ABBREVIATIONS

ABV.	ABOVE
AC	AIR CONDITIONER
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
AL	ACOUSTICAL LINING
ALD	AUTOMATIC LOUVER DAMPER (MOTORIZED)
ATC	AUTOMATIC TEMPERATURE CONTROL
B.D.D.	BACK DRAFT DAMPER
BMS	BUILDING MANAGEMENT SYSTEM
BOD	BOTTOM OF DUCT
BHP	BRAKE HORSE POWER
BRD	BAROMETRIC RELIEF DAMPER
BTU	BRITISH THERMAL UNIT
CC	COOLING COIL
CD	CEILING DIFFUSER
CFM	CUBIC FEET PER MINUTE
CG	CEILING GRILLE
CO2	CARBON DIOXIDE
CHW	CHILLED WATER
CO	CLEAN OUT
COD	CABLE OPERATED VOLUME DAMPER
CDP	CONDENSATE DRAIN PIPING
CP	CONDENSATE PUMP RETURN
CAV	CONSTANT AIR VOLUME TERMINAL
DN	DOWN
EAT	ENTERING AIR TEMPERATURE
EXH FN	EXHAUST FAN
EHC	ELECTRIC HEATING COIL
EV	EXPANSION VESSEL/EXPANSION TANK
EWT	ENTERING WATER TEMPERATURE
ETK	EXPANSION TANK
FC	FLEXIBLE CONNECTION
FCU	FAN COIL UNIT
FD/AD	FIRE DAMPER/ACCESS DOOR
FD/GA	FIRE DAMPER/GRILLE ACCESS
FTR	FIN TUBE RADIATOR
FL	FLOOR
FLA	FULL LOAD AMPS
FSD	FIRE SMOKE DAMPER
FSD/AD	FIRE SMOKE DAMPER/ACCESS DOOR
FSD/GA	FIRE SMOKE DAMPER/GRILLE ACCESS
GPM	GALLONS PER MINUTE
GX	GENERAL EXHAUST
HC	HEATING COIL
HHW	HEATING HOT WATER
HPS	HIGH PRESSURE STEAM
HP	HORSE POWER
HX	HEAT EXCHANGER (SHELL & TUBE)
ID	INSIDE DIMENSION
KW	KILOWATT
LAT	LEAVING AIR TEMPERATURE
LED	LINEAR EXHAUST DIFFUSER (CEILING, WALL, SILL, OR FLOOR)

LRD	LINEAR RETURN DIFFUSER (CEILING, WALL, SILL, OR FLOOR)
LSD	LINEAR SUPPLY DIFFUSER (CEILING, WALL, SILL, OR FLOOR)
LTHW	LOW TEMPERATURE HOT WATER
LVL	LEVEL
LWS	LOUVER WITH WIRE SCREEN
LWT	LEAVING WATER TEMPERATURE
MAT	MIXED AIR TEMPERATURE
MAX	MAXIMUM
MBH	THOUSAND BTU PER HOUR
MBTU	BRITISH THERMAL UNIT (1000 BTU)
MIN	MINIMUM
MO (WO)	MASONRY OPENING (WALL OPENING)
NC	NORMALLY CLOSED
NFA	NET FREE AREA
NIC	NOT IN THIS CONTRACT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OAT	OUTSIDE AIR TEMPERATURE
OBD	OPPOSED BLADE DAMPER
OED	OPEN ENDED DUCT
P	PUMP
PHC	PRE-HEAT COIL
PHX	PLATE & FRAME HEAT EXCHANGE
PSI	POUNDS PER SQUARE INCH (GAUGE)
RA	RETURN AIR
RF	RETURN FAN
RHC	REHEAT COIL
RPM	REVOLUTIONS PER MINUTE
RR	RETURN REGISTER
RX	RECYCLING ROOM EXHAUST
SA	SUPPLY AIR
SCHW	SECONDARY CHILLED WATER
SD	SMOKE DAMPER
SD/ALD	SMOKE DAMPER AND AUTOMATIC LOUVER COMBINATION
SF	SUPPLY FAN
SG	SUPPLY GRILLE
ST	SOUND TRAP
SEF	SMOKE EXHAUST FAN
TOD	TOP OF DUCT
TF	TRANSFER FAN
TG	TOP GRILLE
TR	TOP REGISTER
TD	TRANSFER DUCT
TRX	TRASH EXHAUST
TX	TOILET EXHAUST
UH	UNIT HEATER
VAV	VARIABLE AIR VOLUME
VD	VOLUME DAMPER
VFC	VOLUME FLOW CONTROLLER
VFD	VARIABLE FREQUENCY DRIVE
WMS	WIRE MESH SCREEN
(300)	CUBIC FEET OF AIR PER MINUTE OR GALLONS PER MINUTE

HVAC SYMBOLS (DUCTWORK)

