RECC HVAC MODIFICATIONS
WORCESTER, MA

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WORCESTER, MA 01603

SEPTEMBER 24, 2021

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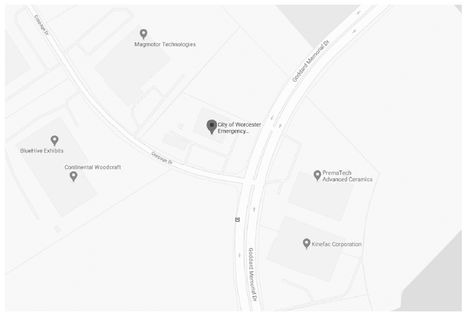

DRAWING LIST	
HVAC	
H100	HVAC LEGEND
H101	HVAC DEMOLITION PLAN
H102	HVAC NEW PLAN
H103	HVAC DETAILS
H104	HVAC SCHEDULES
H105	HVAC CONTROLS
ELECTRICAL	
E001	ELECTRICAL LEGEND, NOTES AND ABBREVIATIONS
E202	ELECTRICAL POWER PLAN PLANS

ISSUED FOR:
CONSTRUCTION
DOCUMENTS

PIPING SYSTEMS

- BOILER FEED WATER
- BRINE SUPPLY
- BRINE RETURN
- CHILLED WATER SUPPLY
- CHILLED WATER RETURN
- CITY WATER MAKEUP
- COMPRESSED AIR
- CONDENSATION DRAIN
- CONDENSER WATER SUPPLY
- CONDENSER WATER RETURN
- DIRECTION OF PITCH
- DIRECTION OF FLOW
- FILL
- FUEL OIL SUPPLY
- FUEL OIL RETURN
- FUEL OIL GAUGE
- GAS
- GLYCOL SUPPLY
- GLYCOL RETURN
- HIGH PRESSURE STEAM SUPPLY
- HIGH PRESSURE STEAM CONDENSATE
- HOT WATER SUPPLY
- HOT WATER RETURN
- LOW PRESSURE STEAM SUPPLY
- LOW PRESSURE STEAM CONDENSATE
- MEDIUM PRESSURE STEAM SUPPLY
- MEDIUM PRESSURE STEAM CONDENSATE
- PUMPED CONDENSATE
- REFRIGERANT LIQUID
- REFRIGERANT SUCTION
- REFRIGERANT HOT GAS
- VENT

PIPING SYMBOLS

- 2-WAY MODULATING PRESSURE INDEPENDENT ACV (PIACV)
- 2-WAY AUTOMATIC CONTROL VALVE (MODULATING)
- 2-WAY AUTOMATIC CONTROL VALVE (TWO POSITION)
- 3-WAY AUTOMATIC CONTROL VALVE (MODULATING)
- 3-WAY AUTOMATIC CONTROL VALVE (TWO POSITION)
- AUTOMATIC FLOW LIMITING VALVE (PRESSURE INDEPENDENT)
- GATE VALVE
- CHECK VALVE
- TRIPLE DUTY VALVE
- GLOBE VALVE
- BALL VALVE
- BALANCING VALVE
- COMBINATION BALANCING & SHUT-OFF VALVE
- PRESSURE REDUCING VALVE
- BUTTERFLY VALVE
- ANGLE VALVE
- RELIEF/SAFETY VALVE
- WEIGHTED LEVER VALVE
- DRAIN/HOSE BIBB
- AIR VENT
- STRAINER W/HOSE BIBB DRAIN
- FLOAT & THERMOSTATIC TRAP
- INVERTED BUCKET TRAP
- TEE-TURNED DOWN
- ELBOW-TURNED DOWN
- ELBOW-TURNED UP
- PIPE ANCHOR
- PIPE GUIDE
- FLEXIBLE PIPE CONNECTION
- REDUCER
- PIPE CAP
- UNION
- COMPANION FLANGE
- BLIND FLANGE
- FLOW MEASURING STATION
- FLOW VENTURI
- THERMOMETER
- GAUGES (PRESSURE)
- PRESSURE TAP
- HUMIDIFIER

CALLOUT SYMBOLS

- THERMOSTAT (TEMPERATURE SENSOR)
- THERMOSTAT-EXISTING (TEMPERATURE SENSOR)
- THERMOSTAT-RELOCATED (TEMPERATURE SENSOR)
- THERMOSTAT-NEW (TEMPERATURE SENSOR)
- HUMIDISTAT (HUMIDITY SENSOR)
- CARBON DIOXIDE (CO2) SENSOR
- CARBON MONOXIDE (CO) SENSOR
- CONNECT NEW TO EXISTING
- LIMIT OF REMOVAL
- SMOKE DETECTOR
- EXISTING TO BE REMOVED
- EXISTING TO REMAIN

F / - / -
MOTORIZED EQUIPMENT (EF, AHU, ETC)
UPPER - EQUIPMENT DESIGNATION
LOWER - EQUIPMENT NUMBER

FPT / MAX / MIN / - | FPT / MBH / GPM / -
MOTORIZED EQUIPMENT (FPT)
UPPER - EQUIPMENT DESIGNATION
MIDDLE - MAX CFM or MBH
LOWER - MIN CFM or GPM

ET / - / -
NON-MOTORIZED EQUIPMENT (ET, AS, ETC)
UPPER - EQUIPMENT DESIGNATION
LOWER - EQUIPMENT NUMBER

VAV / MAX / MIN / - | VAV / MBH / GPM / -
NON-MOTORIZED EQUIPMENT (VAV, EXV)
UPPER - EQUIPMENT DESIGNATION
MIDDLE - MAX CFM or MBH
LOWER - MIN CFM or GPM

A / H-1
UPPER - SECTION DESIGNATION
LOWER - DRAWING NUMBER

12 / H-1
UPPER - RISER IDENTIFICATION
LOWER - RISER NUMBER

- UNDERCUT DOOR
- LOUVERED DOOR

ABBREVIATIONS

ACD	AUTOMATIC CONTROL DAMPER
ACV	AUTOMATIC CONTROL VALVE
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AP	ACCESS PANEL
ATC	AUTOMATIC TEMPERATURE CONTROL
CFM	CUBIC FEET PER MINUTE
CO	CLEAN OUT
DB	DRY BULB
DX	DIRECT EXPANSION
EAT	ENTERING AIR TEMPERATURE
ETC	ETCETERA
ETR	EXISTING TO REMAIN
EWT	ENTERING WATER TEMPERATURE
EXH	EXHAUST
FLA	FULL LOAD AMPS
FD	FIRE DAMPER
FSD	COMBINATION FIRE DAMPER/SMOKE DAMPER
FPM	FEET PER MINUTE
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
HP	HORSEPOWER
HPR	HIGH PRESSURE STEAM CONDENSATE RETURN
HPS	HIGH PRESSURE STEAM SUPPLY
LAT	LEAVING AIR TEMPERATURE
LBS/HR	POUNDS PER HOUR
LPR	LOW PRESSURE STEAM CONDENSATE RETURN
LPS	LOW PRESSURE STEAM SUPPLY
LRA	LOCK ROTOR AMPS
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MBH	THOUSAND BTU PER HOUR
MD	MOTORIZED DAMPER
MIN	MINIMUM
MPR	MEDIUM PRESSURE STEAM RETURN
MPS	MEDIUM PRESSURE STEAM SUPPLY
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
OA	OUTSIDE AIR
OBD	OPPOSED BLADE DAMPER
OED	OPEN END DRAIN
PIACV	PRESSURE INDEPENDENT AUTOMATIC CONTROL VALVE
PD	PRESSURE DROP
PE	PNEUMATIC ELECTRIC SWITCH
PRV	PRESSURE REDUCING VALVE
RA	RETURN AIR
RH	RELATIVE HUMIDITY
RPM	REVOLUTIONS PER MINUTE
SMD	SMOKE DAMPER
SD	SMOKE DETECTOR
SP	STATIC PRESSURE (INCHES OF WATER)
SPD	SPLITTER DAMPER
VD	VOLUME DAMPER
WC	WATER COLUMN
WB	WET BULB TEMPERATURE °F
WMS	WIRE MESH SCREEN
X	EXISTING TO BE REMOVED
XTR	EXISTING TO REMAIN
XR	EXISTING TO BE RELOCATED
XRN	RELOCATED EQUIPMENT IN NEW LOCATION

DUCTWORK SYMBOLS

- 14 x 6 — RECTANGULAR DUCT
- 24 x 12 — FLAT OVAL DUCT
- 12"Ø — ROUND DUCT
- 24 / 12 — DUCT SECTION - SUPPLY
- 24 / 12 — DUCT SECTION - RETURN
- 12" Ø — ROUND DUCT WITH SIZE
- 12 / 48 — FLAT OVAL DUCT WITH SIZE
- DUCT TURNING UP
- DUCT TURNING DOWN
- VOLUME EXTRACTOR
- SPLITTER DAMPER
- DN — DUCT DROP IN RESPECT TO AIR FLOW
- UP — DUCT RISE IN RESPECT TO AIR FLOW
- FLEXIBLE DUCT CONNECTION
- DIFFUSER
- RETURN/EXHAUST OUTLET
- DIFFUSER WITH FLEX DUCT
- RETURN/EXHAUST OUTLET
- ACOUSTICAL DUCT LINING
- SOUND ATTENUATOR
- EXISTING DUCT TO REMAIN
- EXISTING DUCT TO BE REMOVED
- FD — FIRE DAMPER
- SD — SMOKE DAMPER
- FSD — COMBINATION FIRE/SMOKE DAMPER
- VD — VOLUME DAMPER
- MD — MOTORIZED DAMPER
- ACD — AUTOMATIC CONTROL DAMPER
- TRANSFER DUCT

GENERAL NOTES

1. THE HEATING, VENTILATING AND AIR CONDITIONING (HVAC) CONTRACTOR SHALL VISIT THE SITE TO DETERMINE ALL PRE-EXISTING CONDITIONS AND WORK NECESSARY PRIOR TO SUBMISSION OF BID PRICE.
2. THE HVAC CONTRACTOR SHALL BE FAMILIAR WITH ALL CONTRACT DOCUMENTS FOR ALL TRADES AND COORDINATE WITH OTHER CONTRACTORS.
3. THE DRAWINGS ARE DIAGRAMMATIC ONLY; FINAL ROUTING OF DUCTWORK, PIPING AND EQUIPMENT LOCATIONS SHALL BE DETERMINED IN THE FIELD. PROVIDE ALL ADDITIONAL OFFSETS, ELBOWS, ETC., AT NO ADDITIONAL COST TO THE OWNER.
4. CONSTRUCT AND INSTALL ALL DUCTWORK IN ACCORDANCE WITH THE LATEST EDITION OF SMACNA STANDARDS.
5. PROVIDE VOLUME DAMPERS AT ALL LOW PRESSURE SUPPLY, RETURN AND EXHAUST DUCTWORK BRANCH TAKE-OFFS.
6. MINIMUM SIZE OF CONDENSATE DRAIN PIPING SHALL BE 3/4" UNLESS OTHERWISE NOTED.
7. COORDINATE ALL ELECTRICAL AND PLUMBING REQUIREMENTS WITH THE ELECTRICAL AND PLUMBING CONTRACTORS.
8. INTERNALLY LINE THE SUPPLY AND RETURN DUCT MAINS FROM AIR HANDLING EQUIPMENT WITH 1" ACOUSTICAL LINING FOR A MINIMUM OF 10' FROM THE UNIT UNLESS OTHERWISE NOTED. ALL DUCTWORK DIMENSIONS INDICATED ARE CLEAR INSIDE DIMENSIONS. ALL INTERNAL ACOUSTICAL DUCT LINING SHALL HAVE THE AIR SURFACE COATED WITH ACRYLIC COATING FORMULATED WITH IMMOBILIZED EPA REGISTERED ANTI-MICROBIAL AGENT PROVEN TO RESIST MICROBIAL GROWTH AS DETERMINED BY ASTM G21 AND G22.
9. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR FINAL LOCATIONS OF DIFFUSERS, REGISTERS AND GRILLES.
10. AUTOMATIC TEMPERATURE CONTROL (ATC) CONTRACTOR: COORDINATE THERMOSTAT LOCATIONS WITH THE ARCHITECTURAL FURNITURE PLANS. INSTALL ALL SENSORS AND FINISHED SPACE CONTROLS INCLUDING THERMOSTATS 54" ABOVE FINISHED FLOOR UNLESS OTHERWISE NOTED.
11. PROVIDE ALL INCIDENTAL ACCESSORIES NECESSARY TO MAKE THE HVAC WORK COMPLETE AND READY FOR OPERATION.
12. PROVIDE (FURNISH AND INSTALL) ALL HVAC WORK SHALL BE IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL CODES.
13. INSTALL ALL HVAC EQUIPMENT IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
14. DEMOLITION WORK SHALL BE DONE BY THE HVAC CONTRACTOR. THE HVAC CONTRACTOR SHALL COORDINATE ALL WORK CONCERNING EXISTING EQUIPMENT AND SYSTEMS REMAINING IN THE BUILDING.
15. THE HVAC CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE INTEGRITY, CONDITION AND LOCATION OF EXISTING DUCTWORK AND PIPING WHICH IS TO BE REUSED. IF PIPING AND DUCTWORK CANNOT BE REUSED, THE CONTRACTOR SHALL NOTIFY THE ARCHITECT/ENGINEER TO DETERMINE THE EXTENT OF REPLACEMENT.
16. PROVIDE FIRE DAMPERS AND ACCESS PANELS AT ALL FIRE RATED ASSEMBLIES AND FLOOR PENETRATIONS. REFER TO ARCHITECTURAL DRAWINGS FOR ASSEMBLY LOCATIONS.
17. PROVIDE FIRE DAMPERS AT ALL TRANSFER DUCTS IN FIRE RATED PARTITIONS.
18. PROVIDE ISOLATION VALVES IN SUPPLY AND RETURN PIPING ON EACH FLOOR, AND IN BRANCH PIPING SERVING MORE THAN ONE PIECE OF EQUIPMENT.
19. PROVIDE SHUTOFF VALVES IN THE SUPPLY AND RETURN PIPING TO ALL EQUIPMENT TO ALLOW FOR SERVICING. UNIONS OR FLANGES SHALL BE ARRANGED SUCH THAT EQUIPMENT CAN BE SERVICED WITHOUT CUTTING AND MINIMAL DISRUPTION OF PIPING SERVING THE EQUIPMENT.
20. FURNISH TO THE GENERAL CONTRACTOR ALL INFORMATION REQUIRED FOR SETTING OF WALL, ROOF AND PARTITION OPENINGS FOR HVAC WORK. THIS INFORMATION SHALL BE FURNISHED IN A TIMELY MANNER SUCH THAT CONSTRUCTION SCHEDULE IS NOT JEOPARDIZED.
21. INFORM AND COORDINATE WITH THE OWNER ALL NECESSARY INTERRUPTIONS TO EXISTING BUILDING SYSTEMS AND SERVICE THAT MAY AFFECT THE NORMAL OPERATION OF OCCUPIED PORTIONS OF THE BUILDING. THE OWNER SHALL BE INFORMED OF ANY INTERRUPTIONS AT LEAST TWO (2) WEEKS IN ADVANCE.
22. INFORM THE OWNER WELL IN ADVANCE OF ANY WORK TO BE UNDERTAKEN IN OCCUPIED AREAS OF THE BUILDING ASSOCIATED WITH THIS PROJECT. CONFORM TO THE OWNER'S CRITERIA FOR WORK HOURS, ENVIRONMENTAL ISOLATION, AND NOISE LIMITS IN THE PORTIONS OF THE BUILDING WHICH REMAIN OCCUPIED DURING CONSTRUCTION.
23. COORDINATE PHASING REQUIREMENTS FOR THE PROJECT WITH THE GENERAL CONTRACTOR.
24. FIELD MEASURE THE EXACT SIZES AND VERIFY ALL OPENINGS FOR SHAFTS AND LOUVERS PRIOR TO SUBMISSION OF SHOP DRAWINGS AND INSTALLATION.
25. MINIMAL CONTROL POWER HAS BEEN IDENTIFIED ON THE DRAWINGS. IF ANY ADDITIONAL POWER IS REQUIRED BASED ON SYSTEMS DESIGN BY THE CONTROLS CONTRACTOR THE ATC/BAS CONTRACTOR SHALL BE RESPONSIBLE TO SUPPLY THAT POWER

