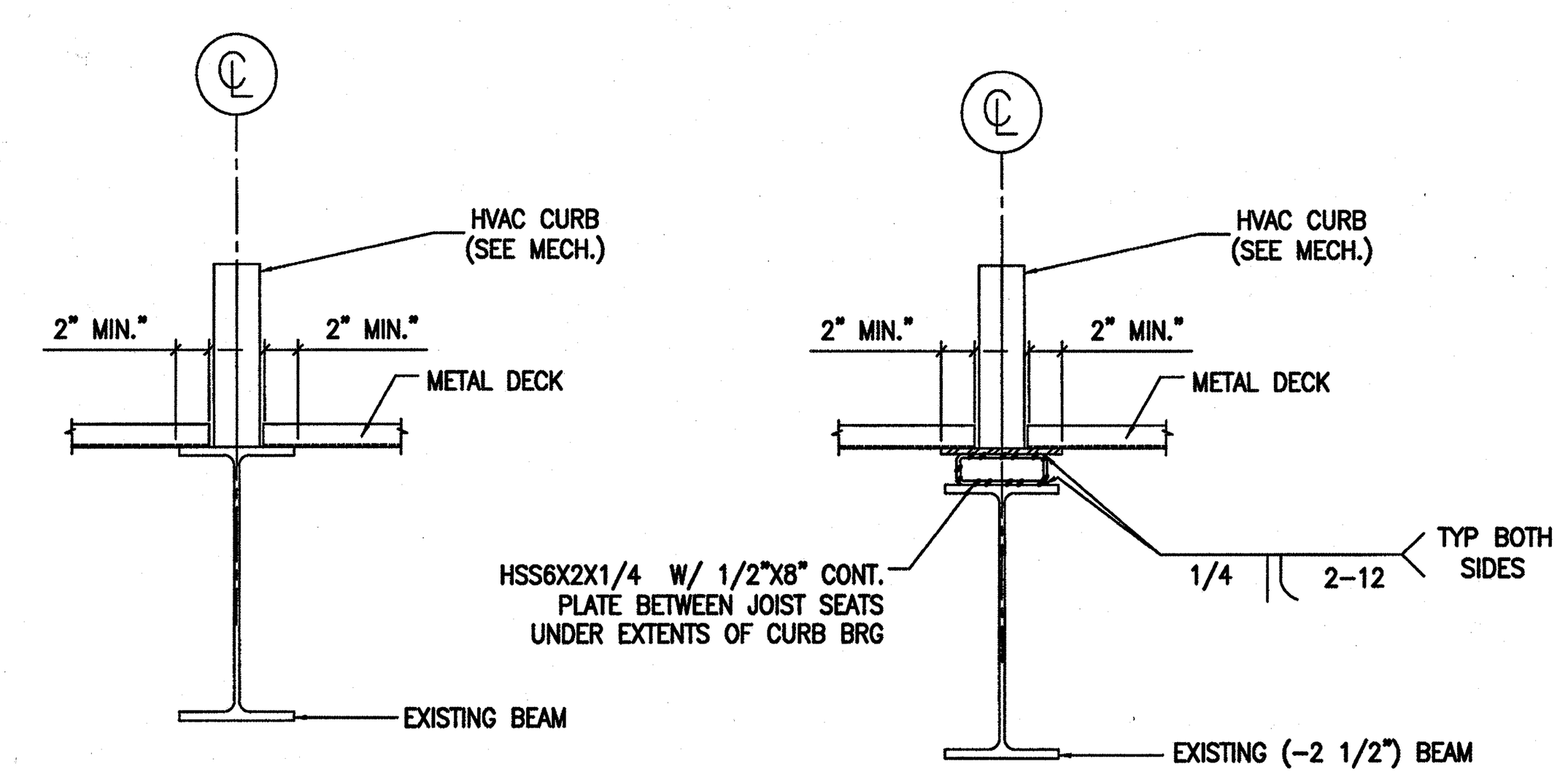
"EX" DENOTES EXISTING FRAMING
"VIF" DENOTES CONTRACTOR SHALL VERIFY IN FIELD

NOTES:

1. ONLY RELEVANT EXISTING FRAMING IS SHOWN, SEE REFERENCE DRAWINGS FOR ADDITIONAL INFORMATION.
2. ALL PRIMARY DIMENSIONS ARE IN FEET & INCHES AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR.
3. CONTRACTOR SHALL VERIFY ROOF PENETRATION SIZES AND LOCATIONS. SEE DETAIL 6 THIS SHEET FOR TYPICAL ROOF OPENING FRAMING.
4. ALL EXISTING HVAC SUPPORT CHANNEL FRAMING INTERFERING WITH NEW HVAC SUPPORT FRAMING SHALL BE REMOVED.
5. EXISTING STRUCTURAL ROOF FRAMING TOP OF STEEL REFERENCE ELEVATION = 62'-0"UNLESS NOTED OTHERWISE ON EXISTING REFERENCE DRAWINGS. ALL NEW FRAMING TOP OF STEEL ELEVATIONS SHALL BE INDICATED AS ABOVE (+) OR BELOW (-) EXISTING TOP OF STEEL.
6. ALL NEW W10 FRAMING TOP OF STEEL TO BE (-) 3/8"
7. ALL FLASHING AT ROOF PENETRATIONS TO BE DESIGNED BY OTHERS
8. ANY EXISTING ROOF PENETRATIONS THAT ARE ABANDONED SHALL RECEIVE NEW ROOF DECK TO MATCH EXISTING, WITH A 2" OVERLAP ON ALL SIDES; EXISTING SUPPLEMENTAL SUPPORT STEEL AT THESE LOCATIONS SHALL BE ABANDONED – DESIGNED BY OTHERS.
9. CONNECTION OF ALL NEW MECHANICAL CURBS TO ROOF STRUCTURAL STEEL SHALL BE DESIGNED BY OTHERS.

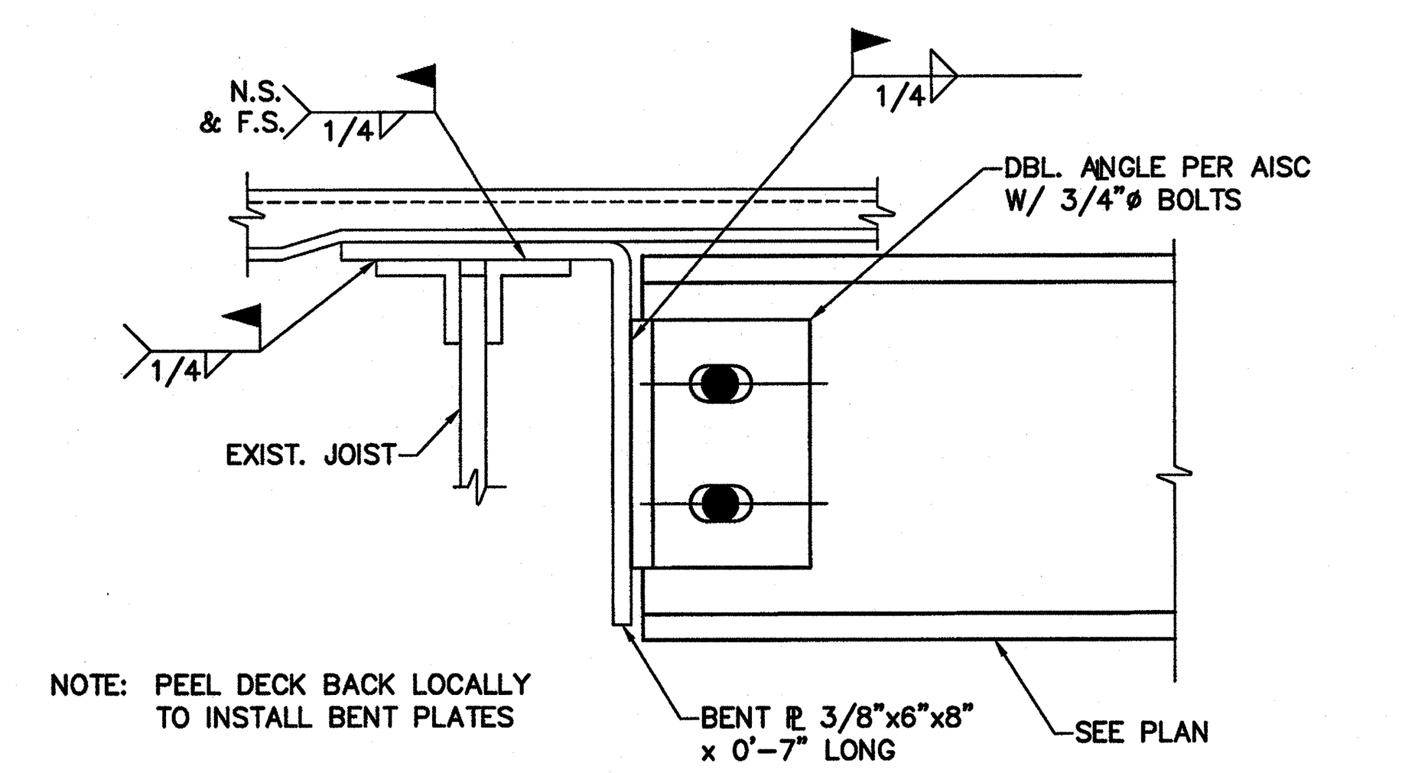
REFERENCE DRAWINGS:

1. SEE BLACK & VEATCH INTERNATIONAL COMPANY, CAPE FEAR PUBLIC UTILITY AUTHORITY ESMD FACILITY DRAWINGS D2 & D6 DATED FEBRUARY 27, 2009 FOR ALL EXISTING FRAMING NOT SHOWN.