	RECTANGULAR DUCT SUPPLY
	RECTANGULAR DUCT RETURN
	RECTANGULAR DUCT EXHAUST
	ROUND DUCT SUPPLY
	ROUND DUCT RETURN
	ROUND DUCT EXHAUST
	FALT OVAL DUCT SUPPLY
	FLAT OVAL DUCT RETURN
	FLAT OVAL DUCT EXHAUST
	DOUBLE WALL DUCTWORK
	DUCT WITH ACOUSTIC LINING
	DUCT WRAPPED WITH FIRE RATED INSULATION
X" TH	BRANCH DUCT WITH RADIUSED SIDE SPLIT - RECTANGULAR DUCT
	BRANCH DUCT TAP, SINGLE BOOT - RECTANGULAR DUCT
	BRANCH DUCT TAP, DOUBLE BOOT - RECTANGULAR DUCT
	BRANCH DUCT TAP, SINGLE BOOT - ROUND & FLAT OVAL DUCT
	BRANCH DUCT TAP, DOUBLE BOOT - ROUND & FLAT OVAL DUCT
	FLEXIBLE DUCT
	FLEXIBLE CONNECTION
AD	ACCESS DOOR
C.O.	CLEAN OUT
	DUCT THROUGH BEAM PENETRATION
	AUTOMATIC DAMPER - OPPOSED BLADE
	AUTOMATIC DAMPER - PARALLEL BLADE
FSD	FIRE SMOKE DAMPER
FD	FIRE DAMPER
BD.D.	BACKDRAFT DAMPER
BR.D.	BAROMETRIC DAMPER
A2	SQUARE CEILING DIFFUSER (SHADED SECTORS INDICATE BLANK OFFS)
B2	ROUND CEILING DIFFUSER (SHADED SECTORS INDICATE BLANK OFFS)
C2	ROUND FLOOR DIFFUSER (UFAD)
	REGISTER - SIDEWALL/CEILING/FLOOR - SUPPLY
	REGISTER/GRILLE - SIDEWALL/CEILING/FLOOR - RETURN/EXHAUST
	WALL TRANSFER GRILLES
	LINEAR DIFFUSER/GRILLE - SUPPLY/RETUN/EXHAUST (UNSHADED SECTIONS INDICATE ACTIVE LINEAR, SHADED SECTIONS INDICATE BLANK OFF)
	PLENUM FOR LINEAR DIFFUSER/GRILLE
SD	DUCT SMOKE DETECTOR
FS	DUCT FIRESTAT
AFS	AIRFLOW STATION
	SOUND TRAP
TR.D.	ACOUSTIC TRANSFER DUCT
	TERMINAL UNIT - VAV BOX - WITH/WITHOUT HEATING COIL
	TERMINAL UNIT - FAN COIL UNIT
	TERMINAL UNIT - FAN POWERED BOX WITH/WITHOUT HEATING COIL
	TERMINAL UNIT - FAN POWERED CHILLED BEAM - WITH HEATING & COOLING COILS
	TERMINAL UNIT - ACTIVE CHILLED BEAM - CEILING MOUNTED (SEE EQUIPMENT SCHEDULES)

HVAC SYMBOLS (DUCTWORK)

H	TERMINAL UNIT - ACTIVE CHILLED BEAM - HORIZONTAL ABOVE CEILING MOUNTED (SEE EQUIPMENT SCHEDULES)
V	TERMINAL UNIT - ACTIVE CHILLED BEAM - VERTICAL ABOVE CEILING MOUNTED (SEE EQUIPMENT SCHEDULES)
	TERMINAL UNIT - AIRFLOW REGULATOR (SLIP IN TYPE)
	TERMINAL UNIT - FAN BOOSTER UNIT (UFAD)
	LINT TRAP
	DUCT MOUNTED COIL
	DUCT MOUNTED UVGI
	DUCT MOUNTED HUMIDIFIER

HVAC SYMBOLS (PIPING)

	PIPE TURNING UP
	PIPE TURNING DOWN
	SLOPE RISE IN DIRECTION OF FLOW
	SLOPE DROP IN DIRECTION OF FLOW
	PIPE THROUGH BEAM PENETRATION
	WALL SLEEVE WITH WATER STOP
	ELBOW
	TEE
	BRANCH PIPE TOP CONNECTION
	BRANCH PIPE BOTTOM CONNECTION
	REDUCER/INCREASER CONCENTRIC
	REDUCER/DECREASER ECCENTRIC
	UNION
	FLANGED JOINT
	BLIND FLANGE
	END CAP
	PIPE GUIDE
	PIPE ANCHOR
	BALL VALVE - MANUAL (LEVER HANDLE)
	BALL VALVE - MANUAL (TEE HANDLE)
	BALL VALVE - MOTORIZED
	GENERAL DUTY ISOLATION VALVE (SEE SPEC FOR TYPE)
	GATE VALVE
	GLOBE VALVE
	BUTTERFLY VALVE - MANUAL
	BUTTERFLY VALVE - MOTORIZED
	ORBIT VALVE
	FLOWSETTER VALVE (BALANCING)
	CARTRIDGE FLOW BALANCER
	PRESSURE REDUCING VALVE
	PLUG VALVE
	CHECK VALVE (SWING TYPE)
	CHECK VALVE (SILENT TYPE, CENTER GUIDED)
PICV	PRESSURE INDEPENDENT CONTROL VALVE (PICV)
	2 WAY CONTROL VALVE
	3 WAY CONTROL VALVE (MIXING TYPE)
	3 WAY CONTROL VALVE (DIVERTING TYPE)
S	SOLENOID VALVE
	RELIEF VALVE
BFP	BACKFLOW PREVENTOR
RPZ	BACKFLOW PREVENTER (RPZ TYPE)
	AIR VENT (AUTOMATIC)
	TEMPERATURE GAUGE (DUCT MOUNTED)
	PRESSURE GAUGE W/ PIGTAIL AND PETCOCK

HVAC SYMBOLS (PIPING)

	SIGHTGLASS
	SIGHTGLASS WITH MOISTURE INDICATOR (REFRIGERANT)
	FILTER-DRYER
LD	LEAK DETECTOR, PROBE TYPE
LD	LEAK DETECTOR, CABLE TYPE
M	METER
	AIR VENT (MANUAL)
	Y-STRAINER WITH HOSE END
	Y-STRAINER WITH BLOW OFF BALL VALVE
	Y-STRAINER
	DRAIN VALVE WITH CAPPED HOSE END
	DUPLEX BASKET STRAINER
	NOISE SUPRESSOR (STEAM PRV)
	TEMPERATURE GAUGE
	PRESSURE GAUGE W/ PIGTAIL AND PETCOCK
	FLEXIBLE COUPLING
	PIPE IN PIPE (FUEL OIL)
	HEAT TRACED PIPE
AS	AIR SEPARATOR
XT	EXPANSION TANK
	CHEM SHOT FEEDER
	SHELL AND TUBE HEAT EXCHANGER
	PLATE AND FRAME HEAT EXCHANGER
	PUMP