DEMOLITION NOTES

1. ALL WORK SHALL CONFORM TO THE STATE OF BUILDING CODES AND ALL OTHER APPLICABLE CODES AND REGULATIONS.
2. THE DRAWINGS DEPICT ONLY GENERALLY THE EXISTING CONDITIONS. THE CONTRACTOR SHALL MAKE FIELD OBSERVATIONS AND CONFIRM WALL LOCATIONS, DUCTWORK, PIPING AND OTHER UTILITIES ABOVE EXISTING CEILINGS.
3. ALL CONFLICTS AND ITEMS FOR CLARIFICATIONS SHALL BE BROUGHT TO THE ENGINEER/ARCHITECT'S ATTENTION PRIOR TO WORK IN THE AREA.
4. THE CONTRACTOR IS RESPONSIBLE TO FOLLOW BUILDING MANAGEMENT RULES WITH REGARDS TO TRASH, ELEVATORS, NOISE, SPRINKLERS AND FIRE ALARM.
5. THE CONTRACTOR SHALL MAINTAIN IN OPERATION ALL EXISTING UTILITIES DURING CONSTRUCTION.
6. ITEMS IDENTIFIED TO BE SALVAGED SHALL BE STOCKPILED IN AN AREA FOR REMOVAL BY THE OWNER; ALL OTHER ITEMS TO BE REMOVED SHALL BE DISPOSED OF LEGALLY OFF SITE. ALL ITEMS BEING REMOVED AND NOT REUSED SHALL BE DISPOSED OF AS DIRECTED BY THE OWNER.
7. CAPPING OF ALL SERVICES SHALL BE PERFORMED TO LEAVE EXISTING SERVICES TO OTHER AREAS INTACT AND FUNCTIONAL.
8. ALL DEMOLITION WORK WILL BE SCHEDULED WITH BUILDING MANAGEMENT AND PERFORMED ONLY FOLLOWING APPROVAL.
9. THE CONTRACTOR SHALL INFORM BUILDING MANAGEMENT AND RECEIVE SCHEDULE APPROVAL FOR ANY REQUIRED UTILITY SHUTDOWN.
10. WHERE EQUIPMENT IS SHOWN TO BE REMOVED, THE EQUIPMENT SHALL BE DELIVERED TO BUILDING MANAGEMENT FOR STORAGE OR PROPERLY DISPOSED OF AS DIRECTED BY BUILDING MANAGEMENT.
11. WHERE EQUIPMENT IS SHOWN OR NOTED AS BEING REMOVED & REPLACED AFTER WALL/CEILING STRUCTURAL OR ARCHITECTURAL WORK IS PERFORMED, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER, SAFE STORAGE OF SUCH EQUIPMENT.
12. ANY DUCTWORK SHOWN TO BE REMOVED SHALL INCLUDE REMOVE OF ALL ASSOCIATED DUCTWORK, FLEXIBLE CONNECTIONS, DIFFUSERS, HANGERS, INSULATION, ETC.
13. ANY PIPING SHOWN TO BE REMOVED WILL BE REMOVED TO THE POINT INDICATED ON THE DRAWING OR TO THE ACTIVE MAIN AND VALVED AND CAPPED. PIPING REMOVAL SHALL INCLUDE ALL HANGERS, VALVES, INSULATION, ETC.
14. EXISTING DUCTWORK SHALL BE CAPPED AND SEALED AIR TIGHT, EXCEPT WHERE UTILIZED FOR NEW BRANCH DUCTWORK.
15. THERMOSTATS ARE TO BE RELOCATED AS SHOWN ON NEW WORK DRAWING.
16. REMOVE AND CLEAN ALL SUPPLY, RETURN & EXHAUST DIFFUSERS & GRILLES. RE-INSTALL OR SAVE FOR RELOCATION AS SHOWN ON NEW WORK PLAN.
17. ALL DIFFUSERS TO BE TIED TO UNDERSIDE OF STRUCTURE TO FACILITATE REMOVAL OF EXISTING CEILING AND MAINTAIN DIFFUSER CONNECTION TO DUCTWORK WHERE APPLICABLE. DIFFUSERS SHALL BE REPLACED INTO NEW CEILING GRID AS SHOWN ON NEW WORK DRAWING. ADDITIONAL LENGTH OF FLEX MAY BE REQUIRED FOR DIFFUSERS.
18. CONTRACTOR SHOULD SURVEY EXISTING CONDITIONS AND INFORM ENGINEER OF ANY DEVIATIONS PRIOR TO CONSTRUCTION.

Project:

CITY OF WORCESTER, MA

WORCESTER REGIONAL EMERGENCY COMMUNICATIONS CENTER HVAC EVALUATION

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Consultants:

Revisions:

No.	Date	Description

Seal:

COA:

Issued For:

CONSTRUCTION DOCUMENTS

Scale:	AS NOTED
Date:	SEPTEMBER 24, 2021
Drawn By:	AVS
Reviewed By:	SEH
Approved By:	SEH
W&S Project No.:	ENG20-0504
W&S File No.:	

Drawing Title:

HVAC LEGEND

Sheet Number:

H100

Rev: 1.5 Date: 04/10/2019

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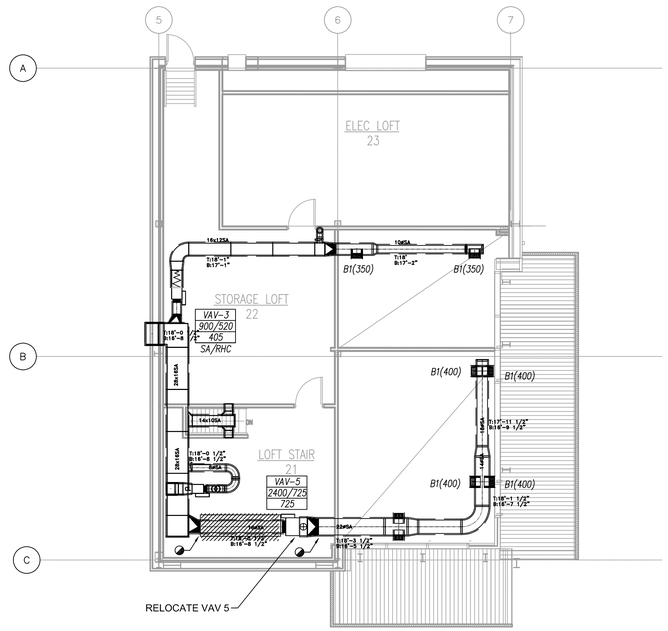
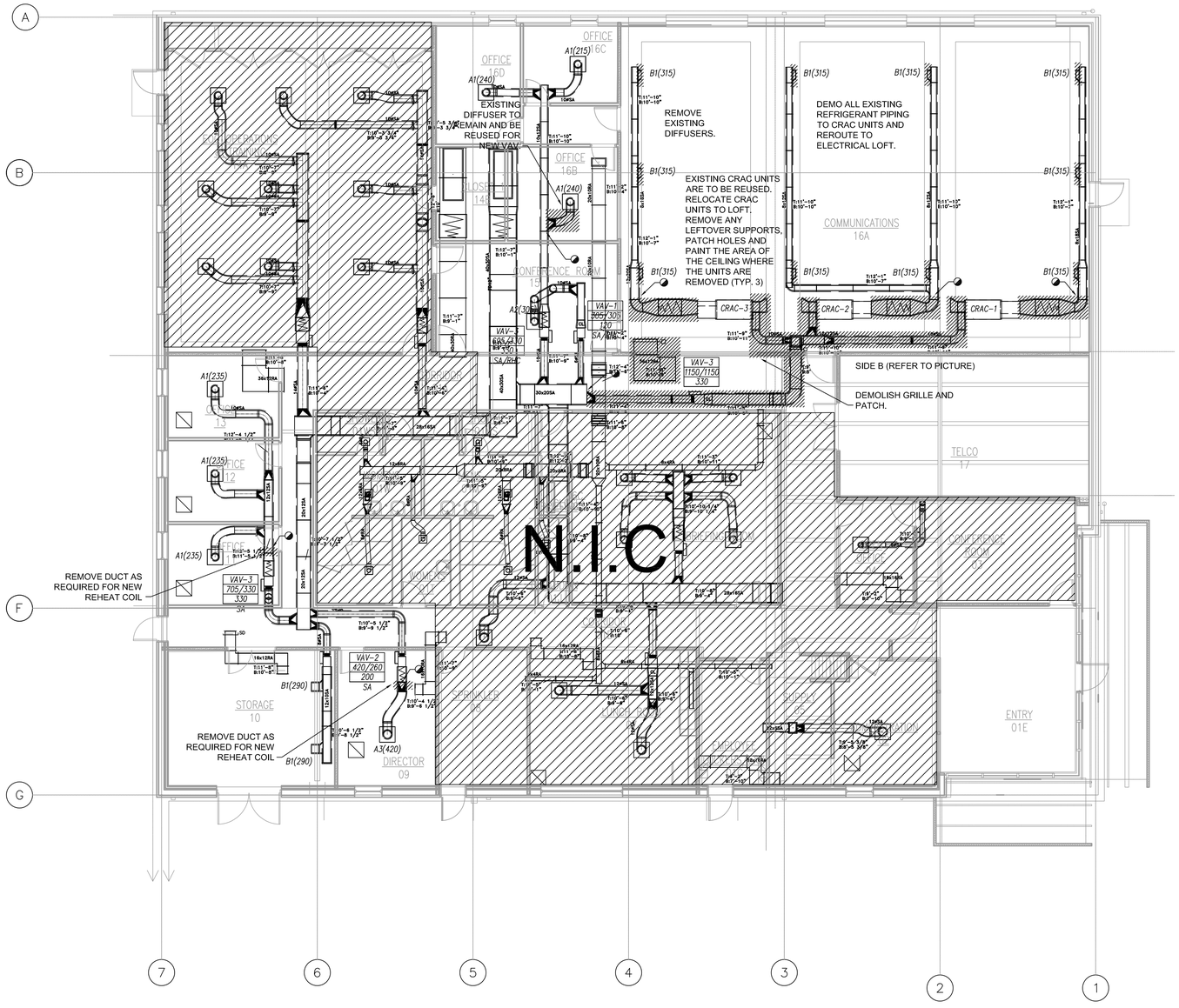
SIDE B

SIDE A

NOTE: CALL CENTER WILL BE IN OPERATION DURING CONSTRUCTION. CONTRACTOR WILL BE RESPONSIBLE FOR WORKING AROUND AND PROTECTING EQUIPMENT. CALL CENTER WILL PROVIDE A 2-WEEK VACANCY TO ALLOW FOR WORK THAT MIGHT IMPACT THE CALL CENTER'S OPERATION, PRIMARILY HEAVY AND NOISY WORK SUCH AS DEMOLITION AND SHEET METAL WORK. MINOR WORK SUCH AS BALANCING THAT IS NOT NOISY AND DOES NOT INTERFERE WITH THE CALL CENTER'S WORK WILL BE ALLOWED WHILE THE CALL CENTER IS OPERATIONAL. EXISTING CALL CENTER EQUIPMENT SHALL REMAIN WHILE IN CONSTRUCTION. EXISTING EQUIPMENT SHALL BE PROTECTED FROM ALL CONSTRUCTION DAMAGE FOR THE DURATION OF THE PROJECT. IN THE EVENT THE HEAVY AND NOISY WORK IS NOT COMPLETED WITHIN THE 2-WEEK VACANCY PERIOD AND THE CALL CENTER CANNOT OPERATE DUE TO WORK NOISE ETC., LIQUIDATED DAMAGES SHALL BE ASSESSED AT THE RATE OF $1,300/DAY THAT THE CALL CENTER CANNOT OPERATE OUTSIDE THE 2-WEEK VACANCY. CONTRACTOR SHALL PROVIDE A 1-WEEK NOTICE FOR THE OWNER TO VACATE THE CALL CENTER FOR 2 WEEKS. THE 2-WEEK VACANCY SHALL BE CONTINUOUS.