3 NEW CURB SUPPORT AT EXISTING BEAM - TYP

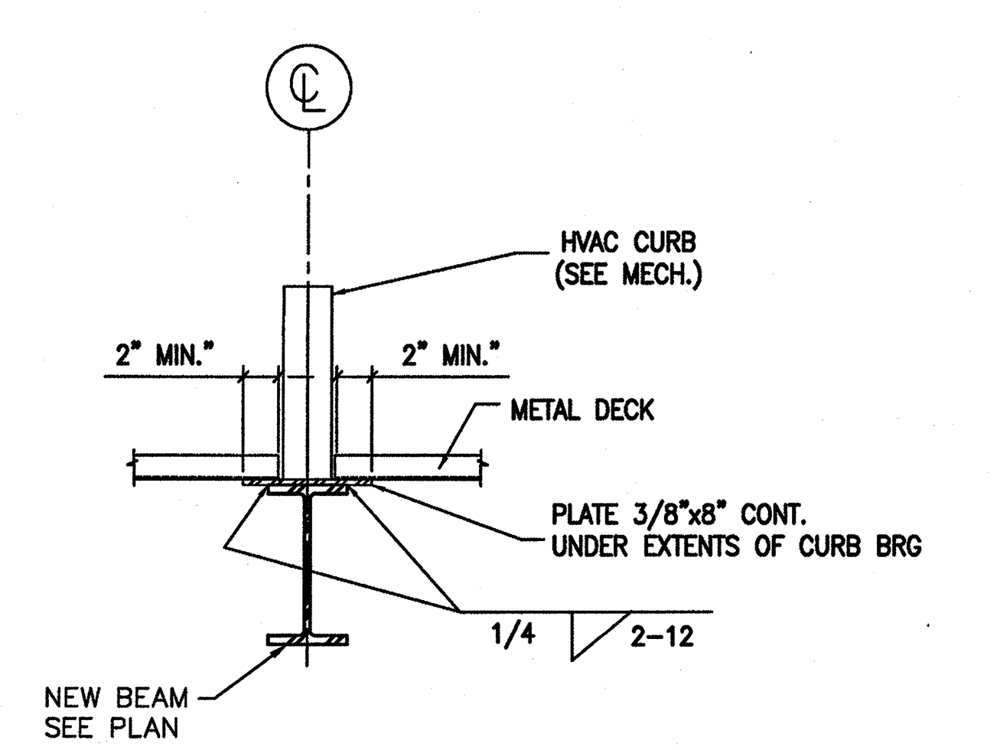
SCALE: 1" = 1'-0"



NOTE: PEEL DECK BACK LOCALLY TO INSTALL BENT PLATES

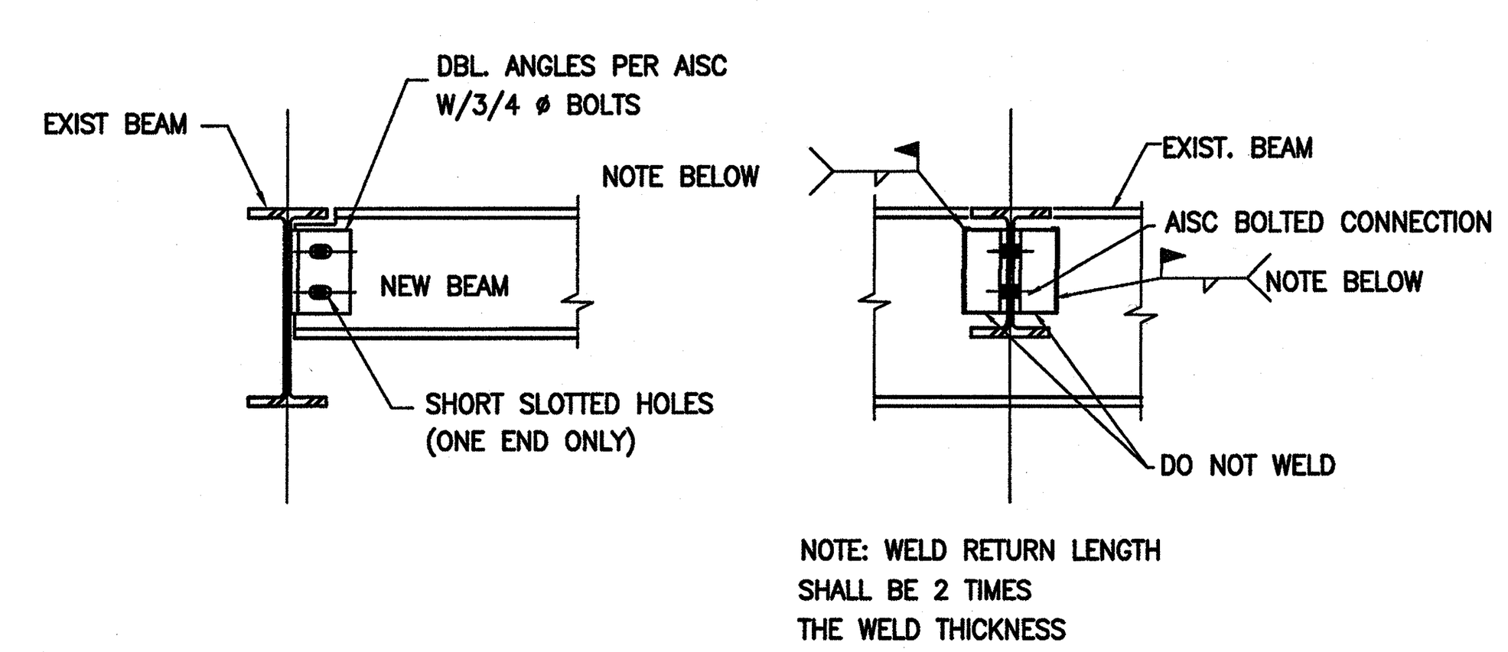
5 NEW BEAM TO EXISTING JOIST CONNECTION - TYP

SCALE: 1/4" = 1"



2 NEW HVAC CURB SUPPORT - TYP

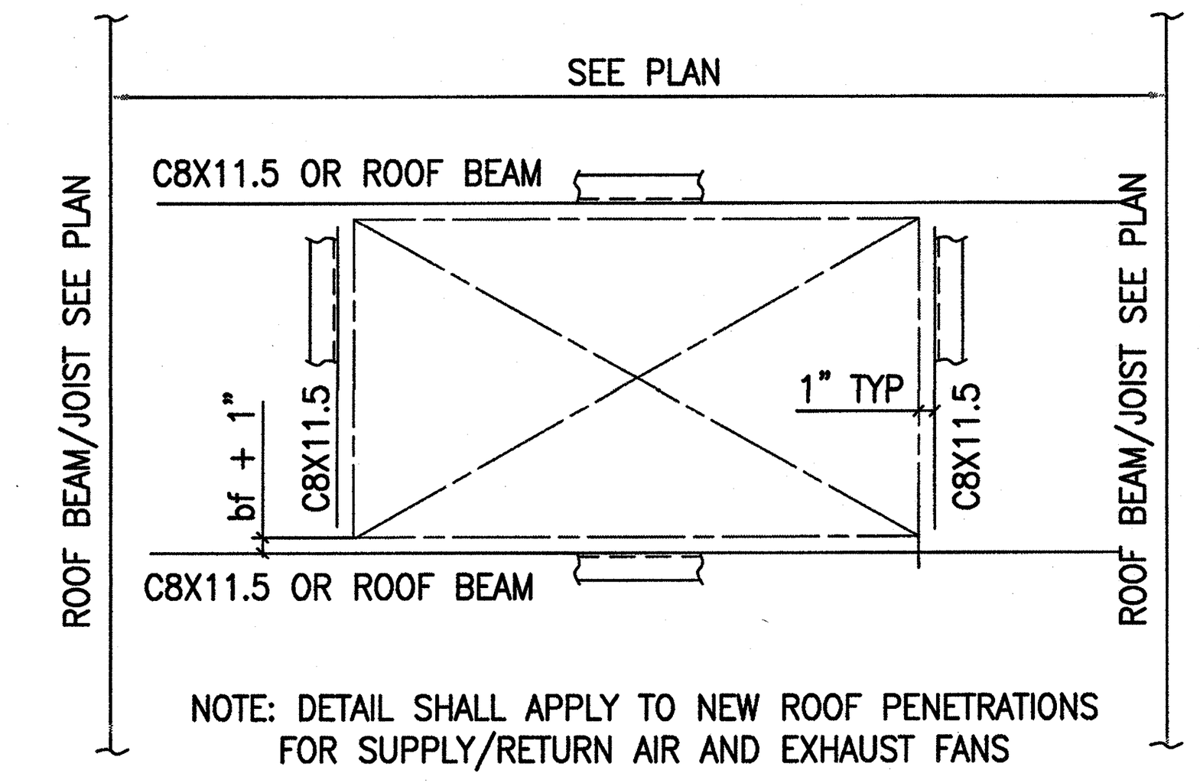
SCALE: 1" = 1'-0"