CONTROLS SYMBOLS

T	THERMOSTAT
T	TEMPERATURE SENSOR
H	HUMIDISTAT
H	HUMIDITY SENSOR
CO	CARBON MONOXIDE SENSOR
CO2	CARBON DIOXIDE SENSOR
NO2	NITROGEN DIOXIDE SENSOR
H1	HYDROGEN SENSOR
R	REFRIGERANT SENSOR
EPO	EMERGENCY POWER OFF SWITCH
	TEMPERATURE GAUGE WITH PIPE WELL

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Key Plan

Description	Date
Filing Set	06/17/22

Project

Storm King Art Center

C.F.M. Building

Seal

NOT FOR CONSTRUCTION

Drawing Title

Abbreviations, Symbols & Legends

Date	06/17/22
Scale	Not to Scale
Drawing Number	M-C-001
Sheet Size	ARCH D

A. GENERAL NOTES

1. EXECUTE THE WORK IN THE BEST AND MOST THOROUGH MANNER AND TO THE SATISFACTION OF THE CONSULTING ENGINEER, WHO WILL JOINTLY INTERPRET THE MEANING OF THE DRAWINGS AND SPECIFICATIONS AND SHALL HAVE THE POWER TO REJECT ANY WORK AND MATERIALS, WHICH IN THEIR JUDGMENT ARE NOT IN FULL ACCORDANCE THEREWITH.

2. EXCEPT FOR CHANGES AS MAY BE SPECIFICALLY APPROVED BY THE CONSULTING ENGINEERS, IN ACCORDANCE WITH ALTERNATES OF OPTIONS STATED HEREINAFTER, ALL WORK MUST BE IN FULL ACCORDANCE WITH THE INTENT OF THE PLANS AND SPECIFICATIONS, COMPLETE IN EVERY WAY AND READY FOR SATISFACTORY AND EFFICIENT OPERATION WHEN DELIVERED TO THE OWNER.

3. WHERE DISAGREEMENTS OCCUR BETWEEN THE PLANS AND THE SPECIFICATIONS, OR WITHIN EITHER DOCUMENT ITSELF, THE ITEM OR ARRANGEMENT OF BETTER QUALITY, GREATER QUANTITY OR HIGHER COST SHALL BE INCLUDED IN THE BASE BID.

4. THE CONTRACTOR COVENANTS AND AGREES THAT THEY AND THEIR SUBCONTRACTORS AND THEY AND THEIR AGENTS, SERVANTS AND EMPLOYEES WILL PROVIDE AND MAINTAIN A SAFE PLACE TO WORK AND THAT THEY AND THEIR WILL COMPLY WITH ALL LAWS AND REGULATIONS OF ANY GOVERNMENTAL AUTHORITY HAVING JURISDICTION THEREOF AND THE CONTRACTOR AGREES TO INDEMNIFY, DEFEND AND HOLD HARMLESS THE CONSULTING ENGINEER, ARCHITECT AND OWNER FROM AND AGAINST ANY LIABILITY, LOSS, DAMAGE OR EXPENSE, INCLUDING ATTORNEY'S FEES ARISING FROM FAILURE OR ALLEGED FAILURE ON THE PART OF THE CONTRACTOR, THEIR SUBCONTRACTORS AND THEY AND THEIR AGENTS, SERVANTS AND EMPLOYEES TO PROVIDE AND MAINTAIN A SAFE PLACE TO WORK OR TO COMPLY WITH ALL LAWS AND REGULATIONS OF ANY GOVERNMENTAL AUTHORITY HAVING JURISDICTION THEREOF.

5. THE CONTRACTOR AND EACH SUBCONTRACTOR COVENANTS AND AGREES TO INDEMNIFY, DEFEND AND HOLD HARMLESS THE CONSULTING ENGINEER, ARCHITECT AND OWNER FROM AND AGAINST ANY LIABILITY, LOSS, DAMAGE OR EXPENSE, INCLUDING ATTORNEY'S ARISING FROM A FAILURE OR ALLEGED FAILURE ON THE PART OF THE CONTRACTOR, THEIR SUBCONTRACTORS AND THEY AND THEIR AGENTS, SERVANTS AND EMPLOYEES PROPERLY TO DISCHARGE THE OBLIGATIONS ASSUMED BY HIM OR THEM IN THE PERFORMANCE OF THE WORK, INCLUDING ANY ACT OR OMISSION ALLEGEDLY RESULTING IN DEATH OR PERSONAL INJURY OR PROPERTY DAMAGE OR IMPROPER CONSTRUCTION, CONSTRUCTION TECHNIQUES OR THE USE OF IMPROPER OR INAPPROPRIATE MATERIAL OR TOOLS.

6. THE CONTRACTOR AGREES THAT ANY CONTROVERSY OR DISPUTE TO WHICH THE CONTRACTOR, THE ARCHITECT, AND THE CONSULTING ENGINEERS ARE PARTIES SHALL BE SUBMITTED TO ARBITRATION FOR DECISION IN ACCORDANCE WITH THE RULES OF SUCH ASSOCIATION FOR CONSTRUCTION INDUSTRY DISPUTES. ALL SUBCONTRACTORS LIKEWISE AGREE TO SUBMIT TO SUCH ARBITRATION ANY DISPUTE BETWEEN OR AMONG THEM, THE CONTRACTOR, THE ARCHITECT AND THE CONSULTING ENGINEERS, AND THE CONTRACTOR AGREES TO MAKE AVAILABLE TO THE CONSULTING ENGINEERS ON DEMAND SIGNED COPIES OF THE CONTRACT BETWEEN THE OWNER AND THE CONTRACTOR AND BETWEEN THE CONTRACTOR AND THEIR SUBCONTRACTORS. THE CONTRACTOR AND EACH SUBCONTRACTOR AGREE THAT BY SUBMITTING A BID WHICH IS ACCEPTED, THIS PARAGRAPH SHALL BE DEEMED A WRITTEN AGREEMENT TO SUBMIT ANY CONTROVERSY THEREAFTER ARISING ARBITRATION.

7. ALL WORK SHALL BE DONE IN CONFORMANCE WITH ALL GOVERNING CODES, INCLUDING AMENDMENTS, BULLETINS, ETC., AS WELL AS STANDARDS OF INSTALLATION AND EQUIPMENT ESTABLISHED FOR THE BUILDINGS, AND REQUIREMENTS OF THE OWNER.