SIDE A (REFER TO PICTURE)



0' 4' 8' 16'

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

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Reviewed By:	SEH
Approved By:	SEH
W&S Project No.:	ENG20-0504
W&S File No.:	

Drawing Title:

HVAC DEMOLITION PLAN

Sheet Number:

H101

Rev: 1.6 Date: 04/10/2019

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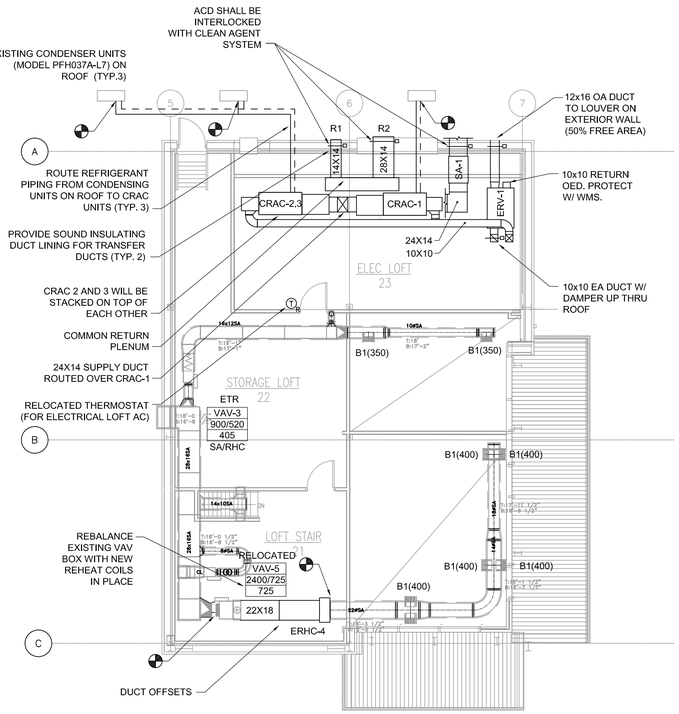

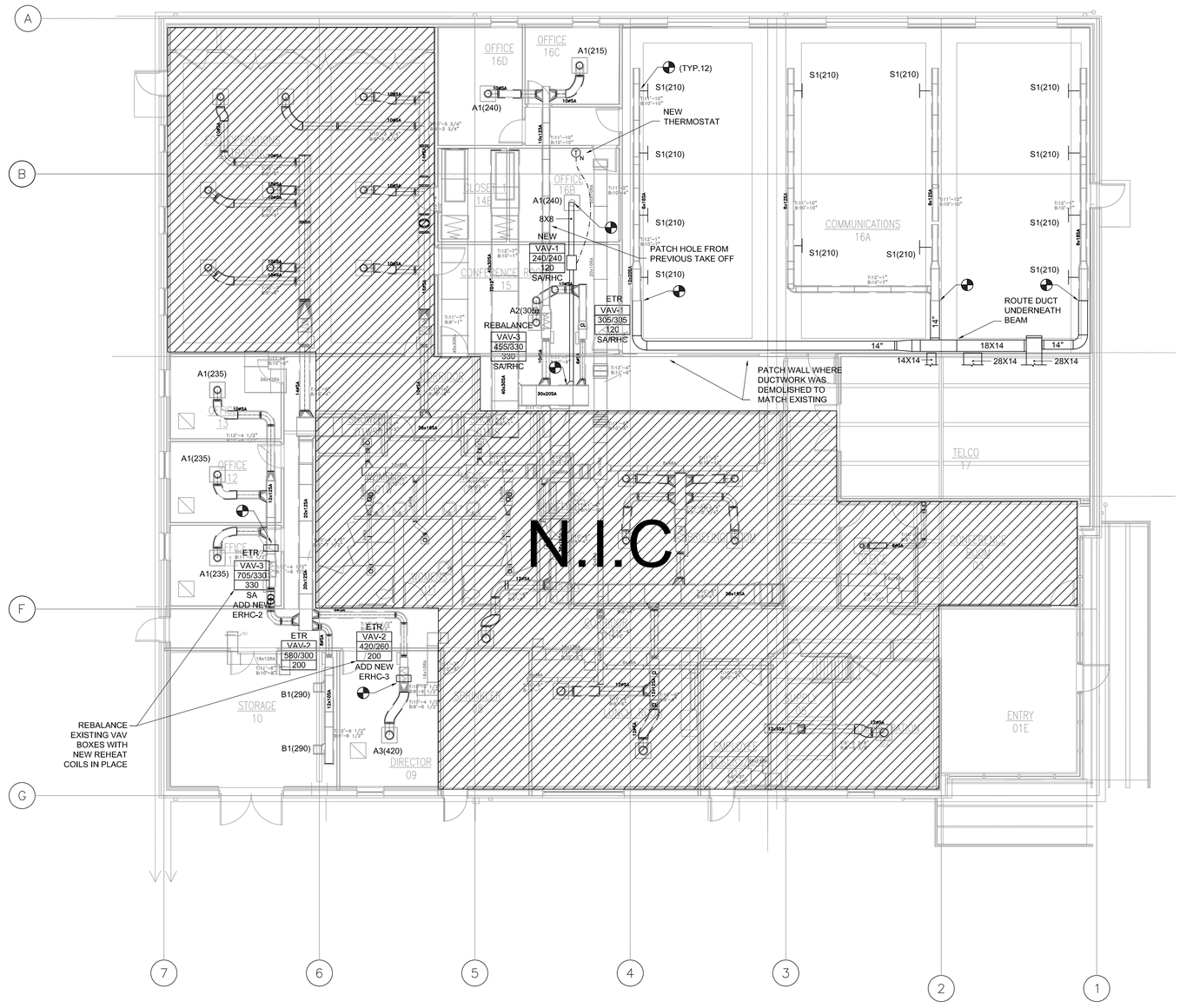

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Reviewed By:	SEH
Approved By:	SEH
W&S Project No.:	ENG20-0504
W&S File No.:	

Drawing Title:

HVAC NEW PLAN

Sheet Number:

H102

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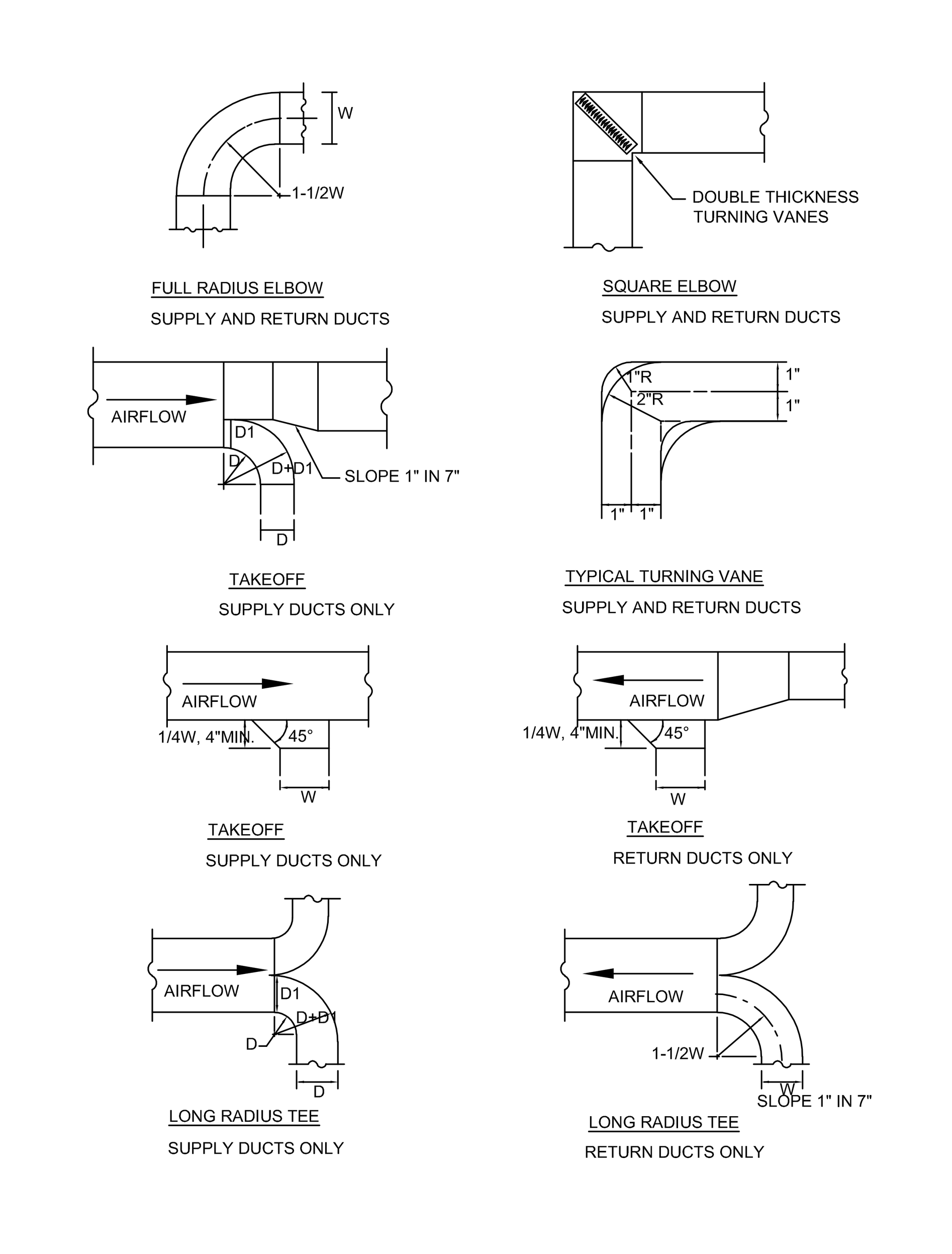
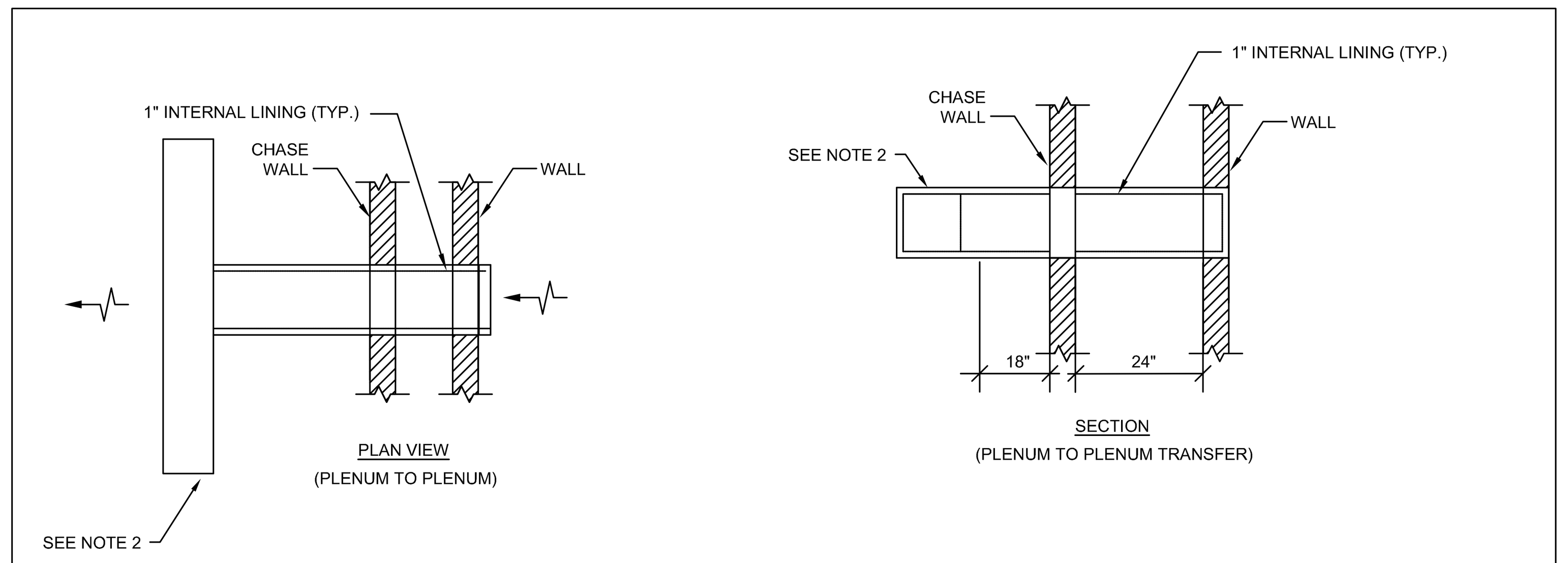
Rev: 1.0 Date: 04/10/2019