NOTE: WELD RETURN LENGTH SHALL BE 2 TIMES THE WELD THICKNESS

4 NEW BEAM TO EXISTING BEAM CONNECTION - TYP

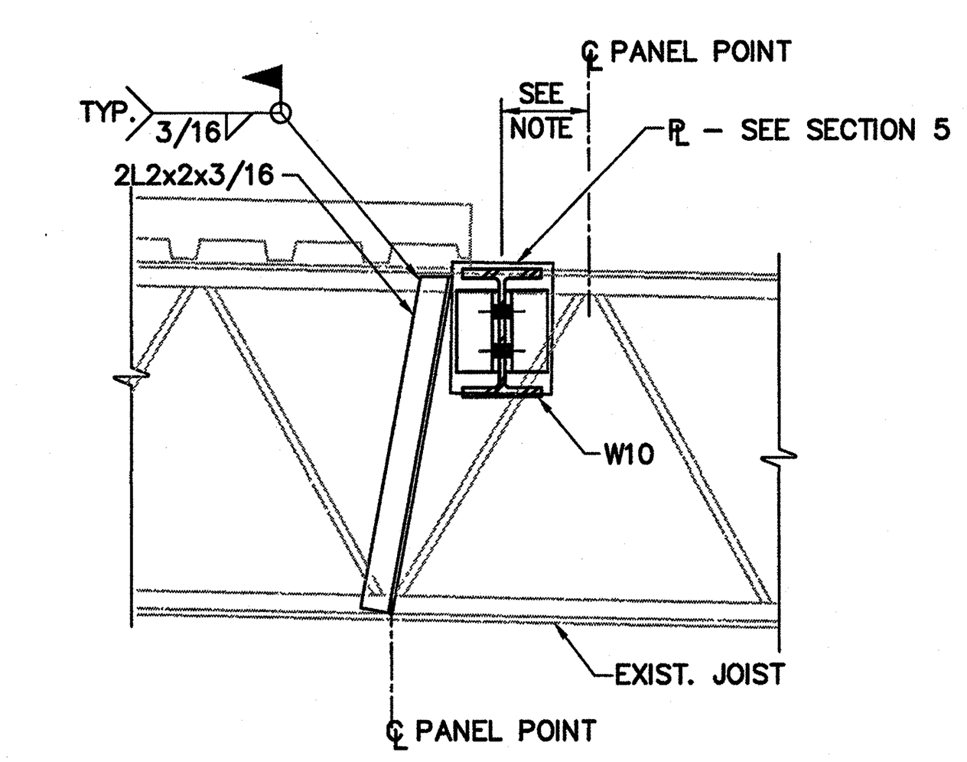
SCALE: 1" = 1'-0"



NOTE: DETAIL SHALL APPLY TO NEW ROOF PENETRATIONS FOR SUPPLY/RETURN AIR AND EXHAUST FANS

6 ROOF OPENING FRAME DETAIL - TYP

SCALE: 1" = 1'-0"



NOTE: INSTALL 2L2x2x3/16 IF DIMENSION IS GREATER THAN 4".

7 JOIST POINT LOAD REINFORCEMENT - TYP

SCALE: 1" = 1'-0"

STRUCTURAL NOTES:

DESIGN CODES (ALL LATEST ADOPTED EDITIONS)

A. 2018 NORTH CAROLINA BUILDING CODE.
B. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC-ASD)
C. AMERICAN WELDING SOCIETY (AWS)
D. AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE 7-10)

ARDURRA
ARDURRA GROUP NORTH CAROLINA
3809 Peachtree Avenue, Suite 102
Wilmington, North Carolina 28403
Phone: (910) 397-2929
www.Ardurra.com
JOB NO. 2019-3790-00

GENERAL

1. DESIGN LOADS:
   ROOF LIVE LOAD: 20 PSF
   PAC-108 WEIGHT: 9,600 LBS
   PAC-109 WEIGHT: 4,300 LBS
   PAC-110 WEIGHT: 9,600 LBS
   EF-101 WEIGHT: 1,150 LBS
   EF-102 WEIGHT: 1,272 LBS
   EF-103 WEIGHT: 1,150 LBS
   (ANY VARIANCE IN THIS WEIGHT OF MORE THAN 100 LBS WILL REQUIRE EOR APPROVAL)
2. NO OPENING SHALL BE MADE IN ANY STRUCTURAL MEMBER WITHOUT THE WRITTEN APPROVAL OF THE ENGINEER.
3. NO CHANGES IN SIZE OR DIMENSION OF STRUCTURAL MEMBERS SHALL BE MADE WITHOUT THE WRITTEN APPROVAL OF THE ENGINEER.
4. THE CONTRACTOR IS RESPONSIBLE FOR LIMITING THE AMOUNT OF CONSTRUCTION LOAD IMPOSED UPON STRUCTURAL FRAMING. CONSTRUCTION LOADS SHALL NOT EXCEED THE DESIGN CAPACITY OF THE FRAMING AT THE TIME THE LOADS ARE IMPOSED.
5. CONTRACTOR SHALL PROVIDE ALL LAYOUT REQUIRED TO CONSTRUCT HIS WORK.
6. DO NOT SCALE THESE DRAWINGS, USE DIMENSIONS.
7. CONTRACTOR SHALL VERIFY EXISTING CONDITIONS AND DIMENSIONS THAT EFFECT NEW WORK PRIOR TO CONSTRUCTION OR FABRICATION. CONTRACTOR SHALL NOTIFY ENGINEER PRIOR TO CONSTRUCTION OR FABRICATION SHOULD DISCREPANCIES DEVELOP. THE RE-FABRICATION OF STEEL OR MODIFICATION TO FABRICATED STEEL DUE TO DIMENSIONAL DISCREPANCIES WILL NOT CONSTITUTE REASON FOR CHANGE ORDERS IF FIELD DIMENSIONS ARE NOT VERIFIED BY THE CONTRACTOR PRIOR TO FABRICATION.
8. CONTRACTOR SHALL BE RESPONSIBLE FOR THE MEANS AND MANNER OF CONSTRUCTION AND FOR THE SAFETY OF PERSONS AND PROPERTY.
9. THE CONTRACT DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE AND DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK AND SHALL BE SOLELY RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES INCLUDING, BUT NOT LIMITED TO BRACING AND SHORING. OBSERVATION VISITS TO THE SITE BY FIELD REPRESENTATIVES OF THE ENGINEER SHALL NOT INCLUDE INSPECTIONS OF THE PROTECTIVE MEASURES OR THE CONSTRUCTION PROCEDURES. ANY SUPPORT SERVICES PERFORMED BY THE ENGINEER DURING THE CONSTRUCTION SHALL BE DISTINGUISHED FROM CONTINUOUS AND DETAILED INSPECTION SERVICES WHICH ARE FURNISHED BY OTHERS. THESE SUPPORT SERVICES PERFORMED BY THE ENGINEER, WHETHER OF MATERIAL OR WORK, AND FOR THE PURPOSE OF ASSISTING IN QUALITY CONTROL AND IN ACHIEVING CONFORMANCE WITH CONTRACT DOCUMENTS, DO NOT GUARANTEE CONTRACTOR'S PERFORMANCE AND SHALL NOT BE CONSTRUED AS SUPERVISION OF CONSTRUCTION.
10. WHERE A CONSTRUCTION DETAIL IS NOT SHOWN OR NOTED, THE DETAIL SHALL BE DISCUSSED WITH THE ENGINEER/DESIGNER AND APPROVAL GIVEN BEFORE PROCEEDING WITH ANY WORK SO INVOLVED.
11. CONSTRUCTION AND MATERIALS SHALL COMPLY WITH AND BE INSTALLED IN ACCORDANCE WITH ALL THE REQUIREMENTS OF ALL LEGALLY CONSTITUTED PUBLIC AUTHORITIES HAVING JURISDICTION, INCLUDING ALL COUNTY AND LOCAL ORDINANCES AND OSHA.
12. ANY REFERENCE TO THE WORDS APPROVED OR APPROVAL IN THESE DOCUMENTS SHALL BE HERE DEFINED TO MEAN GENERAL ACCEPTANCE OR REVIEW AND SHALL NOT RELIEVE THE CONTRACTOR AND/OR HIS SUB-CONTRACTORS OF ANY LIABILITY IN FURNISHING THE REQUIRED MATERIALS OR LABOR SPECIFIED.

STRUCTURAL STEEL

1. ALL DETAILING, FABRICATION AND ERECTION OF STRUCTURAL STEEL SHALL CONFORM TO THE ALLOWABLE STRESS PROVISIONS OF THE AISC 360-10 "SPECIFICATIONS FOR STRUCTURAL STEEL BUILDINGS".
2. ALL STRUCTURAL STEEL SHALL BE DESIGNED TO THE ALLOWABLE STRESS PROVISIONS OF THE AISC STEEL CONSTRUCTION MANUAL, FOURTEENTH EDITION.
3. STRUCTURAL STEEL: BEAMS/COLUMNS – A572 OR A992 GR. 50; PLATES, CHANNELS, & ANGLES – A36.
4. BOLTS: A325-N 3/4" DIAMETER H.S. BOLTS, UNO
5. WELDING ELECTRODES: E-70XX SERIES
6. STRUCTURAL STEEL CLEANING: STEEL STRUCTURES PAINTING COUNCIL, SP3 – LATEST EDITION (POWER TOOL).
7. OIL OR GREASE REMOVAL: SSPC-SPI-LATEST EDITION
8. NO SHOP PAINTING ALLOWED WITHIN 3 INCHES OF FIELD WELDS.
9. ALL ERECTION WORK FOR STRUCTURAL STEEL SHALL BE CARRIED OUT IN STRICT ACCORDANCE WITH LATEST OSHA REQUIREMENTS.
10. CONNECTIONS:
    A. FIELD CONNECTIONS SHALL BE BOLTED UNLESS WELDED CONNECTIONS ARE SPECIFIED ON THE DRAWING & SHALL UTILIZE DOUBLE-ANGLE, SEATED OR SINGLE SHEAR PLATE SHEAR CONNECTIONS.
    B. HOWEVER, IN NO CASE SHALL THE LENGTH OF THE SHEAR CONNECTION BE LESS THAN ONE-HALF OF THE "T" DISTANCE OF THE BEAM WEB.
    C. SHOP CONNECTIONS MAY BE BOLTED OR WELDED.
    D. ALL CONNECTIONS SHALL BE AISC TYPE 2 "STANDARD FRAMED BEAM CONNECTIONS".
    E. USE SNUG-TIGHT CONNECTIONS U.N.O., USING THE TURN-OF-THE-NUT METHOD OR TWIST-OFF TYPE TENSION-CONTROL BOLT TENSIONING.
12. PAINT ALL STRUCTURAL STEEL AND MISCELLANEOUS STEEL WHICH IS NOT GALVANIZED. CLEAN & PRIME WITH ZINC CHROMATE PRIMER AS SPECIFIED IN PAINTING SPECIFICATIONS. TOUCH UP AS REQ'D IN FIELD AFTER ERECTION.
13. STEEL SCHEDULED TO RECEIVE SPAYED-ON FIREPROOFING SHALL NOT BE PRIME PAINTED.
14. WELDING SHALL BE IN ACCORDANCE WITH AWS D1.1, LATEST EDITION.
15. THE FABRICATOR SHALL BE RESPONSIBLE FOR THE DESIGN AND DETAILING OF ALL CONNECTIONS NOT FULLY DETAILED ON THE CONTRACT DOCUMENTS. TYPICAL CONNECTION DETAILS ARE INDICATED ON THE DRAWINGS FOR DESIGN INTENT ONLY.
16. UNLESS SHOWN OTHERWISE ON THE DRAWINGS, ALL CONNECTIONS SHALL BE DESIGNED & DETAILED SO THAT ALL FORCE COMPONENTS CAN BE DELIVERED DIRECTLY TO THE CENTERLINE OF INTERSECTING MEMBERS. WHERE THIS IS NOT DONE, CONNECTIONS SHALL BE DESIGNED FOR RESULTING ECCENTRICITIES.
17. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PREVENT ACCIDENTAL FIRE DURING ALL FIELD WELDING. PRECAUTIONS MAY INCLUDE, BUT NOT BE LIMITED TO, POSTING A FIRE WATCH WITH A FIRE EXTINGUISHER, THE USE OF PROTECTIVE WELDING BLANKETS, OR ANY OTHER METHOD OR COMBINATION OF METHODS USED TO PREVENT FIRE.