8. OBTAIN ALL NECESSARY PERMITS AND APPROVAL FROM GOVERNING AUTHORITIES AND FILE ALL NECESSARY FORMS. PAY ALL INSPECTION FEES.

9. COORDINATE SCHEDULING OF ALL WORK TO BE PERFORMED WITH OWNER AND/OR THEIR AGENT AND INCLUDE ALL NECESSARY PREMIUM TIME REQUIRED FOR SHUTDOWNS, WORK IN OCCUPIED AREAS, ETC.

10. BEFORE COMMENCING WORK, EXAMINE ALL ADJOINING WORK ON WHICH THIS WORK IS IN ANY WAY DEPENDENT FOR PERFECT WORKMANSHIP ACCORDING TO THE INTENT OF THIS SPECIFICATION, AND REPORT TO THE CONSTRUCTION MANAGER ANY CONDITION WHICH PREVENTS PERFORMANCE OF FIRST-CLASS WORK. NO "WAIVER OF RESPONSIBILITY" FOR INCOMPLETE, INADEQUATE OR DEFECTIVE ADJOINING WORK WILL BE CONSIDERED UNLESS NOTICE HAS BEEN FILED BEFORE SUBMITTAL OF A PROPOSAL.

11. COORDINATE ALL WORK WITH OTHER TRADES TO INSURE INSTALLATION IS MADE IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

12. FURNISH ADEQUATE LIABILITY INSURANCE AND BONDING AS REQUIRED BY OWNER.

13. INCLUDE ALL LABOR, MATERIALS, AND APPURTENANCES REQUIRED FOR THE FURNISHING, INSTALLING AND TESTING OF ALL WORK. COMPLETE AND MAKE READY FOR OPERATION IN A MANNER SATISFACTORY TO THE ARCHITECT AND CONSULTING ENGINEER, ALL WORK SHOWN ON DRAWINGS AND SPECIFIED HEREIN.

14. ALL WORK SHALL BE GUARANTEED FOR TWO (2) FULL YEARS FROM THE DATE WHEN THE OWNER HAS ISSUED A "CERTIFICATE OF SUBSTANTIAL COMPLETION".

15. PROVIDE TEMPERATURE CONTROL DEVICES FOR ALL EQUIPMENT, THERMAL ZONE. HEATING & COOLING COILS AND EACH

16. DIMENSIONS INDICATED ON THESE DRAWINGS ARE CLEAR, INSIDE DIMENSIONS.

17. CONTRACTOR SHALL ALLOW FOR ADEQUATE FLEXIBLE DUCT AND PIPE CONNECTIONS. CONNECTION SHALL CONFORM TO THE REQUIREMENTS OF THE MECHANICAL DETAILS AND SPECIFICATIONS.

18. IN ADDITION TO ROTATING EQUIPMENT CONNECTIONS, FLEXIBLE ACOUSTIC ISOLATION, BUILDING CONNECTIONS SHALL OCCUR AT ALL MOVEMENT JOINTS, AND AT ALL "BOX-IN BOX" CONSTRUCTION. COORDINATE REQUIREMENTS WITH ALL OTHER DRAWINGS.

19. ALL SUSPENDED EQUIPMENT TO BE HUNG WITH VIBRATION ISOLATORS PER SPECIFICATION SECTION. MECHANICAL DETAILS AND

20. CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE VIBRATION ISOLATION REQUIREMENTS IN THE SPECIFICATIONS & STANDARD DETAILS.

21. PROVIDE FIRE DAMPERS WHEN CROSSING RATED WALLS. REFER TO RATED WALL LOCATIONS AND ARCHITECTURAL DRAWINGS FOR FIRE TYPES.

22. BUILDING SMOKE PURGE SYSTEMS SHALL COMPLY WITH THE REQUIREMENTS OF ANY LOCAL AHJ REQUIREMENTS..

23. SUPPORT ANCHORS SECURED TO THE BOTTOM OF FLOOR SLABS SHALL BE OF THE DROP-IN OR SLEEVE ANCHOR VARIETY. POWDER CHARGED ANCHORING METHODS SHALL NOT BE USED.

24. COORDINATE WITH ARCHITECT FOR FINAL LOCATIONS OF ALL THERMOSTATS PRIOR TO INSTALLATION AND SEEK ENGINEER CONFIRMATION.

25. ALL CONTROL POWER WIRING AND TRANSFORMERS FOR DAMPERS, ACTUATORS, VAV PANELS, ETC SHALL BE PROVIDED BY THE CONTROLS CONTRACTOR. BOXES, CONTROL POWER FOR CONTROL DEVICES SHALL BE DERIVED FROM SOURCE DESIGNATED BY THE ELECTRICAL CONTRACTOR.

26. PROVIDE ACCESS PANELS IN CEILINGS FOR ACCESS TO EQUIPMENT WHERE NECESSARY. CONTRACTOR SHALL ALLOW FOR ADEQUATE ACCESS FOR ALL BALANCING COMPONENTS AND HVAC EQUIPMENT. ENSURE ALL MECHANICAL ELEMENTS ARE A MINIMUM 8" ABOVE FALSE CEILING.

27. ALL MECHANICAL EQUIPMENT SHALL BE MOUNTED ON HOUSEKEEPING PADS AS INDICATED IN THE DRAWINGS COMPLETE WITH ACOUSTIC AND VIBRATION MOUNTS AS INDICATED IN THE STANDARD DETAILS.

28. ALL SUPPLY & RETURN / EXHAUST GRILLES SHALL BE VISION PROOF WHERE REQUIRED.

29. REFER TO ARCHITECTS DRAWINGS FOR CEILING AND FLOOR MOUNTED GRILLE & DIFFUSER SETTING OUT DIMENSIONS.

30. THESE DRAWINGS ARE DIAGRAMMATIC IN NATURE. REFERENCE ARCHITECTURAL DRAWINGS FOR DIMENSIONS/RELATIONSHIPS OF ALL EXPOSED ELEMENTS. COORDINATE ALL HIDDEN WORK WITH ALL OTHER TRADES AND WITH THE FINAL DIMENSIONED LAYOUT OF ELEMENTS FROM ALL TRADES PRIOR TO THE START OF ANY WORK. REPORT ANY CONFLICTS TO ARCHITECT FOR RESOLUTION PRIOR TO START OF ANY WORK.