TYPICAL DUCT DETAILS

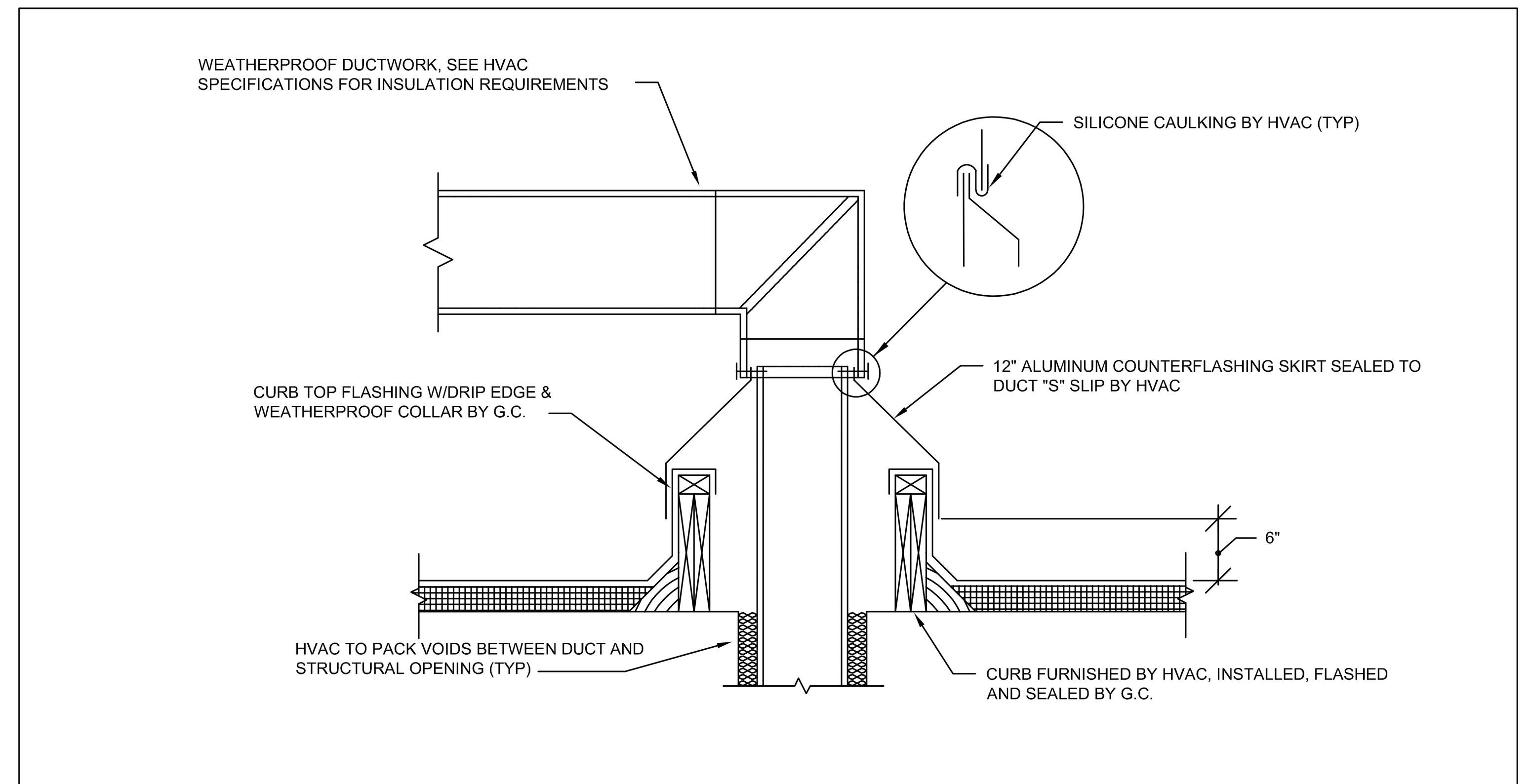


NOTES:

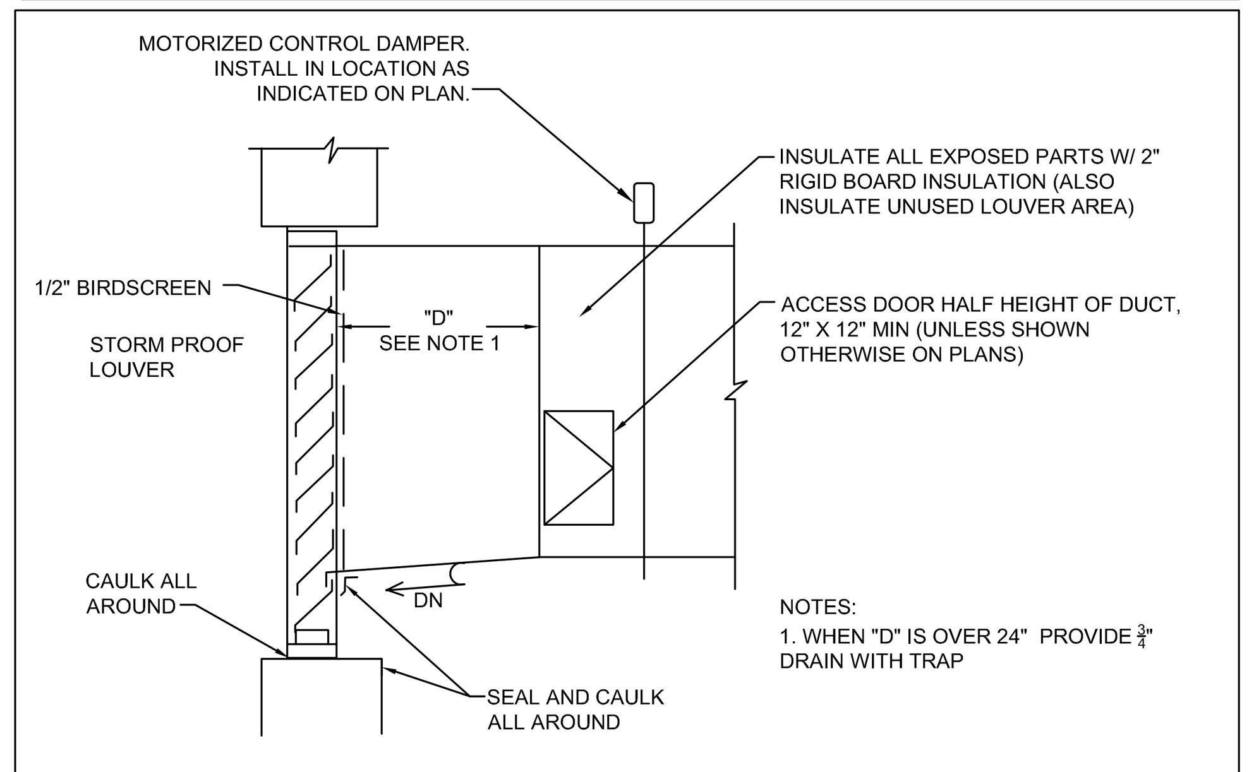
REFER TO ARCHITECTURAL DRAWINGS FOR FULL HEIGHT WALL PARTITIONS.
PROVIDE TRANSFER AIR DUCT IN EACH ROOM AND/ORWHERE SHOWN ON THE DRAWINGS.
REFER TO FLOOR PLANS FOR TRANSFER DUCT SIZE.

1. SUPPORT TRANSFER DUCT FROM STRUCTURE ABOVE.
2. COMMON RETURN PLENUM

TRANSFER DUCT DETAIL

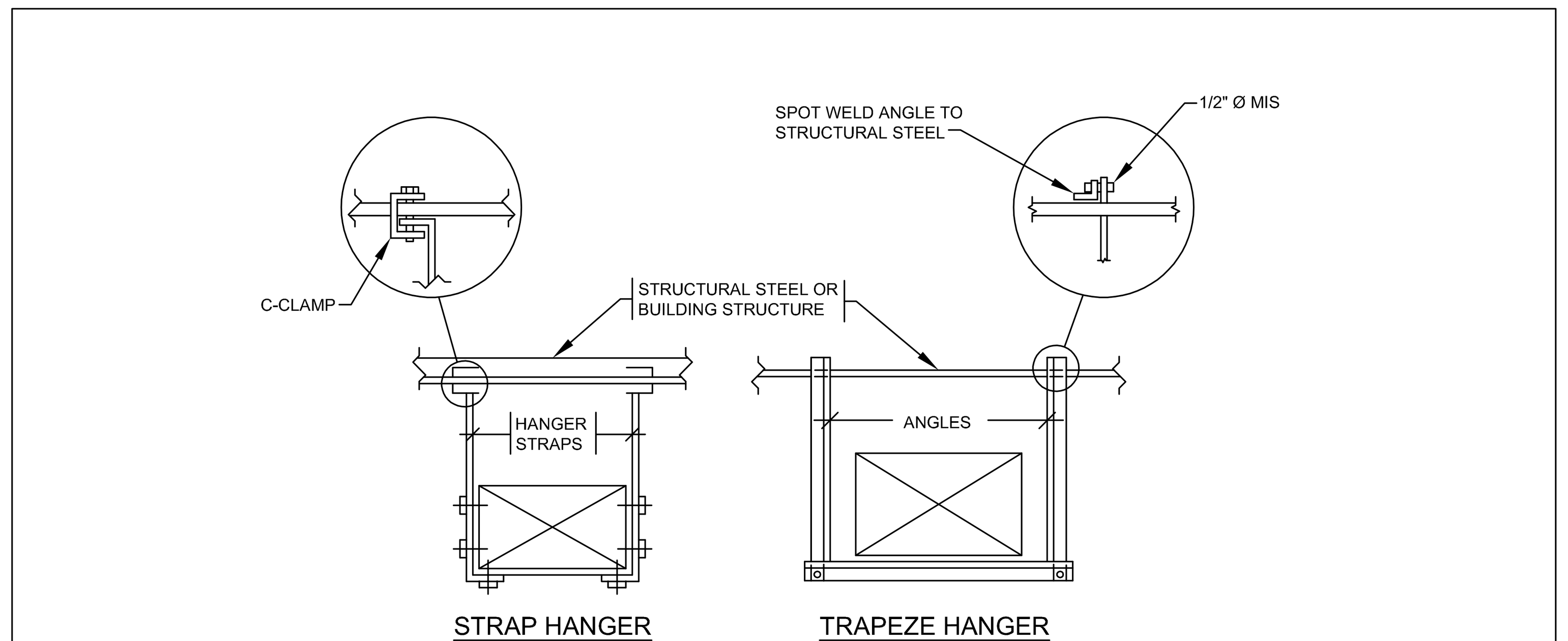


DUCTWORK ROOF PENETRATION DETAIL

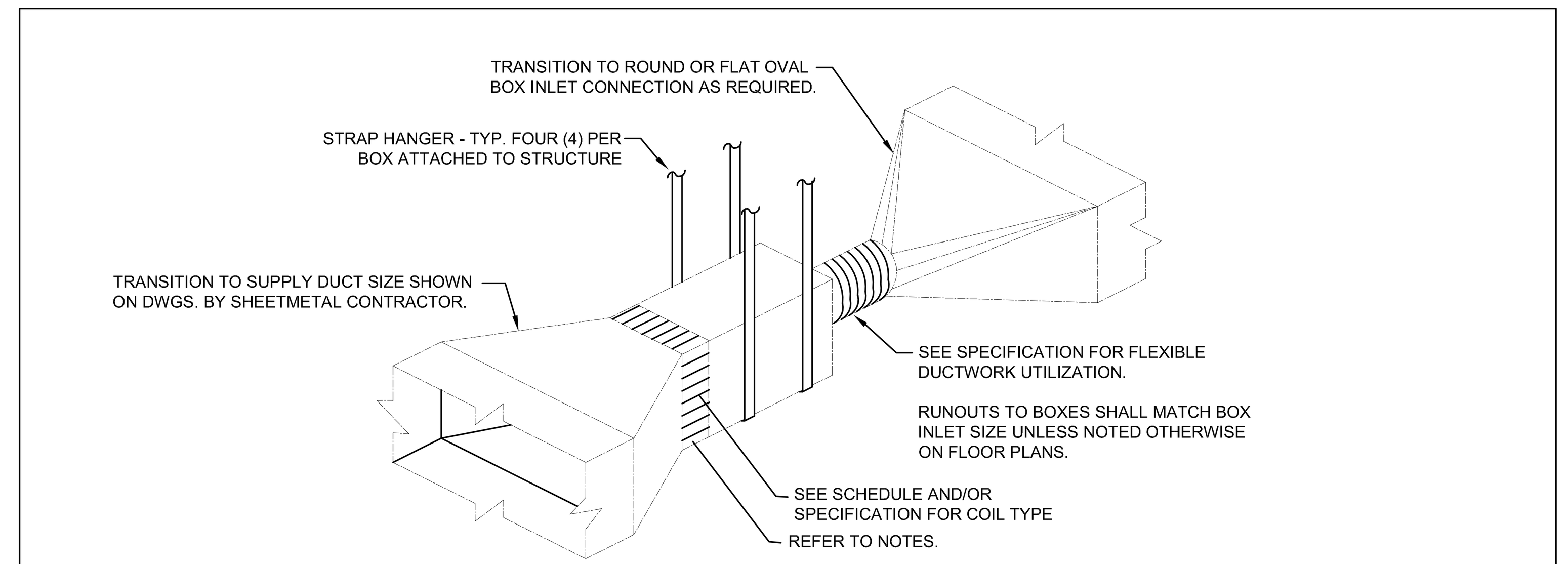


NOTES:
1. WHEN "D" IS OVER 24" PROVIDE 3/4" DRAIN WITH TRAP

LOUVER DETAIL



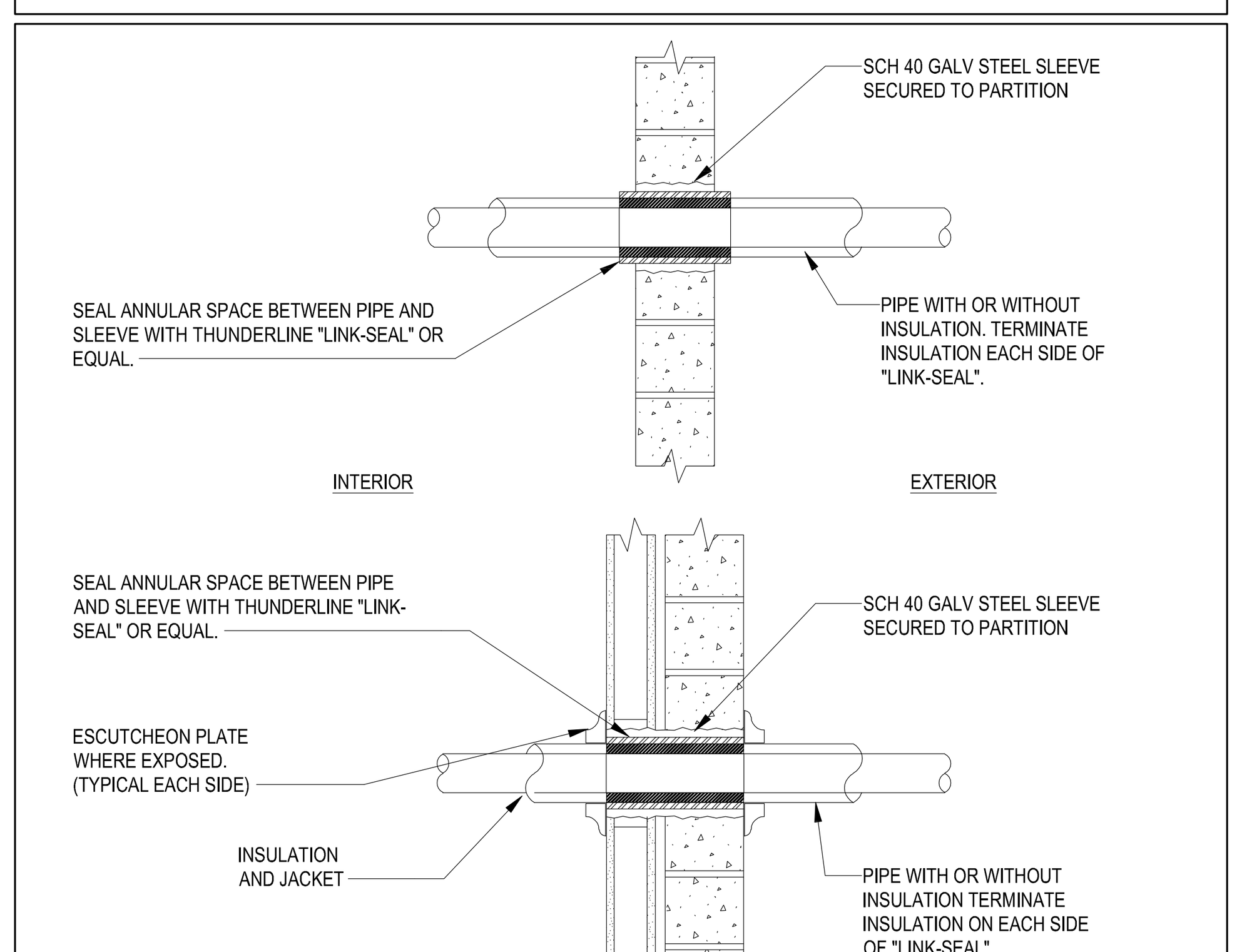
DUCT HANGER DETAIL (LOW VELOCITY)