REVISION	
DATE	DESCRIPTION
7/9/19	FOR REVIEW
7/15/19	FOR REVIEW
9/26/19	FOR FINAL REVIEW
10/1/19	IFC

EMD FACILITY HVAC UPGRADES

628 GROUNDWATER WAY
WILMINGTON, NC 28411

CHEATHAM AND ASSOCIATES, P.A.
CONSULTING ENGINEERS
3412 ENTERPRISE DRIVE
WILMINGTON, NORTH CAROLINA 28405
PH: (910)452-4210 FAX: (910)452-4211
E-MAIL: OFFICE@CHEATHAMPA.COM
NC LICENSE #C-1073

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 046221 JONATHAN E. BARNES 10/1/19

DESIGNED BY	JEB
DRAWN BY	JEB
CHECKED BY	JEB
JOB NUMBER	18093
SHEET 1	S1.0
OF 1	
DATE	OCTOBER 1, 2019

PACKAGED AIR CONDITIONING UNIT SCHEDULE

UNIT NUMBER	LOCATION	INDOOR FAN AIRFLOW (CFM)	INDOOR FAN ESP (IN WG)	INDOOR FAN MOTOR HP	INDOOR FAN WHEEL TYPE	INDOOR FAN DRIVE	POWER SUPPLY VOLTS/PHASE	MINIMUM CIRCUIT AMPACITY	COOLING EAT (FDB)	COOLING EAT (FWB)	COOLING CAPACITY (BTUH) SENSIBLE	COOLING CAPACITY (BTUH) TOTAL	COOLING MIN CAPACITY STAGES	HEATING EAT	HEATING TYPE	HEATING CAPACITY (BTUH OR (KW))	HEATING MINIMUM HEAT STAGES	DISCHARGE DIRECTION	ARI MINIMUM EFFICIENCY	OA (CFM)	APPROX WEIGHT (LBS)	PRE FILTER DATA TYPE	PRE FILTER DATA THICKNESS (IN)	FINAL FILTER DATA TYPE	FINAL FILTER DATA THICKNESS (IN)	REMARKS
PAC-101	OFFICES	2300	0.75	2	FC	DIRECT	480/3	20.6	83	67.9	55500	73200	2	62.6	NATURAL GAS	63100	2	VERTICAL	11.2 SEER	400	800	30%	2	---	---	2,3,4
PAC-102	OFFICES	1700	0.625	1	FC	DIRECT	480/3	18.2	82.9	65.8	43400	51700	2	65.6	NATURAL GAS	44800	1	VERTICAL	13 SEER	170	800	30%	2	---	---	2,3,4
PAC-103	LUNCH/CONF	1650	1	2	FC	BELT	480/3	28.3	91	78.0	64200	133800	4	27	NATURAL GAS	112300	15 TO 1 TURNDOWN	VERTICAL	---	1650	3100	30%	2	---	---	1,2,3,4,5,7,8
PAC-104	OFFICES	1350	1.125	1	FC	DIRECT	480/3	17.4	85.7	68.8	38400	49400	2	60.9	NATURAL GAS	42400	1	VERTICAL	13 SEER	260	800	30%	2	---	---	2,3,4
PAC-105	OFFICES	1920	1	1	FC	DIRECT	480/3	18.2	86	69.5	51300	65700	2	61.1	NATURAL GAS	60000	2	VERTICAL	11.2 SEER	330	1000	30%	2	---	---	2,3,4
PAC-106	OFFICES	960	0.75	1	FC	DIRECT	480/3	14.6	83.2	68.0	22300	26700	2	65.1	NATURAL GAS	25800	1	VERTICAL	13 SEER	100	600	30%	2	---	---	2,3,4
PAC-107	ELEC/STORAGE	1700	0.625	1	FC	DIRECT	480/3	14.8	80.4	65.8	37900	44900	2	66.6	NATURAL GAS	42900	1	VERTICAL	13 SEER	170	800	30%	2	---	---	2,3,4
PAC-108	LABS	3250	1.125	5	BI	BELT	480/3	64.2	91	78.0	144000	307600	5	27	NATURAL GAS	203600	15 TO 1 TURNDOWN	VERTICAL	---	3250	6400	30%	2	85%	12	1,2,3,4,6,8
PAC-109	LABS	1200	0.75	2	FC	BELT	480/3	26.6	91	78.0	53200	113600	5	27	NATURAL GAS	81600	15 TO 1 TURNDOWN	VERTICAL	---	1200	4700	30%	2	85%	12	1,2,3,4,6,8
PAC-110	LABS	5355	0.875	7.5	BI	BELT	480/3	92.4	91	78.0	237300	506800	5	27	NATURAL GAS	335400	15 TO 1 TURNDOWN	VERTICAL	---	5355	8500	30%	2	85%	12	1,2,3,4,6,8

CAPACITY NOTE: CAPACITIES LISTED IN PARENTHESES ARE IN UNITS OF "KW". CAPACITIES LISTED WITHOUT PARENTHESES ARE IN UNITS OF "BTUH".

NOTE:
OUTDOOR COIL ENTERING AIR TEMPERATURE:
COOLING - 101 F DESIGN/ 50 F MIN

REMARKS:
1 - 100% OUTSIDE AIR UNIT
2 - EVAPORATOR AND CONDENSER COILS SUBJECT TO CORROSION FROM COASTAL ENVIRONMENT AND SHALL BE GIVEN A PROTECTIVE COATING TO RESIST A SALT SPRAY AIRSTREAM
3 - TWO INCH PRE-FILTER SECTIONS SHALL BE ANGLED WITH VELOCITY NOT TO EXCEED 350 FPM. 12-INCH FINAL FILTERS SHALL BE FLAT WITH VELOCITIES NOT TO EXCEED 500 FPM
4 - UNIT SHALL BE PROVIDED WITH HUMIDITY CONTROL, HOT GAS REHEAT COIL AND MODULATING HOT GAS REHEAT CONTROL VALVE
5 - UNIT SHALL BE PROVIDED WITH RELIEF HOOD AND MODULATING OUTDOOR AIR AND RELIEF DAMPERS CAPABLE OF INCREASING VENTILATION UP TO 100% BASED ON SIGNALS FROM A CARBON DIOXIDE SENSOR
6 - UNIT SHALL BE PROVIDED DUAL COOL COOLING COILS
7 - UNIT SHALL HAVE A MINIMUM OUTSIDE AIR SETTING OF 165 CFM
8 - THE EQUIPMENT SPECIFIED IS CUSTOM, NON-STANDARD, NON-UNITARY, 100% OUTSIDE AIR WITH DUAL COOL COILS AND HUMIDITY CONTROL, AND IS OUTSIDE THE SCOPE OF THE ARI STANDARDS CONDITIONS FOR UNITARY PACKAGED EQUIPMENT. THE SELECTED CUSTOM ROOFTOP UNITS HAVE THE HIGHEST EFFICIENCY FOR THIS TYPE OF APPLICATION. THE UNITS ARE ALSO EXEMPT PER ASHRAE 90.1 FOR HUMIDITY CONTROL AND FUME HOOD APPLICATION (SEE PAGE 41; 6.5.6.1; 6.5.7.2).

AIR DEVICE SCHEDULE

SYMBOL	MODEL	FRAME/BORDER	MODULE SIZE	MATERIAL	FINISH	DAMPER TYPE	ACCESSORIES	REMARKS
ED-1	APDDRE	LAY-IN	---	ALUMINUM	BAKED WHITE ENAMEL	---	---	1,2
RG-1	80	LAY-IN	---	ALUMINUM	BAKED WHITE ENAMEL	---	---	1
RR-1	80DAL	SURFACE MOUNT	---	ALUMINUM	BAKED WHITE ENAMEL	OPPOSED BLADE	---	1
SD-1	APDNE	LAY-IN	---	ALUMINUM	BAKED WHITE ENAMEL	---	---	1,2
SD-2	SDS100	SURFACE MOUNT	---	ALUMINUM	BAKED WHITE ENAMEL	---	---	1,3
SR-1	22DAL	SURFACE MOUNT	---	ALUMINUM	BAKED WHITE ENAMEL	OPPOSED BLADE	---	1

NOTE: SEE DRAWINGS FOR DEVICE LENGTH, WIDTH, AND SUPPLY PATTERN.