31. ALLOW FOR ACCESS GRATINGS TO EQUIPMENT AND DAMPERS HIGHER THAN 10 FEET ABOVE FLOOR LEVEL IN MECHANICAL ROOMS.

32. PROVIDE ACCESS PANEL IN CEILINGS FOR ACCESS TO EQUIPMENT WHERE NECESSARY. REFER TO ARCHITECTS CEILING PLANS AND DETAILS.

33. DRAIN LINES FROM ROOF MOUNTED EQUIPMENT SHALL BE PIPED TO THE NEAREST ROOF DRAIN.

B MECHANICAL DUCTWORK

1. COMBINATION FIRE SMOKE DAMPERS SHALL BE INSTALLED WHEREVER DUCTWORK PENETRATES A SHAFT ENCLOSURE.

2. MAXIMUM LENGTH OF FLEXIBLE DUCTWORK BETWEEN BRANCH AND AIR TERMINAL SHALL BE 3'-0".

3. PROVIDE VOLUME DAMPERS IN BRANCH AND RUN OUT DUCTWORK FOR ALL AIR OUTLETS AND INLETS. WHERE DAMPERS ARE ABOVE NON-ACCESSIBLE CEILINGS OR ARE WITHIN CONSTRUCTION, CABLE OPERATED, WORM-GEAR TYPE, REMOTE NON-ACCESSIBLE VOLUME DAMPERS SHALL BE PROVIDED.

4. PROVIDE 1" INTERNAL DUCT ACOUSTICAL & THERMAL LINING (TYPE: JOHNS MANVILLE PERMACOTE LINACOUSTIC R-300 TYPE II BOARD OR EQUAL AND APPROVED) ON ALL SUPPLY DUCTWORK FOR THE FIRST 18ft FROM SUPPLY FAN.

5. SUPPORT ANCHORS SECURED TO THE BOTTOM OF FLOOR SLABS SHALL BE OF THE DROP-IN OR SLEEVE ANCHOR VARIETY. POWDER CHARGED ANCHORING METHODS SHALL NOT BE USED.

6. PROVIDE DUCT ACCESS DOORS AND CEILING ACCESS PANELS FOR ALL FIRE, SMOKE AND. COMBINATION FIRE/SMOKE DAMPERS. CEILING ACCESS PANELS SHALL BE COORDINATED WITH ARCHITECTS REQUIREMENTS.

7. PROVIDE SMOKE DETECTORS IN ALL DUCTWORK WHERE REQUIRED BY CODE. COORDINATE ALL SMOKE DETECTORS WITH THE ELECTRICAL CONTRACTOR AND THE FIRE ALARM.

8. AIR OUTLETS LOCATED IN HIGH CEILINGS SHALL BE FIELD ADJUSTED FOR OPTIMUM DRAFT AND THROW PERFORMANCE.

9. ALL EXPOSED DUCTWORK SHALL BE INTERNALLY LINED, CLEAN, STICKER FREE AND FREE OF DEFORMITIES AND MARKS.

10. LINEAR FLOOR GRILLES AND DIFFUSERS SHALL BE SHOWN ON ARCHITECTURAL DRAWINGS AND SHALL BE HEAVY DUTY.

11. MOUNT ALL SIDEWALL REGISTERS AT THE SAME ELEVATION OR AS SHOWN ON ARCHITECTURAL DRAWINGS.

12. ALL SUPPLY AND RETURN GRILLES AND OPENINGS MUST BE COORDINATED WITH ARCHITECTURE USING THE DESIGN REQUIREMENTS SHOWN ON THE MECHANICAL DRAWINGS AND SCHEDULES.

13. APPROVED COORDINATION DRAWINGS TO BE USED FOR ELEVATIONS AND LOCATIONS OF DUCTWORK AND EQUIPMENT.

14. ALL OPEN ENDED DUCTS TO HAVE WIRE MESH SCREENS.

15. OUTDOOR AIR OPENINGS WITHIN 10' OF CONTAMINANTS SHALL POSITIONED TO CONFORM TO ASHRAE 62.1 2007 REQUIREMENTS.

16. ALL AIR PLENUM SHALL BE 18 GAGE SHEET METAL.

C MECHANICAL PIPEWORK

1. ALL PIPING TO ALLOW FOR EXPANSION BY MEANS OF EXPANSION LOOP AND PIPE ANCHORS.

2. ALL GAS-FIRED APPLIANCES SHALL BE VENTED IN ACCORDANCE WITH NFPA-54, REFERENCED IN THE NYC BUILDING CODE AND WITH LOCAL E-DESIGNATION CODE.

3. PROVIDE GAS SAFETY SHUT-OFF VALVES ON BOTH THE FIRM AND INTERRUPTIBLE GAS MAINS LOCATED IN THE BOILER ROOM. THE CONTRACTOR SHALL PRESSURE TEST ALL PIPING AS PER THE SPECIFICATION.