NOTES:

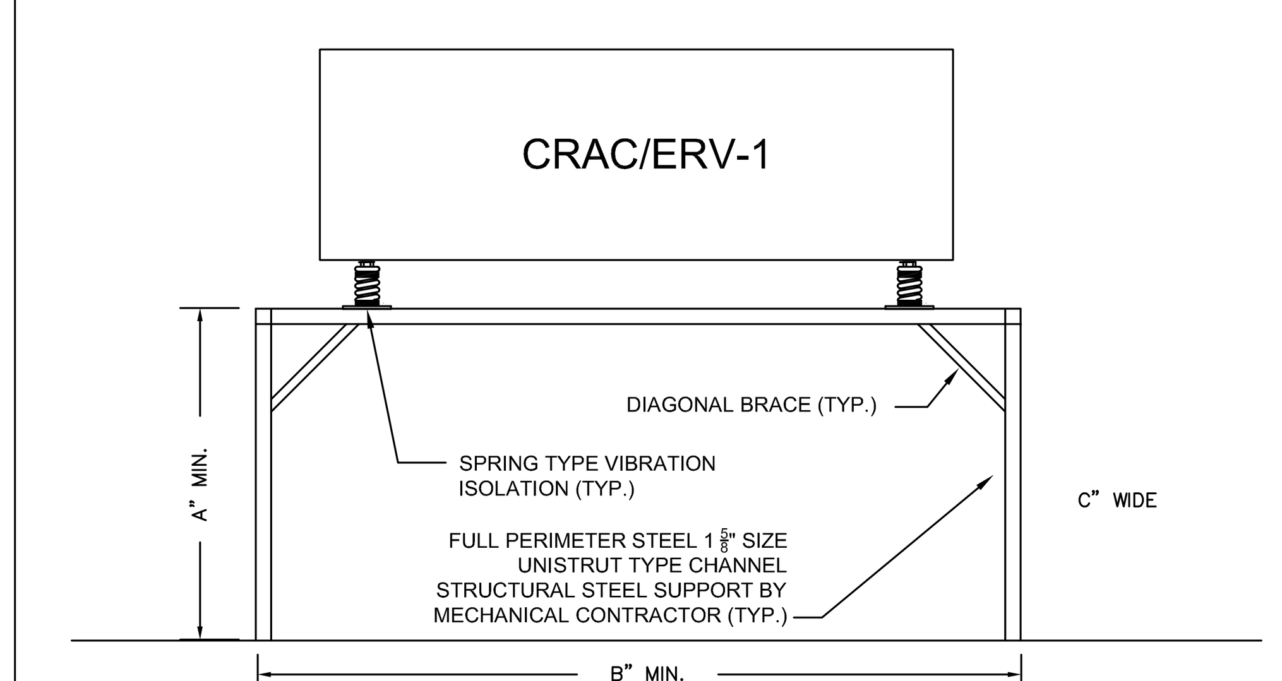
ELECTRIC REHEAT COILS: MINIMUM CFM SHALL BE GREATER THAN 70 CFM PER KW.

VARIABLE AIR & CONSTANT VOLUME BOX W/REHEAT COIL DETAIL



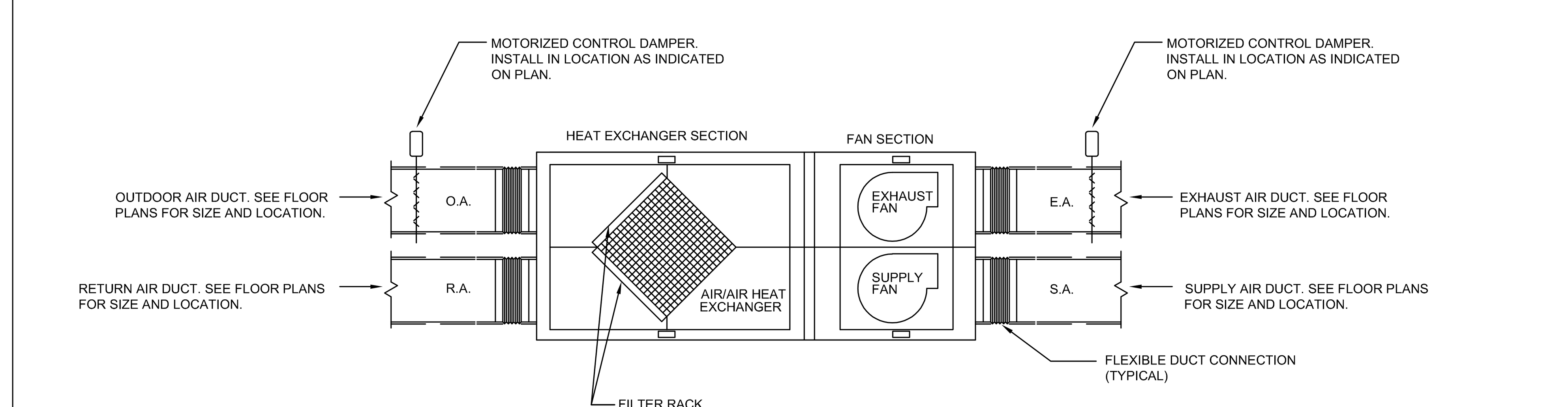
NOTES:
1. TYPICAL FOR NON-INSULATED PIPING AND CONDUIT.
2. TYPICAL FOR MASONRY OR CONCRETE WALL.
3. FOR WALL PENETRATION WITH FIRE RATINGS GREATER THAN (1) HOUR, USE THUNDERLINE "PYRO-PAC" SEALS OR EQUAL.
4. WHERE PIPING EXPOSED AT FINISHED WALL, FLUSH MOUNT SLEEVE, AND PROVIDE AN ESCUTCHEON PLATE.

PIPE PENETRATION DETAIL



NOTES:
1. CRAC-1,2: A = 12", B = 80", C = 30"
2. ERV-1: A = 12", B = 60", C = 36"
3. CRAC-3 (STACKED ABOVE CRAC-2): A = 30", B = 80", C = 30"

STRUCTURE FOR ERV AND CRAC UNITS



ENERGY RECOVERY VENTILATOR DETAIL

Project:

CITY OF WORCESTER, MA

WORCESTER REGIONAL EMERGENCY COMMUNICATIONS CENTER HVAC EVALUATION

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Revisions:

No.	Date	Description

Seal:

COA:

Issued For:

CONSTRUCTION DOCUMENTS

Scale:	NTS
Date:	SEPTEMBER 24, 2021
Drawn By:	AVS
Reviewed By:	SEH
Approved By:	SEH
W&S Project No.:	ENG20-0504
W&S File No.:	

Drawing Title:

HVAC DETAILS

Sheet Number:

H103

Rev: 1.6 Date: 04/10/2019

NEW VARIABLE AIR VOLUME BOX/ ELECTRIC REHEAT COILS

EQUIPMENT NAME	SERVICE/LOCATION	MANUFACTURER	MODEL	CFM RANGE	INLET SIZE	OUTLET SIZE	ELECTRIC REHEAT COIL MAX POWER	VOLTS	PHASE	HZ	COMMENTS
VAV-1/ERHC-1	OFFICE 16B	KRUEGER	LMHS	0-515	6"Ø	12"x8"	3 kW	208	3	60	PROVIDE SCR CONTROLS. TIE INTO EXISTING BMS.
ERHC-2	OFFICES 11-13	KRUEGER	LMHS	0-705	12"x12"	12"x12"	5 kW	208	3	60	PROVIDE SCR CONTROLS. TIE INTO EXISTING BMS.
ERHC-3	DIRECTOR 09	KRUEGER	LMHS	0-420	12"x12"	12"x12"	4 kW	208	3	60	PROVIDE SCR CONTROLS. TIE INTO EXISTING BMS.
ERHC-4	ENTRY 01E	KRUEGER	LMHS	0-2400	22"x18"	22"x18"	16 kW	208	3	60	PROVIDE SCR CONTROLS. TIE INTO EXISTING BMS.

NEW ENERGY RECOVERY VENTILATOR

EQUIPMENT NAME	SERVICE/LOCATION	MANUFACTURER	MODEL	OUTDOOR/SUPPLY (CFM)	ESP (IN WG)	EXHAUST/RETURN (CFM)	ESP (IN WG)	ENTHALPY RECOVERY RATIO COOLING (%)	ENTHALPY RECOVERY RATIO HEATING (%)	EA FILTER	OA FILTER	MCA	MOP	VOLT	PHASE	HZ	WEIGHT (LB)	COMMENTS
ERV-1	COMMUNICATIONS ROOM/LOFT	RENEWAIRE	EV450JIN-S35-ANT-L	300	1.11	313	1.09	61.5	72.7	MERV-8	MERV-8	2.1	15	208	3	60	199	TIE INTO EXISTING BMS. INCLUDE OUTSIDE AIR AND RETURN AIR DAMPER OPTION. PROVIDE STRUCTURE. (SEE DETAILS)

DIFFUSER/REGISTER/GRILLE

EQUIPMENT NAME	TYPE	MANUFACTURER	MODEL	MATERIAL	AIRFLOW RANGE (CFM)	FACE SIZE (IN)	INLET (IN)	N.C.	THROW (FT.) (150-100-50 FPM)	COMMENTS
S-1	SUPPLY GRILLE	PRICE	SDG	ALUMINUM	0-345	14"x8"	12"x6"	<25	7-10-20	ANGLE GRILLES 30° DOWN TOWARDS FLOOR
R-1	RETURN GRILLE	PRICE	630	ALUMINUM	0-850	16"x16"	14"x14"	<35	-	
R-2	RETURN GRILLE	PRICE	630	ALUMINUM	0-1700	30"x16"	28"x14"	<35	-	

NEW SOUND ATTENUATOR

EQUIPMENT NAME	SERVICE	MANUFACTURER	MODEL	CFM	OVERALL SIZE W X H X L (IN)	P.D. (IN. W.G.)	COMMENTS
SA-1	CRAC DISCHARGE	PRICE	RL	2500	26x16x36	0.33	

EXISTING CRAC UNITS

EQUIPMENT NAME	OLD LOCATION	NEW LOCATION	MANUFACTURER	MODEL	CFM	VOLTS	PHASE	FLA	WSA	WEIGHT (LB.)	COMMENTS
CRAC-1	COMMUNICATIONS ROOM	ELECTRICAL LOFT	LIEBERT	MMD36E	1250	460	3	13.9	17.4	225	RECONNECT INTO EXISTING BMS. PROVIDE NEW STRUCTURE. (SEE DETAILS)
CRAC-2	COMMUNICATIONS ROOM	ELECTRICAL LOFT	LIEBERT	MMD36E	1250	460	3	13.9	17.4	225	RECONNECT INTO EXISTING BMS. PROVIDE NEW STRUCTURE. (SEE DETAILS)
CRAC-3	COMMUNICATIONS ROOM	ELECTRICAL LOFT	LIEBERT	MMD36E	1250	460	3	13.9	17.4	225	RECONNECT INTO EXISTING BMS. PROVIDE NEW STRUCTURE. (SEE DETAILS)

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Consultants:

Revisions:

No.	Date	Description

Seal:

COA:

Issued For:

CONSTRUCTION DOCUMENTS

Scale: AS NOTED

Date: SEPTEMBER 24, 2021
Drawn By: AVS
Reviewed By: SEH
Approved By: SEH

W&S Project No.: ENG20-0504
W&S File No.:

Drawing Title:

HVAC SCHEDULES

Sheet Number:

H104

Rev: 1.6 Date: 04/10/2019

CONTROL POINT DESCRIPTOR LEGEND

TAG	ATC CONTRACTOR PROVIDED DDC POINT AND HARDWARE
TAG (ELEC PLBG)	CONTROL DEVICE FURNISHED BY ELECTRICAL OR PLUMBING CONTRACTOR BUT INTERFACED TO DDC SYSTEM BY ATC CONTRACTOR
TAG	ATC CONTRACTOR INTERFACE TO EQUIPMENT MANUFACTURER'S HARDWARE
TAG	ATC CONTRACTOR PROVIDED LOCAL CONTROL POINT