REMARKS:
1 - EQUIPMENT SCHEDULE MODEL NUMBERS BASED ON PRICE.
2 - ALL DIFFUSER CORE STYLES ARE 4-WAY UNLESS OTHERWISE INDICATED ON THE PLANS.
3 - LINEAR DIFFUSERS SHALL BE SUPPLIED WITH ACCESSORY INSULATED PLENUM MODEL SDAI100.

HEATER SCHEDULE

UNIT NUMBER	LOCATION	TYPE	UNIT ORIENTATION	AIRFLOW (CFM)	AIR PD (IN WC)	OUTPUT CAPACITY (BTUH)	OUTPUT CAPACITY (KW)	WATER FLOW (GPM)	WATER PD (FT)	MOTOR HP	POWER SUPPLY VOLTS/PHASE	APPROX WEIGHT (LBS)	REMARKS
CH-101	VESTIBULE	CH	VERTICAL	250	---	---	5	---	---	---	480/3	50	2
EDH-101	TRAINING	EDH	---	680	0.1	---	0.53	---	---	---	480/3	50	1A
EDH-102	LAB	EDH	---	640	0.1	---	4.8	---	---	---	480/3	50	1A
EDH-103	LAB	EDH	---	435	0.1	---	3.4	---	---	---	480/3	50	1A
EDH-104	LAB	EDH	---	625	0.1	---	0.73	---	---	---	480/3	50	1A
EDH-105	LAB	EDH	---	1115	0.1	---	5.2	---	---	---	480/3	50	1A
EDH-106	LAB	EDH	---	1525	0.1	---	4.1	---	---	---	480/3	50	1A
EDH-107	LAB	EDH	---	1200	0.1	---	9.9	---	---	---	480/3	50	1A
WH-101	VESTIBULE	WH	---	175	---	---	1.5	---	---	---	120/1	30	
WH-102	VESTIBULE	WH	---	175	---	---	1.5	---	---	---	120/1	30	

TYPE NOTES:
CH - CABINET HEATER
EDH - ELECTRIC DUCT HEATER
WH - WALL HEATER

NOTE:
ENTERING AIR TEMPERATURE - 60 F

REMARKS:
1 - ELECTRIC DUCT HEATER ELEMENT TYPE A) FINNED TUBE B) OPEN COIL
2 - FRONT INLET, FRONT OUTLET CONFIGURATION

FAN SCHEDULE

UNIT NUMBER	LOCATION	FAN TYPE	AIRFLOW (CFM)	ESP (IN WC)	MOTOR HP	POWER SUPPLY VOLTS/PHASE	MINIMUM WHEEL DIA (IN)	WHEEL TYPE	DRIVE	FILTER DATA TYPE	FILTER DATA THICKNESS (IN)	VIBRATION ISOLATION	APPROX WEIGHT (LBS)	REMARKS
FEF-101	LAB	FEF	1575	1.625	2	480/3	13	C	BELT	---	---	---	600	
FEF-102	LAB	FEF	525	0.875	0.5	480/3	9	C	BELT	---	---	---	500	
FEF-103	LAB	FEF	3640	2	5	480/3	16	C	BELT	---	---	---	1200	
PRV-101	RESTROOMS	PRV	610	0.75	0.25	480/3	8	C	BELT	---	---	---	100	1, 2A
PRV-102	JANITOR	PRV	100	0.625	1/6	120/1	7	C	BELT	---	---	---	100	1, 2A
PRV-103	GAS	PRV	80	0.375	1/6	120/1	7	C	BELT	---	---	---	100	2A, 3
PRV-104	GAS	PRV	80	0.375	1/6	120/1	7	C	BELT	---	---	---	100	2A, 3
PRV-105	CORRIDOR	PRV	925	0.875	0.5	480/3	10	C	BELT	---	---	---	100	1, 2A
PRV-106	LAB	PRV	1325	0.75	0.5	480/3	12	C	BELT	---	---	---	100	1, 2A
PRV-107	LAB	PRV	475	0.75	0.25	480/3	8	C	BELT	---	---	---	100	1, 2A
PRV-108	LAB	PRV	1365	0.875	0.5	480/3	12	C	BELT	---	---	---	100	1, 2A

FAN TYPE NOTES:
FEF - FUME EXHAUST FAN
PRV - POWER ROOF VENTILATOR

WHEEL TYPE NOTES:
C - CENTRIFUGAL

REMARKS:
1 - BACKDRAFT DAMPER
2 - CONTRUCTION A) ALUMINUM FAN BLADES B) STEEL FAN BLADES
3 - EXPLOSION PROOF

ROOF HOOD SCHEDULE

UNIT NUMBER	LOCATION	AIRFLOW (CFM)	AIR PD (IN WC)	TYPE	THROAT SIZE (IN x IN)	HOOD CONSTRUCTION	APPROX WEIGHT (LBS)	REMARKS
RH-101	SERVICES ROOM	---	---	INTAKE	10 x 10	ALUMINUM	50	

FOR REFERENCE ONLY

GENERAL NOTE:
1. DUCTWORK, EQUIPMENT AND PIPING LOCATED OUTDOORS ASSOCIATED WITH THE PLUMBING AND HVAC SYSTEMS SHALL BE FULLY ANCHORED AND SUPPORTED TO MEET THE WIND CATEGORY C, 130 MPH WIND AND LOAD DESIGN FACTORS LISTED ON THE STRUCTURAL GENERAL NOTES DRAWING.

DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK	APP
02/27/09	DOCUMENT REVISED AND REISSUED FOR REBID	1	CO	RWC	HKP

CYGNET ID: 160751-3000-H-N00012RCX
XREF1: HVAC Schedules.xls
WF: F05.dwg
XREF2:
SAVED: LOV16744, 2/24/2009 10:18:01 AM
XREF3:
PLOTTED: LOV16744, 2/3/2009 2:46:37 PM
XREF4:
USER: LOV16744
DWG VER: 1.10
XREF5:

NORTH CAROLINA PROFESSIONAL SEAL 34772 ENGINEER 2/27/09

BLACK & VEATCH
Black & Veatch International Company
8520 Cliff Cameron Drive, Suite 350
Charlotte, North Carolina 28269

CAPE FEAR PUBLIC UTILITY AUTHORITY
ESMD FACILITY

HVAC SCHEDULES

DESIGNED: CO,KMC
DETAILED: DAH,BDL
CHECKED: RWC
APPROVED: HKP
DATE: 02/27/09

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO. 160751

F5
SHEET
66 OF 86

FD160751
0160751

HVAC - SEQUENCE OF OPERATIONS

EQUIPMENT TAG NUMBER	CONTROL SWITCH TYPE NOTE 1	CONTROL SWITCH LOCATION NOTE 2	AUTO POSITION CONTROL FROM NOTE 3	ASSOCIATED ROOFTOP UNIT NOTE 4	CONTROL DAMPER INTERLOCKS NOTE 5	HUMIDITY CONTROL NOTE 6	100% OUTDOOR AIR CONTROL NOTE 7	FIRE ALARM SYSTEM INTERLOCK NOTE 8	HIGH FILTER LOSS NOTE 9	CARBON DIOXIDE DETECTOR INTERLOCK NOTE 10	ROOM THERMOSTATS: COMB T & H SENSOR NOTE 11 / 12	ROOM THERMOSTATS: ROOM REHEAT SENSOR NOTE 13	OCCUPIED/UNOCCUPIED CONTROL: NIGHT SETBACK CONTROL NOTE 14	OCCUPIED FAN OPERATION NOTE 15	SETBACK FAN OPERATION NOTE 16	OVERRIDE SWITCH LOCATION NOTE 17	SETBACK REMARKS	DDC CONTROL REMARKS
PAC-101	PT	PT	PT		YES	YES		YES	YES		T-101		YES	CONT	INT	T-101		NOTE 19
PAC-102	PT	PT	PT		YES	YES		YES	YES		T-102		YES	CONT	INT	T-102		NOTE 19
PAC-103	O-O-A	ECP	DDCP-101		YES	YES	YES	YES	YES	YES	T-103		YES	CONT	INT	T-103		NOTE 19
PAC-104	PT	PT	PT		YES	YES		YES	YES		T-104		YES	CONT	INT	T-104		NOTE 19
PAC-105	PT	PT	PT		YES	YES		YES	YES		T-105		YES	CONT	INT	T-105		NOTE 19
PAC-106	PT	PT	PT		YES	YES		YES	YES		T-106		YES	CONT	INT	T-106		NOTE 19
PAC-107	PT	PT	PT		YES	YES		YES	YES		T-107		YES	CONT	INT	T-107		NOTE 19
PAC-108	O-O-A	ECP	DDCP-102		YES	YES	YES	YES	YES (2-STAGE)		T-108		YES	CONT	INT	T-108	NOTE 18	NOTE 19
PAC-109	O-O-A	ECP	DDCP-103		YES	YES	YES	YES	YES (2-STAGE)		T-109		YES	CONT	INT	T-109	NOTE 18	NOTE 19
PAC-110	O-O-A	ECP	DDCP-104		YES	YES	YES	YES	YES (2-STAGE)		T-110		YES	CONT	INT	T-110	NOTE 18	NOTE 19
FEF-101	O-O-A	TCP-101	DDCP-102	PAC-108									YES	CONT	OFF	T-108	NOTE 18	NOTE 19
FEF-102	O-O-A	TCP-101	DDCP-103	PAC-109									YES	CONT	OFF	T-109	NOTE 18	NOTE 19
FEF-103	O-O-A	TCP-101	DDCP-104	PAC-110									YES	CONT	OFF	T-110	NOTE 18	NOTE 19
PRV-101	O-O-A	TCP-101	DDCP-102	PAC-104,105									YES	CONT	OFF	T-104,105		NOTE 19
PRV-102	O-O	WMD																
PRV-103	O-O	WMD																
PRV-104	O-O	WMD																
PRV-105	O-O-A	TCP-101	DDCP-102	PAC-108,109,110									YES	CONT	OFF	T-108,109,110	NOTE 18	NOTE 19
PRV-106	O-O-A	TCP-101	DDCP-102	PAC-108									YES	CONT	OFF	T-108	NOTE 18	NOTE 19
PRV-107	O-O-A	TCP-101	DDCP-103	PAC-109									YES	CONT	OFF	T-109	NOTE 18	NOTE 19
PRV-108	O-O-A	TCP-101	DDCP-104	PAC-110									YES	CONT	OFF	T-110	NOTE 18	NOTE 19
EDH-101	O-O-A	ECP	DDCP-101	PAC-103								T-111	YES					NOTE 19
EDH-102	O-O-A	ECP	DDCP-102	PAC-108								T-112	YES					NOTE 19
EDH-103	O-O-A	ECP	DDCP-102	PAC-108								T-113	YES					NOTE 19
EDH-104	O-O-A	ECP	DDCP-103	PAC-109								T-114	YES					NOTE 19
EDH-105	O-O-A	ECP	DDCP-104	PAC-110								T-115	YES					NOTE 19
EDH-106	O-O-A	ECP	DDCP-104	PAC-110								T-116	YES					NOTE 19
EDH-107	O-O-A	ECP	DDCP-104	PAC-110								T-117	YES					NOTE 19
FSD-101 to 110								YES										