4. ALL PIPING IN UNHEATED AREAS OR OUTSIDE SHALL BE HEAT TRACED.

5. COORDINATE WITH PLUMBING CONTRACTOR FOR ALL GAS CONNECTIONS TO GAS FIRED EQUIPMENT.

6. DRAIN LINES FROM CEILING MOUNTED EQUIPMENT SHALL BE PIPED TO THE NEAREST FLOOR DRAIN OR SANITARY LINE.

7. HEAT TRACE ALL HEATING HOT WATER PIPE LOCATED ABOVE GRADE OUTSIDE OF BUILDINGS, OR IN COVERED WALKWAYS.

8. ALL PIPING PASSING THROUGH MASONRY WALLS SHALL HAVE A SLEEVE, SEE SPECIFICATIONS.

9. ALL PIPING PASSING THROUGH FIRE-RATED WALLS SHALL HAVE A FIRE-RATED SLEEVE - SEE SPECIFICATIONS.

10. REFRIGERANT PIPE INSULATION AND VAPOR BARRIERS SHALL BE CONTINUOUS THROUGH PIPE HANGERS.

11. ALL BLACK STEEL PIPE HANGERS SHALL BE PAINTED PRIOR TO INSTALLATION.

12. PROVIDE A STRAIGHT RUN OF PIPING AT PUMP SUCTIONS OF LENGTH AT LEAST 5 PIPE DIAMETERS.

D. DIRECT DIGITAL CONTROL (DDC) OVERAL SYSTEM

(BASES OF DESIGN : DISTECH CONTROLS BY AUTOMATED BUILDING SOLUTIONS)
CONTRACTOR SHALL INCLUDE A NEW AND OPEN COMMUNICATION PROTOCOL STATE OF THE ART DIRECT DIGITAL CONTROL (DDC) SYSTEM. COMPOSEDOF AN OPERATING SYSTEM CAPABLE TO TREND READING DATA, ALARM CONTROL SETPOINTS OUT OF RANGE, SCHEDULE SPECIAL AND REGULAR EVENTS AND DISPLAY 3D GRAPHICS. THIS OPERATING SYSTEM SHALL BE HOSTED BY A RACK SERVER WITH ALL THE NECESSARY ACCESSORIES IN ORDER TO BE SEATED INTO THE OWNER'S BUILDING IT NETWORK OR DEDICATED DDC FOR PASSWORD PROTECTED REMOTE ACCESS AND ACT AS A VIRTUAL SERVER. THE OPERATING DDC SYSTEM SHALL BE THE LATEST VENDOR'S VERSION AND ANY FUTURE UPGRADES SHALL BE INCLUDED AS PART OF THE SCOPE FOR AT LEAST THE PERIOD OF THE WARRANTY. THE SYSTEM SHALL SUPPORT API PROTOCOLS

TRAINING SHALL BE INCLUDED AND IT SHALL INCLUDE THREE PHASES:
1. A GENERAL SYSTEM OVERALL TRAINING.
2. HANDS-ON TRAINING.
3. FOLLOW UP TRAINING –THIS FOLLOW UP TRAINING SHALL BE SIX MONTHS AFTER FINAL CONSTRUCTION.

THE DDC SYSTEM SHALL INCLUDE DATA MANAGER CONTROLLERS PER EACH LEVEL OR FLOOR WITH NETWORK LOOPS OF A MINIMUM OF 64 DEVICES OR UNITARY CONTROLLERS. THE DDC SYSTEM ALSO SHALL BE CAPABLE OF EXPANSION. DEDICATED UNITARY CONTROLLERS SHALL BE PROVIDED FORALL TYPE OF MECHANICAL SYSTEMS AS WELL AS ALL THE ASSOCIATED END DEVICES. EACH DDC CONTROLLER SHALL HAVE UNIVERSAL INPUTS AND OUTPUTS.

CONTROLS WILL HAVE THE CAPABILITY OF TREND LOGGING SPECIFIC PARAMETERS IN ORDER TO COMMISSION THE SYSTEM AND TRACK ENERGY COSTS AS REQUIRED (THIS INCLUDES ANY METERING STRATEGIES REQUIRED BY LEED E.G. MEASUREMENT & VERIFICATION). IT IS ENVISAGED THAT AN ENERGY "DASHBOARD"WILL BE PROVIDED IN THE FACILITY FOR THE BUILDING MANAGERS TO VIEW THE CURRENT ENERGY USAGE AND HISTORICAL ENERGY USAGE AND BE CONFIGURE PER THE OWNER'S DIRECTION.

THE DDC SYSTEM SHALL HAVE INTEGRATION CAPABILITIES; THE INTENT OF THE INTEGRATION IS TO FORM THE ABILITY TO HAVE A SINGLE ACCESS TO ALL INTEGRATED SYSTEMS. THIS IS NOT LIMITED TO THE FOLLOWING: BOILER MASTER PANELS, VRF INTERFACES, CHILLERS, CRAC UNITS, VFD'S , GAS AND WATER FLOW METERS, WATER TREATMENT SYSTEM, SECURITY, ACCESS CONTROL, CCTV, VIDEO SURVEILLANCE, LIGHTING CONTROL, UPS/BATTERY POWER SYSTEM, ATS SWITCHES, POWER METERS, DIGITAL SIGNAGE, ELEVATOR CONTROLS AND PACKAGED HVAC EQUIPMENT SUCH AS AHUS AND RTUS. ALTHOUGHALL FEATURES MAY NOT BE INSTALLED IN THIS PROJECT, THE DDC SHALL HAVE THE CAPABILITY. IF NECESSARY THE DDC SYSTEM SHALL ALSO BE CAPABLE TO MANAGE WIRELESS COMMUNICATION SYSTEMS. THIS APPLIES TO DATA-MANAGERS AS WELL AS UNITARY CONTROLLERS AND CRITICAL SENSORS.

THE DDC VENDOR SHALL INCLUDE A SEQUENCE OF OPERATIONS GRAPHIC AND DEDICATED PAGE(S). ALL THE SEQUENCES SHOULD BE IN A SEPARATE PART OF THE NAVIGATION TREE, BUT ALSO ORGANIZED BY INDIVIDUAL ROOM, BY AHU EQUIPMENT , AND/OR BY SYSTEM. THE SEQUENCE SHOULD BE THE AS-BUILT

SEQUENCE THAT MATCHES EXACTLY WHAT IS PROGRAMMED. AS COMMISSIONING OCCURS AND SEQUENCE CHANGES ARE MADE, THESE PAGES SHALL BE UPDATED.