CONTROL ABBREVIATIONS

ACD	AUTOMATIC CONTROL DAMPER
ACV	AUTOMATIC CONTROL VALVE
AFMS	AIR FLOW MEASURING STATION
ALM	ALARM
ATC	AUTOMATIC TEMPERATURE CONTROL
AQS	AQUASTAT
BCV	BASEBOARD CONTROL VALVE
BDD	BACKDRAFT DAMPER (ADJUSTABLE COUNTERWEIGHT)
BIBO	BAG-IN BAG-OUT
BV	BYPASS VALVE
C	CARBON DIOXIDE SENSOR
CAP	CAPACITY CONTROL
CCLT	COOLING COIL LEAVING AIR TEMPERATURE SENSOR
CO	CARBON MONOXIDE SENSOR
CRT	CONDENSER WATER RETURN TEMPERATURE SENSOR
CST	CONDENSER WATER SUPPLY TEMPERATURE SENSOR
CT	CURRENT TRANSFORMER (STATUS FEEDBACK)
CV	COOLING COIL CONTROL VALVE
DAT	DISCHARGE AIR TEMPERATURE SENSOR
DDC	DIRECT DIGITAL CONTROL
DDCFP	DIRECT DIGITAL CONTROL FIELD PANEL
DPS	DIFFERENTIAL PRESSURE SWITCH
DPT	DIFFERENTIAL PRESSURE SENSOR/TRANSMITTER
DPV	DIFFERENTIAL PRESSURE BYPASS VALVE
DSP	DISCHARGE STATIC PRESSURE SENSOR
DWDI	DOUBLE WIDTH DOUBLE INLET
EAD	EXHAUST AIR DAMPER
ECM	ELECTRONICALLY COMMUTATED MOTOR
EHRET	EXHAUST HEAT RECOVERY COIL ENTERING AIR TEMPERATURE SENSOR
EHRLT	EXHAUST HEAT RECOVERY COIL LEAVING AIR TEMPERATURE SENSOR
EHRV	EXHAUST HEAT RECOVERY COIL CONTROL VALVE
ES	END SWITCH
FA	FAULT ALARM
FID	FAN ISOLATION DAMPER
FMT	FLOW METER/TRANSMITTER
FS	FLOW SWITCH
FZ	FREEZESTAT
H	HUMIDITY SENSOR
HALM	HOOD ALARM
HCLT	HEATING COIL LEAVING AIR TEMPERATURE SENSOR
HEGA	HIGH EFFICIENCY GAS ABSORBER FILTER
HEPA	HIGH EFFICIENCY PARTICULATE AIR FILTER
HGB	HOT GAS BYPASS
HHL	HIGH HUMIDITY LIMIT SENSOR
HIV	HUMIDIFIER ISOLATION VALVE
HLH	HIGH/LOW HUMIDITY LIMIT SENSOR
HOA	HANDS-OFF AUTOMATIC SWITCH
HR	HUMIDITY SENSOR (ROOM)
HRET	HEAT RECOVERY COIL ENTERING AIR TEMPERATURE SENSOR
HRLT	HEAT RECOVERY COIL LEAVING AIR TEMPERATURE SENSOR
HRT	HEAT RECOVERY LOOP TEMPERATURE SENSOR
HRCV	HEAT RECOVERY COIL CONTROL VALVE
HRV	HEAT RECOVERY LOOP CONTROL VALVE
HS	HAND SWITCH
HSPS	HIGH STATIC PRESSURE SWITCH
HSS	HOOD SASH SWITCH
HUV	HUMIDIFIER CONTROL VALVE
HV	HEATING COIL CONTROL VALVE
HWRT	HOT WATER RETURN TEMPERATURE SENSOR
HWST	HOT WATER SUPPLY TEMPERATURE SENSOR
IFBD	INTEGRAL FACE & BYPASS DAMPER
IGV	INLET GUIDE VANES
LAT	LEAVING AIR TEMPERATURE SENSOR
LSPS	LOW STATIC PRESSURE SWITCH
LS	LEVEL SENSOR OR LIGHT SWITCH INTERFACE
LSHA	LEVEL SENSOR HIGH ALARM
LSHS	LEVEL SENSOR HIGH SWITCH
LSLA	LEVEL SENSOR LOW ALARM
LSLS	LEVEL SENSOR LOW SWITCH
MAT	MIXED AIR TEMPERATURE SENSOR
MUWV	MAKE-UP WATER VALVE
MD	MOTION DETECTOR
NC	NORMALLY CLOSED (ON LOSS OF POWER)
NO	NORMALLY OPEN (ON LOSS OF POWER)
OAD	OUTSIDE AIR DAMPER
OAH	OUTSIDE AIR HUMIDITY SENSOR (FOR WET BULB READING)
OAT	OUTSIDE AIR TEMPERATURE SENSOR (DRY BULB)
PAD	PRIMARY AIR DAMPER
PCHRT	PRIMARY CHILLED WATER RETURN TEMPERATURE SENSOR
PCHST	PRIMARY CHILLED WATER SUPPLY TEMPERATURE SENSOR
PR	PRESSURE SENSOR (ROOM)
RAD	RETURN AIR DAMPER
RAH	RETURN AIR HUMIDITY SENSOR
RAT	RETURN AIR TEMPERATURE SENSOR
RV	REHEAT CONTROL VALVE
RH	RELATIVE HUMIDITY
RI	RUN INDICATOR
RSID	RETURN SMOKE ISOLATION DAMPER
S	SWITCH
SAD	SUPPLY AIR DAMPER
SD	SMOKE DAMPER
SDET	SMOKE DETECTOR
SFD	SMOKE/FIRE DETECTOR
SP	STATIC PRESSURE SENSOR
SPD	SPEED CONTROL
S/S	START/STOP
S/S_H	START/STOP HIGH SPEED/CAPACITY
S/S_L	START/STOP LOW SPEED/CAPACITY
SSID	SUPPLY SMOKE ISOLATION DAMPER
SSP	SUCTION STATIC PRESSURE SENSOR
T	THERMOSTAT
TS	TEMPERATURE SENSOR
VFD	VARIABLE FREQUENCY DRIVE
VFDS	VARIABLE FREQUENCY DRIVE SPEED
VFDO	VARIABLE FREQUENCY DRIVE OUTPUT (FEEDBACK)
VS	VIBRATION SWITCH
WC	WATER COLUMN
X	REMOVE EXISTING ITEM

CONTROL DIAGRAM SYMBOLS

MODULATING PARALLEL BLADE DAMPER

TWO POSITION PARALLEL BLADE DAMPER

MODULATING OPPOSED BLADE DAMPER

MODULATING OPPOSED BLADE DAMPER


FAN


PUMP


VARIABLE FREQUENCY DRIVE


MOTOR STARTER


ELECTRONICALLY COMMUTATED MOTOR

FILTER BANK

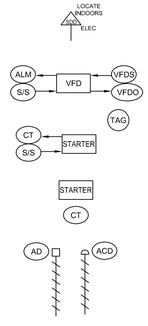
WATER COIL

MODULATING ACTUATOR

2-POSITION ACTUATOR

120 V

24 V



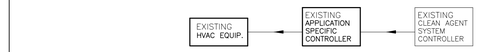
ATC GENERAL NOTES

1. TIE INTO EXISTING BMS

TS — GLOBAL OUTDOOR AIR TEMPERATURE AND RELATIVE HUMIDITY SENSORS.
RH

GLOBAL POINTS

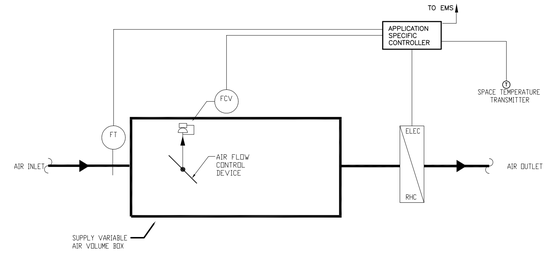
DDC CONTROL MATRIX		
EQUIPMENT CATEGORY	CONTROLS BY: MFR	ATC
VAV BOXES		X
ERV-1		X



THE FOLLOWING SEQUENCE IS REVERSIBLE UNLESS OTHERWISE NOTED.

UPON ACTIVATION OF CLEAN AGENT SYSTEM, HVAC EQUIPMENT (CRAC UNIT OR AC UNIT) SHALL BE DE-ENERGIZED.

HVAC EQUIPMENT INTERLOCK W/ CLEAN AGENT SYSTEM SEQUENCE OF OPERATION



GENERAL:

a. VARIABLE AIR VOLUME BOX (VAV) SHALL BE CONTROLLED BY A LOCAL (BOX MOUNTED) DDC CONTROLLER COMMUNICATING WITH THE BAS. ALL BOXES SHALL BE CAPABLE OF VARIABLE, TWO POSITION AND CONSTANT AIR VOLUME OPERATION. PROVIDE INPUT/OUTPUT EXPANSION MODULES AS REQUIRED TO PERFORM SEQUENCES OUTLINED. SEE TYPICAL SPACE SEQUENCES FOR OPERATING REQUIREMENTS.

b. SETPOINTS AND OCCUPANCY SCHEDULING SHALL BE ADJUSTABLE FROM THE BAS. THE BAS SHALL BE CAPABLE OF ADJUSTING SETPOINTS AND STATUS GLOBALLY AS WELL AS ON AN INDIVIDUAL BOX BASIS.

c. LOCAL SPACE TEMPERATURE TRANSMITTER (TT) SHALL BE CAPABLE OF SETPOINT ADJUSTMENT WITHIN A BAS DEFINED ADJUSTABLE RANGE. THE LOCAL TRANSMITTER SHALL ALSO BE CAPABLE OF OVERRIDING THE BAS UNOCCUPIED SCHEDULE TO ALLOW THE VAV BOX TO OPERATE TEMPORARILY IN THE OCCUPIED MODE FOR A BAS DEFINED ADJUSTABLE TIME PERIOD (0.5 TO 12 HOURS).

d. ALL BOXES SHALL BE NORMALLY OPEN UNLESS NOTED OTHERWISE.

e. VAV BOX AIR FLOW RATE SETPOINT AS MEASURED AT FT SHALL BE MAINTAINED BY THE LOCAL CONTROLLER REGARDLESS OF UPSTREAM PRESSURE (PRESSURE INDEPENDENT OPERATION). THE BAS SHALL MONITOR AND DISPLAY (UPON REQUEST) THE FLOW RATE OF ANY VAV BOX.

ALARMS: THE FOLLOWING SHALL INITIATE A SPECIFIC ALARM NOTICE AT THE BAS:

a. SPACE TEMPERATURE 10°F ABOVE SETPOINT – 10 MINUTE TIME DELAY.
b. SPACE TEMPERATURE 10°F BELOW SETPOINT – 10 MINUTE TIME DELAY.
c. AIR FLOW RATE 10% ABOVE SETPOINT FOR 5 CONSECUTIVE MINUTES.
d. AIR FLOW RATE 10% BELOW SETPOINT FOR 5 CONSECUTIVE MINUTES.

OCCUPIED MODE:

a. VAV BOX SHALL OPERATE BETWEEN PRESET FLOW RATES (CFM) SHOWN ON THE PLANS (OCCUPIED MAXIMUM TO OCCUPIED MINIMUM), WHERE THESE VALUES ARE SHOWN TO BE THE SAME, THE BOX SHALL MAINTAIN CONSTANT VOLUME. THE LOCAL CONTROLLER AND THE BAS SHALL MONITOR ROOM TEMPERATURE AT TT AND AIR FLOW RATE AT FT. THE LOCAL CONTROLLER SHALL MODULATE AIR FLOW RATE VIA FCV.

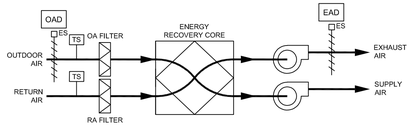
b. WHEN THE SPACE TEMPERATURE IS AT OR ABOVE OCCUPIED SETPOINT AT TT, THE ELECTRIC REHEAT COIL SHALL BE OFF AND THE AIR FLOW CONTROL DAMPER FCV SHALL BE MODULATED AS REQUIRED TO MAINTAIN MAXIMUM OCCUPIED AIR FLOW SETPOINT AT FT. AS THE TEMPERATURE AT TT DROPS, THE AIR FLOW CONTROL DAMPER SHALL BE MODULATED CLOSED TO REDUCE FLOW AS REQUIRED TO MAINTAIN SETPOINT AT TT. ONCE AIR FLOW HAS BEEN REDUCED TO MINIMUM OCCUPIED FLOW SETPOINT AT FT, ELECTRIC REHEAT COIL SHALL BE STAGED ON TO MAINTAIN SETPOINT AT TT. UPON A RISE IN TEMPERATURE AT TT, THE REVERSE SHALL OCCUR.

UNOCCUPIED MODE:

a. VAV BOX SHALL OPERATE AT FIXED PRESET FLOW RATE (CFM) SHOWN ON THE PLANS (UNOCCUPIED SETPOINT). THE LOCAL CONTROLLER AND THE BAS SHALL MONITOR ROOM TEMPERATURE AT TRANSMITTER TT AND AIR FLOW RATE AT FT. THE LOCAL CONTROLLER SHALL MODULATE AIR FLOW RATE VIA FCV.

b. WHEN THE SPACE TEMPERATURE IS AT OR ABOVE THE UNOCCUPIED SETPOINT AT TT, ELECTRIC REHEAT COIL SHALL BE OFF, AIR FLOW CONTROL DAMPER FCV SHALL MODULATE AS REQUIRED TO MAINTAIN UNOCCUPIED FLOW SETPOINT AT FT, AS THE SPACE TEMPERATURE DROPS, ELECTRIC REHEAT COIL SHALL BE STAGED ON IN ORDER TO MAINTAIN UNOCCUPIED SETPOINT AT TT. UPON A RISE IN TEMPERATURE AT TT, THE ELECTRIC REHEAT COIL SHALL STAGE OFF.