HVAC SEQUENCE OF OPERATIONS

1. CONTROL SWITCH TYPE

THE FOLLOWING CONTROL SWITCH TYPE ABBREVIATIONS SHALL APPLY TO THE SEQUENCE OF OPERATIONS:

- O-O ON-OFF
- O-O-A ON-OFF-AUTO
- PT PROGRAMMABLE THERMOSTAT (WITH HUMIDITY SENSOR)

2. CONTROL SWITCH LOCATION

THE FOLLOWING CONTROL ABBREVIATIONS SHALL APPLY:

- CONT CONTINUOUS
- DDCP DIRECT DIGITAL CONTROL PANEL
- ECP EQUIPMENT MOUNTED CONTROL PANEL PROVIDED WITH UNIT
- INT INTERMITTENT
- TCP MOUNTED ON A TEMPERATURE CONTROL PANEL
- WMD WALL MOUNTED INSIDE THE SPACE NEAR AN ENTRANCE

3. AUTOMATIC CONTROL FROM

WHEN THE CONTROL SWITCH IS PLACED IN THE AUTO POSITION, THE EQUIPMENT SHALL BE CONTROLLED BY THE INDICATED CONTROL DEVICES.

4. ASSOCIATED ROOFTOP UNIT

THE DDC SYSTEM SHALL CONTROL THE EQUIPMENT TO OPERATE IN CONJUNCTION WITH ROOFTOP UNIT INDICATED IN THIS COLUMN.

5. CONTROL DAMPER INTERLOCKS

UNLESS OTHERWISE INDICATED, THE CONTROL DAMPERS SHALL BE PROVEN OPEN BEFORE THE EQUIPMENT IS ALLOWED TO ENERGIZE AND CLOSE WHEN THE EQUIPMENT IS DE-ENERGIZED.

CONTROL DAMPERS WITH ROOFTOP PACKAGED AIR CONDITIONERS SHALL COME BUILT IN WITH THE EQUIPMENT AS DESCRIBED IN SPECIFICATION SECTION 15650.

6. HUMIDITY CONTROL

THE UNIT SHALL BE PROVIDED WITH HUMIDITY CONTROL. HUMIDITY CONTROL SHALL BE FROM THE UNIT PROGRAMMABLE THERMOSTAT OR DDC UNIT CONTROLLER.

ROOM THERMOSTATS SHALL HAVE BUILT IN HUMIDITY SENSING AND ADJUSTMENT.

HUMIDITY CONTROL SHALL INCLUDE HOT GAS REHEAT COIL AND MODULATING HOT GAS REHEAT CONTROL VALVE AND ALL NECESSARY CONTROLS.

HUMIDITY CONTROL SHALL COME PACKAGED WITH THE UNIT AS DESCRIBED IN THE PACKAGED AIR CONDITIONER SPECIFICATION IN SECTION 15650.

7. 100% OUTDOOR AIR CONTROL

THE UNIT SHALL BE PROVIDED WITH 100% OUTDOOR AIR CONTROL FROM THE DDC UNIT CONTROLLER.

THE UNIT SHALL PROVIDE UP TO 5 STAGES OF MECHANICAL COOLING, GAS HEATING, DEHUMIDIFICATION, WITH PRE AND POST COOLING COILS AS REQUIRED.

100% OUTDOOR AIR CONTROL SHALL COME PACKAGED WITH THE UNIT AS DESCRIBED IN THE PACKAGED AIR CONDITIONER SPECIFICATION IN SECTION 15650.

8. FIRE ALARM SYSTEM

AS PART OF THE PACKAGED AIR CONDITIONER EQUIPMENT CONTROLS EACH UNIT SHALL INTERFACE WITH THE FIRE DETECTION AND ALARM SYSTEM SPECIFIED IN SECTION 16721. AS SPECIFIED IN SECTION 16721 A NORMALLY CLOSED CONTACT RATED FOR 120 VOLT 10 AMPS SHALL BE FURNISHED IN THE FIRE ALARM CONTROL PANEL FOR EACH PACKAGED AIR CONDITIONING UNIT AND CONNECTED TO THE PACKAGED AIR CONDITIONING UNIT CONTROLS. THE CONTACT SHALL OPEN ON A FIRE ALARM CONDITION AND SHALL SHUTDOWN THE PACKAGED AIR CONDITIONER WITHOUT EXCEPTION. WHEN THE CONTACT IS RESET AT THE FIRE ALARM CONTROL PANEL, THE PACKAGED AIR CONDITIONING UNIT SHALL BE ALLOWED TO RESTART AS REQUIRED BY THE EQUIPMENT CONTROLS. TERMINALS SHALL BE FURNISHED IN THE PACKAGED AIR CONDITIONING UNIT CONTROL PANEL FOR TERMINATION OF THE REQUIRED WIRING.

COMBINATION FIRE/SMOKE DAMPERS SHALL ALSO INTERFACE WITH THE FIRE DETECTION AND ALARM SYSTEM SPECIFIED IN SECTION 16721. WHEN A FIRE ALARM CONDITION IS NOT PRESENT, THE DAMPERS SHALL BE POWERED OPEN FOR NORMAL OPERATION. WHEN A FIRE ALARM CONDITION IS PRESENT, THE FIRE/SMOKE DAMPERS SHALL BE DE-ENERGIZED AND SPRING RETURN TO THE CLOSED POSITION. AN AREA SMOKE DETECTOR SHALL BE LOCATED WITHIN 5 FEET HORIZONTALLY FROM ALL FIRE/SMOKE DAMPERS.

9. HIGH FILTER

A DIFFERENTIAL PRESSURE SWITCH MOUNTED ACROSS THE UNIT FILTER SECTION SHALL SEND AN INDICATION OF DIRTY FILTER CONDITION TO THE UNIT PROGRAMMABLE THERMOSTAT OR UNIT DDC CONTROLLER.

WHEN THE PRESSURE DIFFERENCE ACROSS TWO INCH 30% FILTER SECTIONS EXCEEDS 0.75 INCHES WATER COLUMN A DIRTY FILTER CONDITION SHALL BE INDICATED.

PACKAGED AIR CONDITIONERS PAC-108, 109, AND 110 HAVE TWO STAGE FILTERS. WHEN THE PRESSURE DIFFERENCE ACROSS TWELVE INCH FINAL FILTER SECTIONS EXCEEDS 1.25 INCHES WATER COLUMN A DIRTY FINAL FILTER CONDITION SHALL BE INDICATED.

HIGH FILTER LOSS INDICATION SHALL COME PACKAGED WITH THE UNIT AS DESCRIBED IN THE PACKAGED AIR CONDITIONER SPECIFICATION IN SECTION 15650.

10. CARBON DIOXIDE DETECTOR INTERLOCK

UNIT SHALL HAVE DEMAND CONTROL VENTILATION CAPABLE OF INCREASING VENTILATION UP TO 100% OUTDOOR AIR BASED ON SIGNALS FROM A CARBON DIOXIDE SENSOR MOUNTED IN THE UNIT RETURN AIR OPENING. THE UNIT SHALL BE PROVIDED WITH FACTORY MOUNTED CARBON DIOXIDE DETECTOR, RELIEF HOOD, MODULATING OUTDOOR AIR AND RELIEF DAMPERS.

IN THE UNOCCUPIED MODE, THE OUTDOOR AIR DAMPER SHALL BE MAINTAINED AT THE MINIMUM OUTDOOR AIR SETTING.

11. PROGRAMMABLE THERMOSTAT WITH HUMIDITY SENSOR

STANDARD PACKAGED ROOFTOP UNITS SHALL BE CONTROLLED BY THEIR RESPECTIVE PROGRAMMABLE THERMOSTAT. THE THERMOSTAT SHALL ENERGIZE THE PIECE OF EQUIPMENT TO MAINTAIN THE ROOM TEMPERATURE SETPOINT.