SMART BUILDING FEATURE
THE DDC SYSTEM SHALL BE CAPABLE TO ACT AS "THE DRIVER" IN COLLECTING DATA, MONITOR PERFOMANCE AND ENERGY USAGE OF SEVERAL THIRD PARTY SYSTEM VIA DDC INTEGRATION. THE DDC SYSTEM SHALL HAVE INTEGRATION CAPABILITIES, THE INTENT OF THE INTEGRATION IS TO FORM THE ABILITY TO HAVE A SINGLE ACCESS TO ALL INTEGRATED SYSTEMS. THIS IS NOT LIMITED TO THE FOLLOWING: HEAT PUMPS, AIR HANDLING UNITS, VRF INTERFACES, FAN COIL UNITS UNITS, UNIT HEATERS, VFD'S , WATER FLOW METERS, WATER TREATMENT SYSTEM, SECURITY, ACCESS CONTROL, CCTV, VIDEO SURVEILLANCE, LIGHTING CONTROL, UPS/BATTERY POWER SYSTEM, ATS SWITCHES, POWER METERS, DIGITAL SIGNAGE, ELEVATOR CONTROLS, SHADES AND PACKAGED HVAC EQUIPMENT SUCH AS AHUS AND RTUS. IF NECESSARY THE DDC SYSTEM SHALL ALSO BE CAPABLE TO MANAGE WIRELESS COMMUNICATION SYSTEMS THIS APPLIES TO DATA-MANAGERS AS WELL AS UNITARY CONTROLLERS AND CRITICAL SENSORS.