VARIABLE AIR VOLUME BOX (VAV) CONTROL SEQUENCE WITH ELECTRIC REHEAT



GENERAL

1. ENERGY RECOVERY VENTILATOR (ERV-1) SHALL BE CONTROLLED BY THE MANUFACTURER'S STAND-ALONE PACKAGED CONTROLS.
2. OUTDOOR AIR AND EXHAUST AIR MOTORIZED DAMPERS SHALL BE INTERLOCKED WITH THE OPERATION OF THE ERV.
3. WHEN OFF, THE SUPPLY AND EXHAUST FAN SHALL BE OFF WITH THE ASSOCIATED OUTSIDE AIR DAMPER AND EXHAUST AIR DAMPER CLOSED.
4. OCCUPIED AND UNOCCUPIED MODE SHALL BE BASED ON A TIME OF DAY SCHEDULE SETUP IN THE ERV REMOTE CONTROLLER.

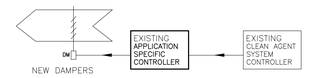
OCCUPIED SEQUENCE

1. WHEN COMMANDED TO START THE OUTDOOR AIR AND EXHAUST AIR DAMPER SHALL OPEN AND THE SUPPLY AND EXHAUST FANS SHALL START.
2. THE ERV WILL BE SET TO OPERATE IN AUTO MODE. AUTO MODE SHALL AUTOMATICALLY CHANGE OPERATION BETWEEN BYPASS AND ENERGY RECOVERY MODE BASED ON RETURN AND OUTSIDE AIR TEMPERATURE AND OPERATION MODE OF INDOOR/OUTDOOR UNIT(S).
3. THE SUPPLY FAN AND EXHAUST FAN SHALL RUN CONTINUOUSLY IN THE OCCUPIED MODE.

UNOCCUPIED SEQUENCE

1. WHEN IN UNOCCUPIED MODE, THE SUPPLY AND EXHAUST FAN SHALL BE OFF, AND THE OUTSIDE AIR AND EXHAUST AIR DAMPERS SHALL BE CLOSED.

ENERGY RECOVERY VENTILATOR (ERV-1)



THE FOLLOWING SEQUENCE IS REVERSIBLE UNLESS OTHERWISE NOTED.

UPON ACTIVATION OF CLEAN AGENT SYSTEM, THE CONTROL DAMPER SHALL CLOSE FULLY.

CONTROL DAMPER INTERLOCK W/ CLEAN AGENT SYSTEM SEQUENCE OF OPERATION

Project:

CITY OF WORCESTER, MA

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CONSTRUCTION DOCUMENTS

Scale:	NTS
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Drawn By:	AVS
Reviewed By:	SEH
Approved By:	SEH
W&S Project No.:	ENG20-0504
W&S File No.:	

Drawing Title:

HVAC CONTROLS

Sheet Number:

H105

Rev: 16 Date: 04/10/2019

ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
AC	ALTERNATING CURRENT
A	AMPERE
ATC	AUTOMATIC TEMPERATURE CONTROLS
ATS	AUTOMATIC TRANSFER SWITCH
BKR	BREAKER
C	CONDUIT
CKT	CIRCUIT
CB	CIRCUIT BREAKER
EC	ELECTRICAL CONTRACTOR
EMT	ELECTRIC METALLIC TUBING
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EF	EXHAUST FAN
FL	FLOOR
FLA	FULL LOAD AMPERE
GC	GENERAL CONTRACTOR
GFI	GROUND FAULT INTERRUPTER
GND	GROUND
HOA	HAND OFF AUTOMATIC
HP	HORSEPOWER
IG	ISOLATED GROUND
JB	JUNCTION BOX
KVA	KILOVOLT AMPERES
KW	KILOWATT
MCB	MAIN CIRCUIT BREAKER
MLO	MAIN LUGS ONLY
MC	MECHANICAL CONTRACTOR
MTD	MOUNTED
MTG	MOUNTING
NMC	NON-METALLIC CONDUIT
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NA	NOT APPLICABLE
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
PNL	PANELBOARD
PH	PHASE
PVC	POLYVINYL CHLORIDE CONDUIT
RSC	RIGID GALVANIZED STEEL CONDUIT
SF	SUPPLY FAN
SS	SAFETY SWITCH
TEL	TELEPHONE
TRF	TRANSFORMER
V	VOLTS
W	WATTS OR WIRE
WP	WEATHERPROOF
4WSN	4-WIRE SOLID NEUTRAL

ELECTRICAL LEGEND

RACEWAY AND WIRING

1,3 LP1B — HOMERUN TO PANELBOARD, NUMBER OF TICKS INDICATES NUMBER OF #12 AWG CONDUCTORS CONTAINED IN RACEWAY. TWO (2) #12 AWG SHALL NOT BE INDICATED BY TICKS. NUMERALS 1 AND 3 INDICATE CIRCUITS IN PANELBOARD. RACEWAYS LARGER THAN 1/2" AND CONDUCTORS LARGER THAN #12 AWG SHALL BE INDICATED ON THE DRAWINGS. PROVIDE AN INSULATED GREEN GROUND WIRE IN ALL RACEWAYS MINIMUM SIZE TO BE #12AWG.

- RACEWAY CONCEALED IN CEILING OR WALLS
- RACEWAY EXPOSED
- RACEWAY CONCEALED IN SLAB OR LOCATED IN THE CEILING OF THE FLOOR BELOW
- RACEWAY TURNING UP
- RACEWAY TURNING DOWN
- FLEXIBLE CONNECTION
- DIRECT HARD WIRED CONNECTION
- P — UNDERFLOOR POWER DUCT
- T — UNDERFLOOR TELEPHONE DUCT

POWER DISTRIBUTION EQUIPMENT

- DISTRIBUTION PANEL
- PANELBOARD-SURFACE MOUNTED
- PANELBOARD-FLUSH MOUNTED
- T — DRY TYPE TRANSFORMER
- 30AS 20AF — FUSIBLE SAFETY SWITCH - RATING AND TYPE AS NOTED ON THE DRAWING. (30 AMP, 20 AMP FUSE, 3 POLE)
- 1 — MOTOR, NUMERAL DENOTES HORSE POWER

PANEL DP1
NOT TO SCALE

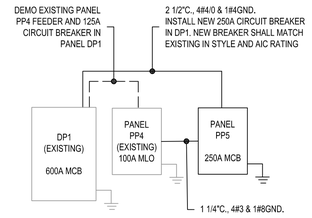
PANELBOARD SCHEDULE

DESIGNATION: PP5 — S.C. RATING: 10,000 A RMS SYSTEM — REMARKS: NEW PANEL
LOCATION: ELEC. LOFT — SERVICE: 208/120V,3Ø,4W
RATING: 250 AMPS — MOUNTING: SURFACE
MAIN: 250 AMP MLO

CKT. NO.	LOAD DESIGNATION	BREAKER TRIP	BREAKER POLE	PHASE A B C	BREAKER POLE	BREAKER TRIP	LOAD DESIGNATION	CKT. NO.
1	-	-				-	-	2
3	EHRC-1 (3kW REHEAT COIL)	20				20	EHRC-2 (5kW REHEAT COIL)	4
5	-	-				-	-	6
7	-	-				-	-	8
9	EHRC-3 (4kW REHEAT COIL)	20				60	EHRC-4 (16kW REHEAT COIL)	10
11	-	-				-	-	12
13	SPARE	20				20	SPARE	14
15	SPARE	20				20	SPARE	16
17	SPARE	20				20	SPARE	18
19	SPARE	20				20	SPARE	20
21	SPARE	20				20	SPARE	22
23	SPARE	20				20	SPARE	24
25	SPARE	20				20	SPARE	26
27	SPARE	20				20	SPARE	28
29	SPARE	20				20	SPARE	30
31	SPARE	20				20	SPARE	32
33	SPARE	20				20	SPARE	34
35	SPARE	20				20	SPARE	36
37	SPARE	20				-		38
39	SPARE	20				100	PANEL PP4	40
41	SPARE	20				-		42

POWER DISTRIBUTION DIAGRAM NOTES:

1. REFER TO DRAWING E001 FOR LEGEND, SYMBOLS AND GENERAL NOTES THAT MAY PERTAIN TO THIS DRAWING.
2. THIS DRAWING IS INTENDED TO ILLUSTRATE MAJOR EQUIPMENT AND REQUIRED INTERCONNECTIONS. REFER TO THE FLOOR PLANS FOR EXACT LOCATIONS AND THE SPECIFICATIONS FOR ADDITIONAL INSTALLATION REQUIREMENTS.
3. PANELBOARDS AND ELECTRICAL EQUIPMENT SHALL BE FIELD MARKED TO WARN QUALIFIED PERSONS OF POTENTIAL ARC FLASH HAZARDS. THE MARKING SHALL BE LOCATED SO AS TO BE CLEARLY VISIBLE TO QUALIFIED PERSONS BEFORE EXAMINATION, ADJUSTMENT, SERVICING OR MAINTENANCE OF THE EQUIPMENT.
4. REFER TO THIS DRAWING FOR PANELBOARD SCHEDULES.



PARTIAL POWER RISER DIAGRAM
NOT TO SCALE

GENERAL DRAWING NOTES:

1. DRAWINGS ARE DIAGRAMMATIC ONLY. THE EXACT LOCATION, MOUNTING HEIGHTS, SIZE OF EQUIPMENT AND ROUTING OF RACEWAYS SHALL BE COORDINATED AND DETERMINED IN THE FIELD.
2. ALL STRAIGHT FEEDER, BRANCH CIRCUIT AND AUXILIARY SYSTEM CONDUIT RUNS SHALL BE PROVIDED WITH SUFFICIENT PULL BOXES TO LIMIT THE MAXIMUM LENGTH OF ANY SINGLE CABLE PULL TO 150 FEET. EXACT SIZES OF PULL BOXES AND LOCATIONS TO BE DETERMINED IN THE FIELD BY THE ELECTRICAL CONTRACTOR.
3. FURNISH ALL REQUIRED ACCESS PANELS AS REQUIRED TO SUIT FIELD CONDITIONS FOR THE PROPER OPERATION AND MAINTENANCE OF THE ELECTRICAL SYSTEM. THE EXACT SIZES AND PHYSICAL LOCATIONS SHALL BE TO SUIT ACCESSIBILITY AND CONSTRUCTION CONDITIONS. ALL ACCESS PANELS PROVIDED BY THE ELECTRICAL CONTRACTOR SHALL MATCH EXACTLY THE ACCESS PANELS FURNISHED AND INSTALLED BY THE GENERAL CONTRACTOR. THE ACCESS PANELS WILL BE INSTALLED BY THE TRADE CONTRACTOR UNDER THE APPROPRIATE SECTION OF THE SPECIFICATIONS FOR THE SURFACE IN WHICH THE PANELS ARE LOCATED.
4. THE ELECTRICAL CONTRACTOR SHALL COORDINATE WITH THE HVAC CONTRACTOR AS APPLICABLE AS TO THE EXACT LOCATION OF THEIR RESPECTIVE EQUIPMENT; THE POWER WIRING, CONTROL WIRING AND ALL ELECTRICAL CONNECTIONS AND CONDUIT TURN-UPS SHALL BE COORDINATED WITH THE RESPECTIVE CONTRACTORS BEFORE THE START OF CONSTRUCTION IN THE FIELD.
5. SLEEVES ARE TO BE UTILIZED FOR PASSAGE OF CONDUITS THROUGH FLOORS OR WALLS. CONDUITS AND BOXES ARE TO BE SUPPORTED BY THE USE OF PRESET FASTENERS INSTALLED IN FLOORS, WALLS OR COLUMNS. CONDUITS AND BOXES ARE TO BE INSTALLED CONCEALED IN MASONRY WALLS AND ABOVE HUNG CEILINGS. ALL SLEEVES ARE TO BE SEALED WITH APPROVED FIRE STOPPING SEALANT.
6. WORK SHALL CONFORM TO THE MASSACHUSETTS ELECTRICAL CODE, MASSACHUSETTS BUILDING CODE, NFPA AND REQUIREMENTS OF LOCAL AUTHORITIES HAVING JURISDICTION.
7. THE WORD "CONTRACTOR" AS USED IN THE "ELECTRICAL WORK" SHALL MEAN THE ELECTRICAL SUBCONTRACTOR.
8. CONTRACTOR SHALL PAY FOR ALL PERMITS, INSURANCE AND TESTS, AND SHALL PROVIDE LABOR AND MATERIAL TO COMPLETE THE ELECTRICAL WORK SHOWN.
9. EXCEPT AS OTHERWISE NOTED, THE ELECTRICAL WORK SHALL INCLUDE DEMOLITION, PANELBOARDS, CIRCUIT BREAKERS, FEEDERS, WIRING, RACEWAYS, DEVICES, SAFETY SWITCHES AND CONNECTION NECESSARY TO OPERATE MOTORS AND OTHER EQUIPMENT.
10. AUTOMATIC TEMPERATURE CONTROLS SHALL BE PROVIDED AND INSTALLED BY THE MECHANICAL SUBCONTRACTOR. STARTERS, VFD'S AND OTHER CONTROL DEVICES FOR EQUIPMENT SHALL BE FURNISHED BY THE MECHANICAL SUBCONTRACTOR FOR INSTALLATION AND CONNECTION BY THIS CONTRACTOR.
11. DURING CONSTRUCTION, THE ELECTRICAL CONTRACTOR SHALL KEEP HIS PORTION OF THE WORK NEAT, CLEAN AND ORDERLY.
12. ALL SYSTEMS SHALL BE TESTED FOR SHORT CIRCUIT AND GROUNDS PRIOR TO ENERGIZING AND ANY DEFECTS SHALL BE CORRECTED.
13. ALL CUTTING AND PATCHING REQUIRED FOR ELECTRICAL WORK SHALL BE INCLUDED AS PART OF THIS SECTION.
14. COMPLETE SHOP DRAWINGS SHALL BE SUBMITTED FOR ELECTRICAL EQUIPMENT. WHERE SPECIFIED ELECTRICAL EQUIPMENT IS SUBSTITUTED, THE ELECTRICAL CONTRACTOR SHALL SUBMIT COMPLETE SPECIFICATIONS ON THE SUBSTITUTE AS WELL AS THE ITEM ORIGINALLY SPECIFIED.
15. MATERIALS SHALL BE SPECIFICATION GRADE AND UL LISTED.
16. WHERE MATERIAL IS CALLED OUT IN THE LEGEND BY MANUFACTURER, TYPE OR CATALOG NUMBER, SUCH DESIGNATIONS ARE TO ESTABLISH STANDARDS OR DESIRED QUALITY. ACCEPTANCE OR REJECTIONS OF PROPOSED SUBSTITUTIONS SHALL BE SUBJECT TO THE APPROVAL OF THE OWNER.
17. WORK SHALL BE COORDINATED WITH THAT OF OTHER TRADES TO ELIMINATE INTERFERENCES.
18. ELECTRICAL WORK SHALL BE GUARANTEED FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL COMPLETION.
19. WORK SHALL BE GROUNDED IN ACCORDANCE WITH CODE REQUIREMENTS. COMPLETE EQUIPMENT (INSULATED GREEN WIRE) GROUNDING SYSTEM SHALL BE INSTALLED.
20. WIRE SHALL BE TYPE "THHN-THWN" INSULATED FOR 600 VOLTS, MINIMUM SIZE #12 AWG COPPER UNLESS SPECIFICALLY NOTED OTHERWISE.
21. WIRING METHODS:
    a. INTERIOR BRANCH CIRCUITS FOR HVAC EQUIPMENT SHALL BE EMT OR RGS.
    b. EQUIPMENT CONNECTIONS SHALL BE LIQUID TIGHT FLEXIBLE METAL CONDUIT.
24. CONNECTORS FOR RIGID CONDUIT SHALL BE MADE WITH THREADED COUPLINGS.
25. CONNECTORS FOR ELECTRIC METALLIC TUBING (EMT) AND FLEXIBLE LIQUID TIGHT CONDUIT SHALL BE STEEL COMPRESSION TYPE WITH INSULATED THROATS OR STEEL SET SCREW TYPE. (COORDINATE WITH SPEC)
26. CONDUIT AND TUBING SHALL BE SUPPORTED ON GALVANIZED WALL BRACKETS. TRAPEZE HANGERS OR PIPE STRAPS SECURED BY MEANS OF TOGGLE BOLTS OR INSERTS IN WOOD CONSTRUCTION.
27. FEEDERS SHALL BE ROUTED TIGHT TO THE UNDERSIDE OF THE BUILDING STRUCTURE. CONDUIT SHALL BE INSTALLED PARALLEL AND PERPENDICULAR TO MAIN BUILDING SUPPORTS.
28. BOXES SHALL BE GALVANIZED STEEL AND SHALL BE SIZED TO ACCOMMODATE THE EQUIPMENT OR APPARATUS TO BE INSTALLED. WHERE BOXES OF A STANDARD MAKE ARE NOT AVAILABLE, SPECIAL BOXES SHALL BE MANUFACTURED. FIXTURES SUPPORTED ON THE CEILING OR ON THE WALL SHALL HAVE SUITABLE FIXTURE SUPPORT FOR THE SPECIFIC FIXTURE.
29. PANELBOARDS SHALL BE DEAD FRONT, THERMAL MAGNETIC BOLT-ON CIRCUIT BREAKER TYPE, DESIGNED FOR SURFACE OR FLUSH MOUNTING AS INDICATED ON PLAN, AND HAVING CONNECTIONS TO 120/208 SERVICE. ALL BUS BARS SHALL BE COPPER. CABINETS SHALL BE MADE OF CODE GAUGE GALVANIZED SHEET STEEL, WITH A MINIMUM OF 4 INCH GUTTERS, DOOR IN DOOR CONSTRUCTION, LOCKED DOOR, AND FLUSH HINGES. TYPEWRITTEN INDEX SHALL BE MOUNTED ON DOOR INSIDE TRANSPARENT COVER INDICATING LOAD SERVED. PANELS SHALL INCLUDE SEPARATE EQUIPMENT GROUND BUS.
30. PANELBOARDS, DISCONNECT SWITCHES, AND CONTROLLERS SHALL HAVE NAMEPLATES OF BLACK LAMINATED PLASTIC WITH ENGRAVED WHITE LETTERS, SECURED WITH SELF-TAPPING SCREWS.
31. CONNECTIONS AT MOTORS SHALL BE MADE WITH 18" LENGTH OF 1/2 INCH FLEXIBLE LIQUID TIGHT CONDUIT.
32. CONTRACTOR SHALL PHASE BALANCE PANELBOARDS IN THE FIELD. LOAD ON EACH PHASE SHALL BE BALANCED WITHIN 10% OF EACH OTHER.
33. FUSED OR UNFUSED SAFETY SWITCHES SHALL BE TOTALLY ENCLOSED, HEAVY DUTY TYPE. SWITCHES SHALL HAVE VOLTAGE, HORSEPOWER AND AMPERE RATING SUITABLE FOR THE APPLICATION. PROVIDE NUMBER OF POLES AS REQUIRED.
34. FUSES SHALL BE DUAL ELEMENT, TIME DELAY TYPE, AS MANUFACURED BY BUSSMAN, RELIANCE OR APPROVED EQUAL.
35. FURNISH AND INSTALL SLEEVES IN FLOORS, BEAMS, WALLS, ETC. REQUIRED FOR INSTALLING THIS WORK.
36. CONDUIT PASSING THROUGH FIRE RATED WALLS AND FLOORS SHALL BE PROVIDED WITH ALL NECESSARY MATERIALS TO ENSURE THAT THE FIRE RATED INTEGRITY IS MAINTAINED.
37. FEEDER TAPS WILL NOT BE ALLOWED IN PANELBOARD GUTTERS.
38. CONTRACTOR SHALL CHECK EXISTING CONDITIONS TO DETERMINE EXACT EXTENT OF WORK TO BE PERFORMED PRIOR TO BIDDING. DIMENSIONS RELEVANT TO EXISTING WORK SHALL BE VERIFIED IN THE FIELD.
39. IN AREAS NOT AFFECTED BY THIS RENOVATION, THIS SUBCONTRACTOR SHALL MAINTAIN CONTINUITY OF ELECTRIC SERVICE.
40. WHERE CONNECTIONS ARE MADE IN EXISTING PANELS, THE PANEL INDEX SHALL BE REVISED TO INDICATE THE NEW LOADS SERVED. NEW CIRCUIT BREAKERS ADDED TO EXISTING PANELS SHALL BE THE SAME FRAME SIZE, VOLTAGE RATING AND INTERRUPTING CAPACITY AS EXISTING PANEL AND CIRCUIT BREAKERS.
41. THE CONTRACTOR SHALL PROVIDE ALL REQUIRED POWER SUPPLIES, APPURTENANCES, FINAL CONNECTIONS, TESTING AND WORK REQUIRED FOR ADDITIONS TO THE EXISTING FIRE ALARM SYSTEM. PAY ALL COSTS ARISING THERE FROM, FOR A COMPLETE AND OPERATIONAL SYSTEM.
42. ELECTRICAL SHUTDOWN SHALL BE AT A TIME AND DATE APPROVED BY THE OWNER.
43. PROVIDE AS-BUILT "CADD" DRAWINGS AT THE COMPLETION OF THE PROJECT.
44. ELECTRICAL CONTRACTOR SHALL LABEL ALL ELECTRICAL DEVICES INCLUDING BUT NOT LIMITED TO DISCONNECT SWITCHES, PANELBOARDS, THERMAL MOTOR SWITCHES, CONTROL PANELS, JUNCTION BOXES, ETC.
    a. DISCONNECTS - PANEL NAME, CIRCUIT DESIGNATION AND EQUIPMENT SERVING.
    b. PANELBOARDS - PANEL NAME, VOLTAGE, AMPERAGE, PHASE AS WELL AS PANEL AND CIRCUIT IT IS FED FROM.
    c. JUNCTION BOXES - PANEL NAME AND CIRCUIT DESIGNATION
47. ADDRESS QUESTIONS TO THE ENGINEER IN WRITING BEFORE AWARD OF CONTRACT, OTHERWISE ENGINEER INTERPRETATION OF MEANING AND INTENT OF DRAWINGS SHALL BE FINAL.

Project:

CITY OF WORCESTER, MA

WORCESTER REGIONAL EMERGENCY COMMUNICATIONS CENTER HVAC EVALUATION

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Consultants:

Revisions:

No.	Date	Description

Seal:

COA:

Issued For:

CONSTRUCTION DOCUMENTS

Scale:	NO SCALE
Date:	SEPTEMBER 24, 2021
Drawn By:	CAP
Reviewed By:	DNM
Approved By:	RFM
W&S Project No.:	ENG20-0504
W&S File No.:	

Drawing Title:

ELECTRICAL LEGEND, NOTES AND ABBREVIATIONS

Sheet Number:

E001

Rev: 1.6 Date: 04/10/2019

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PHOTO 'A'

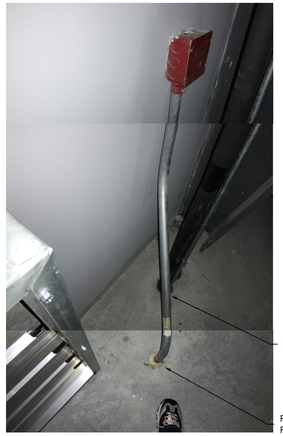
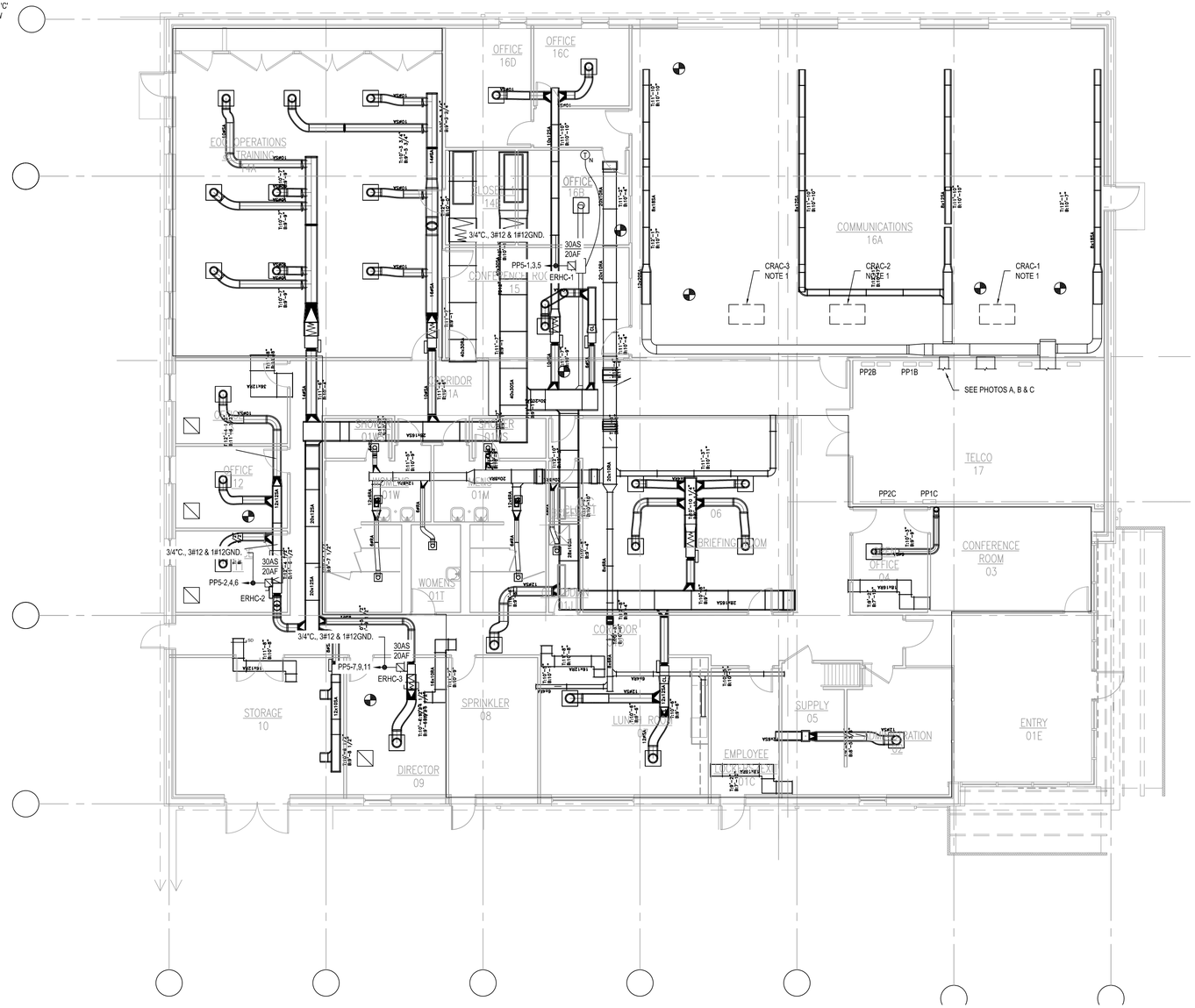


PHOTO 'B'

PHOTO 'C'

NOTES:

1. DISCONNECT, REMOVE AND RELOCATE DISCONNECT TO NEW LOCATION IN ELECTRICAL LOFT. CONTRACTOR SHALL INTERCEPT EXISTING FEEDER AND EXTEND TO NEW LOCATION. NEW CONDUIT AND WIRE SHALL MATCH EXISTING IN STYLE AND SIZE. (TYP. OF 3 UNITS)
2. INSTALL NEW 20A/3P CIRCUIT BREAKER IN EXISTING PANEL PPB2 LOCATED IN TELCO RM 17. NEW CIRCUIT BREAKER SHALL MATCH EXISTING IN STYLE AND AIC RATING.



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Consultants:

Revisions:

No.	Date	Description

Seal:

COA:

Issued For:

CONSTRUCTION DOCUMENTS

Scale:	AS NOTED
Date:	SEPTEMBER 24, 2021
Drawn By:	CAP
Reviewed By:	DNM
Approved By:	RFM
W&S Project No.:	ENG20-0504
W&S File No.:	

Drawing Title:

ELECTRICAL POWER PART PLANS

Sheet Number:

E202

Rev: 1.6 Date: 04/10/2019