12. COMBINATION TEMPERATURE AND HUMIDITY SENSORS

100% OUTDOOR AIR UNITS SHALL BE CONTROLLED FROM THEIR DDC UNIT CONTROLLERS. THE UNIT COMPRESSORS AND GAS BURNERS SHALL BE CONTROLLED TO MAINTAIN THE SUPPLY AIR SETPOINTS. ROOM HUMIDITY AND TEMPERATURE SENSORS SHALL RE-SET SUPPLY AIR SETPOINTS TO MAINTAIN ROOM SETPOINT TEMPERATURE AND HUMIDITY.

13. ROOM REHEAT SENSORS

THE ELECTRIC DUCT HEATERS SHALL BE CONTROLLED FROM ON-OFF-AUTO SWITCHES LOCATED ON THE UNIT MOUNTED CONTROL PANEL. IN THE AUTO MODE, THE ELECTRIC DUCT HEATERS SHALL BE CONTROLLED FROM THE ROOM TEMPERATURE SENSORS AND DDC SYSTEM CONTROLLER TO MAINTAIN THE ROOM TEMPERATURE SETPOINTS. THE DDC SYSTEM SHALL CONTROL THE OCCUPIED/UNOCCUPIED ROOM SETPOINTS.

14. NIGHT SETBACK CONTROL

NIGHT SETBACK PROGRAMMING FOR OCCUPIED/UNOCCUPIED MODE CONTROL SHALL BE FROM THE UNIT PROGRAMMABLE THERMOSTAT, OR FROM THE DDC SYSTEM AS INDICATED IN THIS COLUMN.

15. OCCUPIED MODE FAN OPERATION

IN THE OCCUPIED MODE, FANS SHALL CONTINUOUSLY OR INTERMITTENTLY AS INDICATED IN THIS COLUMN.

16. SETBACK MODE FAN OPERATION

IN THE UNOCCUPIED MODE FAN SHALL RUN AS INDICATED IN THIS COLUMN. THE OUTSIDE AIR CONTROL DAMPER SHALL BE IN THE CLOSED POSITION.

17. SETBACK OVERRIDE SWITCH LOCATION

THE SETBACK OVERRIDE SWITCH FOR THE EQUIPMENT SHALL BE BUILT IN LOCATED ON THE THERMOSTAT INDICATED IN THIS COLUMN.

18. SETBACK REMARKS

FOR PAC-108, PAC-109 AND PAC-110 IN THE OCCUPIED MODE, THE FAN SHALL RUN CONTINUOUSLY, THE OUTDOOR AIR DAMPER SHALL BE OPEN, THE RETURN AIR DAMPER SHALL BE CLOSED, AND THE UNIT SHALL PROVIDE 100% OUTDOOR AIR VENTILATION. THE ROOM AIR SHALL BE EXHAUSTED BY THE ASSOCIATED FUME HOOD EXHAUST FANS AND POWER ROOF VENTILATORS.

IN THE UNOCCUPIED MODE, THE FAN SHALL RUN INTERMITTENTLY, THE OUTDOOR AIR DAMPER SHALL BE CLOSED, AND THE RETURN AIR DAMPER SHALL BE OPEN. THE FUME HOOD EXHAUST FANS AND POWER ROOF VENTILATORS SERVING THE AREAS SHALL BE DE-ENERGIZED.

19. THE CONTRACTOR SHALL PROVIDE TWO BID PRICE ALTERNATIVES FOR THE TEMPERATURE CONTROLS. THE BASE BID SHALL PROVIDE FOR STAND ALONE PAC UNIT CONTROLS. BID ALTERNATIVE 2 SHALL PROVIDE FOR A NETWORKED DCC CONTROL SYSTEM TO INCLUDE A DDC SYSTEM CONTROL PANEL DDCP-105 AND COMMUNICATIONS TRUNK AS DESCRIBED IN THE SPECIFICATIONS. REFER TO HVAC CONTROLS SCHEMATIC AND HVAC CONTROLS POINT LIST ON SHEET F7 FOR ADDITIONAL INFORMATION.

20. HEATERS

WALL HEATERS, CONVECTIVE HEATERS, CABINET HEATERS, INFRARED HEATERS, FIN TUBE HEATERS, AND BASEBOARD HEATERS SHALL BE CONTROLLED BY THEIR RESPECTIVE THERMOSTATS.

21. TEMPERATURE CONTROL PANELS

TEMPERATURE CONTROL PANELS SHALL BE PROVIDED WITH THE INDICATING LIGHTS, RUNNING LIGHTS, AND SELECTOR SWITCHES AS INDICATED IN THE SEQUENCE OF OPERATIONS. RUNNING LIGHTS SHALL BE PROVIDED FOR EACH CONTROL SWITCH TO INDICATE BOTH ENERGIZED AND DE-ENERGIZED STATUS. INDICATING LIGHT COLORS SHALL BE AS FOLLOWS:

- GREEN - DE-ENERGIZED
- RED - ENERGIZED
- AMBER - ALARM
- WHITE - STATUS

TEMPERATURE CONTROL PANELS SHALL BE PROVIDED WITH ALARM CONDITION INDICATING LIGHTS FOR EACH ALARM CONDITION.

UNLESS OTHERWISE NOTED, THE CONTROL PANEL LISTED SHALL PROVIDE ALL NECESSARY CONTROLS AND INTERLOCKS TO OPERATE ALL ASSOCIATED CONTROL EQUIPMENT WITH THE EQUIPMENT ITEM AS INDICATED IN THE SEQUENCE OF OPERATION. CONTROL PANELS SHALL PROVIDE A SINGLE ISOLATED CONTACT OUTPUT WHICH CLOSES TO ENERGIZE THE EQUIPMENT ITEM AND OPENS TO DE-ENERGIZE THE EQUIPMENT ITEM.

TEMPERATURE CONTROL PANELS SHALL COME WITH PHENOLIC NAMEPLATES FOR EACH CONTROL SWITCH INDICATING SWITCH TYPE, EQUIPMENT CONTROLLED, AND SWITCH AUTOMATIC POSITION EQUIPMENT INTERLOCK.

22. THERMOSTAT SETPOINTS

UNLESS OTHERWISE INDICATED, THERMOSTAT SETPOINTS SHALL BE AS FOLLOWS UNLESS INDICATED OTHERWISE.

AIR CONDITIONED AREAS	- 75° F
	- 50° RH
LABORATORY AREAS	- 70° F
	- 50° RH
NIGHT SETBACK	- 65° F (HEATING)
	- 85° F (COOLING)
LOW LIMIT	- 45° F

DATE	REVISIONS AND RECORD OF ISSUE	CO	NO.	BY	CK	APP
02/27/09	DOCUMENT REVISED AND REISSUED FOR REBID	/		RWC		HKP

CYGNET ID: 160751-3000-H-H000012RCW
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USER: LOV16744
DWG VER: 1.14
XREF1: HVAC Schedules.xls
XREF2:
XREF3:
XREF4:
XREF5:

NORTH CAROLINA PROFESSIONAL SEAL 3??? ENGINEER 2/27/09

BLACK & VEATCH
Black & Veatch International Company
8520 Cliff Cameron Drive, Suite 360
Charlotte, North Carolina 28269

CAPE FEAR PUBLIC UTILITY AUTHORITY
ESMD FACILITY
HVAC SEQUENCE OF OPERATIONS

DESIGNED: CO,KMC
DETAILED: DAH,BDL
CHECKED: RWC
APPROVED:
DATE: 02/27/09

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO. 160751

F6
SHEET 67 OF 86

FD160751
D160751

Item	DO	DI	AO	AI	Comments
PAC-108 (DDCP-102)					
Supply Fan Start/Stop	1				
Supply Fan Status		1			
Outdoor/Return Air Damper Control			1		
Mixed Air Temperature				1	
Return Air Temperature				1	
Outdoor Air Temperature				1	
Pre-Filter Status		1			
Final Filter Status		1			
1st Stg Pre-Cooling	1				
2nd Stg Pre-Cooling	1				
3rd Stg Pre-Cooling	1				
4th Stg Pre-Cooling	1				
Pre-Cooling Discharge Temperature				1	
1st Stg Post-Cooling	1				
1st Stg Post-Cooling Discharge Temperature				1	
Condenser Hot Gas Reheat			1		
Condenser Hot Gas Reheat Discharge Temperature				1	
Gas Heat			1		
Discharge Air Temperature				1	
Duct Static High Limit Sensor		1			
Fire Alarm Interlock		1			
Fume Hood Interlock		1			
Exhaust Fan Interlock		3			
Space Temperature				1	
Space Temperature Setpoint Adjustment				1	
Space Occupied/Unoccupied Control		1			
Space Humidity				1	
PAC-108 (EDH, FEF & PRV Interface)					
EDH-102 Space Temperature				1	
EDH-102 Setpoint Adjust				1	
EDH-102 Unoccupied Override		1			
EDH-102 Heat Control			1		
EDH-103 Space Temperature				1	
EDH-103 Setpoint Adjust				1	
EDH-103 Unoccupied Override		1			
EDH-103 Heat Control			1		
FEF-101 Start/Stop	1				
FEF-101 Status		1			
PRV-101 Start/Stop	1				
PRV-101 Status		1			
PRV-105 Start/Stop	1				
PRV-105 Status		1			
PRV-106 Start/Stop	1				
PRV-106 Status		1			
Totals	10	16	5	14	45

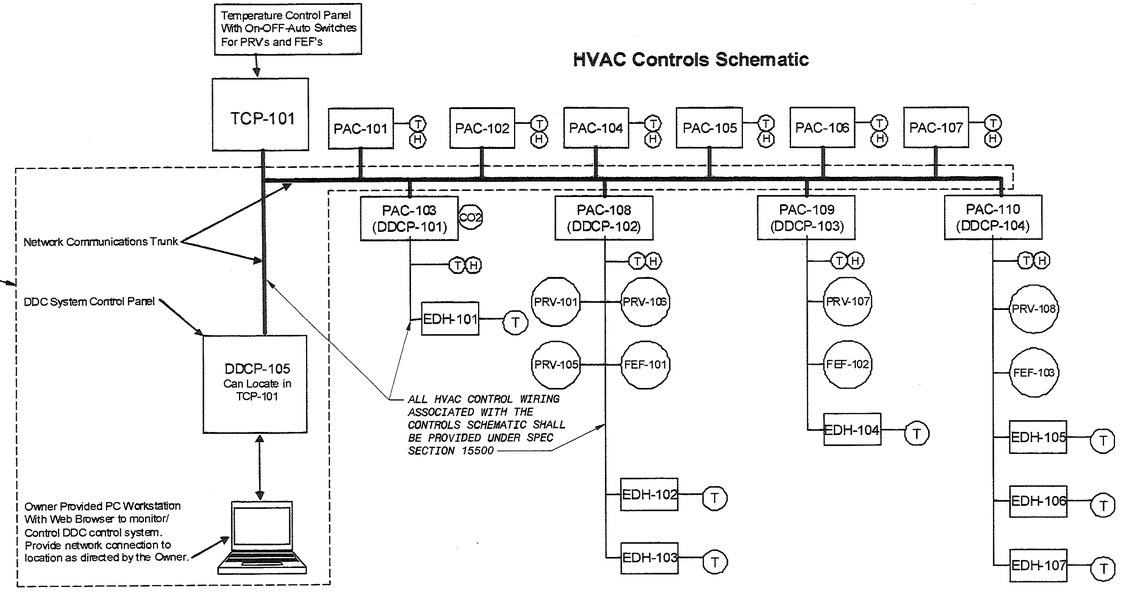
Item	DO	DI	AO	AI	Comments
PAC-103 (DDCP-101)					
Supply Fan Start/Stop	1				
Supply Fan Status		1			
Outdoor/Return Air Damper Control			1		
Mixed Air Temperature				1	
Return Air Temperature				1	
CO2 Sensor				1	
Outdoor Air Temperature				1	
Filter Status		1			
1st Stg Cooling	1				
2nd Stg Cooling	1				
3rd Stg Cooling	1				
4th Stg Cooling	1				
5th Stg Cooling	1				
Cooling Discharge Temperature				1	
Condenser Hot Gas Reheat			1		
Condenser Hot Gas Reheat Discharge Temperature				1	
Gas Heat			1		
Discharge Air Temperature				1	
Duct Static High Limit Sensor		1			
Fire Alarm Interlock		1			
Space Temperature				1	
Space Temperature Setpoint Adjustment				1	
Space Occupied/Unoccupied Control		1			
Space Humidity				1	
PAC-103 (EDH Interface)					
EDH-101 Space Temperature				1	
EDH-101 Setpoint Adjust				1	
EDH-101 Unoccupied Override		1			
EDH-101 Heat Control			1		
Totals	6	6	4	12	28

NOTE:
ALL ADDITIONAL CONTROL COMPONENTS, INCLUDING, BUT NOT LIMITED TO, ELECTRIC RELAYS, TEMPERATURE SENSORS AND TRANSMITTERS, HUMIDITY SENSORS AND TRANSMITTERS, CONTROLLERS, AND POSITION SWITCHES, SHALL BE FURNISHED WHERE NECESSARY TO ENSURE A COMPLETE, PROPERLY OPERATING INSTALLATION. ALL COMPONENTS SHALL BE PRODUCTS OF THE TEMPERATURE CONTROL MANUFACTURER. ACCESSORY COMPONENTS NOT MOUNTED INSIDE THE TEMPERATURE CONTROL PANELS SHALL BE FURNISHED WITH EQUIPMENT ENCLOSURES. RELAYS SHALL BE PROVIDED WITH 120 VOLT COILS AND AT LEAST 10 AMPERE CONTACTS.

Item	DO	DI	AO	AI	Comments
PAC-109 (DDCP-103)					
Supply Fan Start/Stop	1				
Supply Fan Status		1			
Outdoor/Return Air Damper Control			1		
Mixed Air Temperature				1	
Return Air Temperature				1	
Outdoor Air Temperature				1	
Pre-Filter Status		1			
Final Filter Status		1			
1st Stg Pre-Cooling	1				
2nd Stg Pre-Cooling	1				
3rd Stg Pre-Cooling	1				
4th Stg Pre-Cooling	1				
Pre-Cooling Discharge Temperature				1	
1st Stg Post-Cooling	1				
1st Stg Post-Cooling Discharge Temperature				1	
Condenser Hot Gas Reheat			1		
Condenser Hot Gas Reheat Discharge Temperature				1	
Gas Heat			1		
Discharge Air Temperature				1	
Duct Static High Limit Sensor		1			
Fire Alarm Interlock		1			
Fume Hood Interlock		1			
Exhaust Fan Interlock		1			
Space Temperature				1	
Space Temperature Setpoint Adjustment				1	
Space Occupied/Unoccupied Control		1			
Space Humidity				1	
PAC-109 (EDH, FEF & PRV Interface)					
EDH-104 Space Temperature				1	
EDH-104 Setpoint Adjust				1	
EDH-104 Unoccupied Override		1			
EDH-104 Heat Control			1		
FEF-102 Start/Stop	1				
FEF-102 Status		1			
PRV-107 Start/Stop	1				
PRV-107 Status		1			
Totals	8	11	4	12	35

Item	DO	DI	AO	AI	Comments
PAC-110 (DDCP-104)					
Supply Fan Start/Stop	1				
Supply Fan Status		1			
Outdoor/Return Air Damper Control			1		
Mixed Air Temperature				1	
Return Air Temperature				1	
Outdoor Air Temperature				1	
Pre-Filter Status		1			
Final Filter Status		1			
1st Stg Pre-Cooling	1				
2nd Stg Pre-Cooling	1				
3rd Stg Pre-Cooling	1				
4th Stg Pre-Cooling	1				
Pre-Cooling Discharge Temperature				1	
1st Stg Post-Cooling	1				
1st Stg Post-Cooling Discharge Temperature				1	
Condenser Hot Gas Reheat			1		
Condenser Hot Gas Reheat Discharge Temperature				1	
Gas Heat			1		
Discharge Air Temperature				1	
Duct Static High Limit Sensor		1			
Fire Alarm Interlock		1			
Fume Hood Interlock		1			
Exhaust Fan Interlock		1			
Space Temperature				1	
Space Temperature Setpoint Adjustment				1	
Space Occupied/Unoccupied Control		1			
Space Humidity				1	
PAC-110 (EDH, FEF & PRV Interface)					
EDH-105 Space Temperature				1	
EDH-105 Setpoint Adjust				1	
EDH-105 Unoccupied Override		1			
EDH-105 Heat Control			1		
EDH-106 Space Temperature				1	
EDH-106 Setpoint Adjust				1	
EDH-106 Unoccupied Override		1			
EDH-106 Heat Control			1		
EDH-107 Space Temperature				1	
EDH-107 Setpoint Adjust				1	
EDH-107 Unoccupied Override		1			
EDH-107 Heat Control			1		
FEF-103 Start/Stop	1				
FEF-103 Status		1			
PRV-108 Start/Stop	1				
PRV-108 Status		1			
Totals	8	13	6	16	43

HVAC Controls Schematic



BID ALTERNATIVE 2 - HVAC DDC CONTROLS NETWORK
THE CONTRACTOR SHALL PROVIDE TWO BID PRICE ALTERNATIVES FOR THE TEMPERATURE CONTROLS. THE BASE BID SHALL PROVIDE FOR STAND ALONE PAC UNIT CONTROLS. BID ALTERNATIVE 2 SHALL PROVIDE FOR A NETWORKED DCC CONTROL SYSTEM TO INCLUDE A DDC SYSTEM CONTROL PANEL DDCP-105 AND COMMUNICATIONS TRUNK AS DESCRIBED IN THE SPECIFICATIONS SECTION 15500 PARAGRAPH 2-4.18.04.01.

Item	DO	DI	AO	AI	Comments
PAC-101, 102, 104, 105, 106 & 107					
Supply Fan Start/Stop	1				
1st Stg Cooling	1				
2nd Stg Cooling	1				
1st Stg Heating	1				
2nd Stg Heating	1				
Condenser Hot Gas Reheat	1				
Space Temperature				1	
Space Temperature Setpoint Adjustment				1	
Space Occupied/Unoccupied Control		1			
Space Humidity				1	
Fire Alarm Interlock		1			
Totals	6	2	0	3	11

NOTE:
DO = DIGITAL OUTPUT, DI = DIGITAL INPUT, AO = ANALOG OUTPUT, AI = ANALOG INPUT

FOR REFERENCE ONLY

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE
/	CO	RWC	HPK	02/27/09	DOCUMENT REVISED AND REISSUED FOR REBID

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USER: LOVI6744
XREF1: HVAC Controls Points List.xls
XREF2: HVAC Controls Schematic.ppt
XREF3:
XREF4:
XREF5:
DWG VER: 1.19

PROFESSIONAL ENGINEER SEAL 24772 NORTH CAROLINA REGISTERED 2/27/09

BLACK & VEATCH
Black & Veatch International Company
8520 Cliff Cameron Drive, Suite 350
Charlotte, North Carolina 28269

CAPE FEAR PUBLIC UTILITY AUTHORITY
ESMD FACILITY

HVAC CONTROLS SCHEMATIC AND POINTS LIST

DESIGNED: CO,KMC
DETAILED: DAH,BDL
CHECKED: RWC
APPROVED: HPK
DATE: 02/27/09

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IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO. 160751

F7
SHEET 68 OF 86

F0160751
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