DDC GENERAL NOTES
1. THE DDC CONTRACTOR SHALL FURNISH AND INSTALL ALL STATE OF THE ART HARDWARE AND ALL THE LATEST OPERATING AND APPLICATIONS SOFTWARE NECESSARY TO PERFORM THE CONTROL SEQUENCES OF OPERATION AS CALLED FOR IN THIS SPECIFICATION.
2. AS A MINIMUM, ONE DEDICATED DDCP SHALL BE PROVIDED FOR EACH MAIN HVAC EQUIPMENT (AHU, RTU, WATER SYSTEMS, VAV, FAN POWEREDVAV BOXES, FCU), IT IS ACCEPTABLE TO HAVE EXPANSION DDC CONTROLLER WITHIN THE SAME SYSTEM DDCP.
3. ALL SETPOINTS INDICATED IN THE SEQUENCES SHALL BE ADJUSTABLE AT THE FRONT END DDC MAIN SOFTWARE SYSTEM OR ANY USER INTERFACE STATION CONNECTED TO ANY MAIN DATA MANAGER CONTROLLER.
4. UNLESS OTHERWISED NOTED, THE DDC SYSTEM ARCHITECTURE SHALL TIE INTO THE BUILDING IT INFRASTRUCTURE AND IT SHALL INTERACT BETWEEN EACH OTHER FOR REMOTE ACCESS. BUILDING IT SHALL PROVIDE STATIC IP ADDRESS AS REQUIRE BY THE DDC CONTRACTOR DDC DESIGN.
5. THE DDC CONTRACTOR SHALL COMPLY WITH ALL BUILDING IT INFRASTRUCTURE SECURITY POLICIES FROM REMOTE ACCESS.
6. UNLESS OTHERWISE NOTED, THE DDC CONTRACTOR SHALL PROVIDE, FOR THE PRIMARY NETWORK, AN INDIVIDUAL ETHERNET VERTICAL HOMERUNS FROM DDC SERVER SWITCH/HUB TO EACH DATA MANAGER OR PRIMARY CONTROLLER AS LONG AS ETHERNET MAXIMUM DISTANCE LIMITATION ARE NOT EXCEEDED.
7. THE DDC CONTRACTOR SHALL BE RESPONSIBLE TO FOLLOW ALL THE TECHNICAL REQUIREMENTS IN A DDC SYSTEM ARCHITECTURE DESIGN FOR DISTANCE LIMITATIONS ON ETHERNET AND FIBER NETWORK. ALL ETHERNET SWITCHES OR FIBER TO ETHERNET CONVERTERS AND ASSOCIATED ACCESSORIES TO BE FURNISH BY THE DDC CONTRACTOR. THE DDC VENDOR SHALL PROVIDE PRIMARLY 24VAC POWER INPUT SWITCHES OR CONVERTER'S TYPE.
8. THE DDC BMS SYSTEM SHALL ALLOW THE DISTRIBUTION OF SYSTEM FUNCTIONS SUCH AS MONITORING AND CONTROL AND GRAPHICAL USER INTERFACE ETC. ACROSS THE NETWORK TO ACHIEVE MAXIMUM FLEXIBILITY, ACCESSIBILITY AND PERFORMANCE.
9. IT IS NOT ACCEPTABLE TO UTILIZE THE NETWORK TO SEND CRITICAL DATA REQUIRED BY A CONTROL ALGORITHM FROM ONE CONTROLLER TO ANOTHER. CRITICAL DATA SHALL BE A DIRECT HARDWIRE INPUT TO THE CONTROLLER CONTAINING THE CONTROL ALGORITHM. IF MULTIPLE CONTROLLERS REQUIRE THE SAME PIECE OF DATA FOR A CONTROL ALGORITHM, THE DATA SHALL BE A DIRECT HARDWIRE INPUT TO EACH CONTROLLER.
10. IT IS NOT ACCEPTABLE TO RESTRICTED ACCESS TO DDC SYSTEM DATA BY THE HARDWARE CONFIGURATION OF THE BMS. HARDWARE CONFIGURATION OF THE BMS NETWORK SHALL BE TOTALLY OPEN AND TRANSPARENT TO THE USER WHEN ACCESSING DATA OR DEVELOPING CONTROL PROGRAMS.
11 THE DDC CONTRACTOR BMS DESIGN SHALL BE MADE TO ALLOW THE CO-EXISTENCE OF CURRENT (IF APPLICABLE) AND FUTURE EXPANSION OF DATA MANAGER CONTROLLERS AND PERSONAL COMPUTER OPERATOR WORKSTATIONS ON THE SAME PRIMARY NETWORK.
12. IT IS NOT ACCEPTABLE TO RESTRICTED ACCESS TO A DDC SYSTEM DATA BY THE HARDWARE CONFIGURATION OF THE BMS. HARDWARE CONFIGURATION OF THE BMS NETWORK SHALL BE TOTALLY OPEN AND TRANSPARENT TO THE USER WHEN ACCESSING DATA OR DEVELOPING CONTROL PROGRAMS.
13. THE DDC CONTRACTOR SHALL PROVIDE NETWORK WIRING AS REQUIRED TO ENSURE TOTAL SYSTEM OPERATION AND COMMUNICATION WITHOUT INTERRUPTION, EVEN IF THE NETWORK WIRING IS OPEN IN ONE (1) LOCATION.
14. THE PRIMARY NETWORK SHALL ALLOW ANY DATA MANAGER CONTROL PANEL TO ACCESS ANY DATA FROM, OR SEND CONTROL COMMANDS AND ALARM REPORTS DIRECTLY TO, ANY OTHER PRIMARY CONTROL PANEL OR COMBINATION OF CONTROLLERS ON THE NETWORK WITHOUT DEPENDENCE UPON A CENTRAL OR INTERMEDIATE PROCESSING DEVICE.
15. THE PEER-TO-PEER NETWORK SHALL ALSO ALLOW ANY PRIMARY CONTROL PANEL TO ACCESS, EDIT, MODIFY, ADD, DELETE, BACK UP, RESTORE ALL SYSTEM POINT DATABASE AND ALL PROGRAMS, ASSIGN PASSWORD ACCESS AND CONTROL PRIORITIES TO EACH SYSTEM INDIVIDUALLY. THE LOGON PASSWORD (AT ANY PC WORKSTATION OR PORTABLE OPERATOR TERMINAL) SHALL ENABLE THE OPERATOR TO MONITOR, ADJUST AND CONTROL ONLY THE SYSTEM THAT THE OPERATOR IS AUTHORIZED FOR.
16. A RACK SERVER WITH BUILT-IN MONITOR SHALL BE FURNISHED LOADED WITH THE DDC CONTRACTOR OPERATING BUILDING MANAGEMENT SYSTEM (BMS) SOFTWARE PLUS ALL THE NECESSARY ACCESSORIES FOR MOUNTING AND CONNECTING TO AN IT NETWORK. AN ADDITIONAL UI STATION TO ACCESS DDC SERVER AT THE MAIN LOCATION POINTS OF CONTROL OF THE DDC SYSTEM SHOULD BE ALSO PROVIDED AND SET UP BY THE DDC CONTRACTOR.
17. ALL GLOBAL COMMON INFORMATION (OUTSIDE AIR TEMP & HUMIDITY, ETC) SHALL BE MEASURED AND COMMUNICATED FROM THE CENTRAL WEATHER STATION.
18. WEATHER STATION SHALL BE VAISALA WXT536 & IT SHALL BE PROVIDED WITH ALL NECESSARY ACCESSORIES TO MEASURE PRESSURE, TEMPERATURE, HUMIDITY, RAIN, WIND. INTERFACE CONNECTIVITY AS WELL AS HARDWIRE TERMINATIONS ARE ACCEPTABLE .
19. THE DDC CONTRACTOR SHALL FURNISH COMMUNICATIONS INTERFACE (INCLUDING NECESSARY SOFTWARE) BETWEEN THE DDC SYSTEM AND EACH MANUFACTURER SUPPLIED CONTROL PANEL SPECIFIED. THE DDC SYSTEM SHALL BE CAPABLE OF READING AND DISPLAYING ALL DATA USED BY THE MANUFACTURER'S CONTROL PANEL. SOFTWARE INTERFACE SHALL BE THROUGH LONMARK/BACNET/MOD BUS COMPLIANT PROTOCOL. WHERE THE DDC SYSTEM IS REQUIRED TO CONTROL THE OPERATION OF THE EQUIPMENT, PROVIDE INPUT AND OUTPUT INTERFACE AS REQUIRED.
20. DDC SYSTEM SHALL BE EXPANDABLE WITHOUT HAVING TO PHYSICALLY RECONFIGURE THE NETWORK.
21. AN UNINTERRUPTIBLE POWER SUPPLY (UPS) SHALL BE PROVIDED AND INSTALLED BY THE DDC CONTRACTOR FOR EACH OF THE FOLLOWING DEVICES THAT ARE POWERED BY THE BMS INCLUDING; NETWORK SWITCHES, BMS PRIMARY CONTROL PANEL, BMS SECONDARY CONTROL PANEL, OPERATOR'S WORKSTATION, PRINTER AND FIELD DEVICE. EACH UPS SHALL POWER THE DEVICE FOR A MINIMUM OF 30 MINUTES, IN THE CASE OF POWER INTERRUPTION.
22. EACH UPS SHALL BE PROVIDED WITH DRY CONTACTS FOR STATUS, RECOMMENDED MANUFACTURER: FUNCTIONAL DEVICES PART# PSH850-UPS-STAT.

PRIMARY NETWORK
1. ALL OPERATOR WORKSTATIONS AND DATA MANAGER CONTROLLERS SHALL DIRECTLY RESIDE ON A NETWORK SUCH THAT COMMUNICATIONS (I.E., ABILITY TO ACCESS, EDIT, MODIFY, ADD, DELETE, BACK UP, REPORT, TREND, RESTORE ALL SYSTEM POINT DATABASE AND ALL PROGRAMS) MAY BE EXECUTED DIRECTLY BETWEEN SERVERS, PRIMARY CONTROL PANELS, AND OPERATOR WORKSTATIONS ON A PEER-TO-PEER BASIS.
2. ALL OPERATOR DEVICES EITHER NETWORK RESIDENT OR CONNECTED VIA INTRANET AND INTERNET, SHALL HAVE THE ABILITY TO ACCESS ALL POINT STATUS AND APPLICATION REPORT DATA OR EXECUTE CONTROL FUNCTIONS FOR ANY AND ALL OTHER DEVICES VIA THE PRIMARY NETWORK OR THE SECONDARY NETWORK.
3. ACCESS TO DATA SHALL BE BASED UPON LOGICAL IDENTIFICATION OF BUILDING EQUIPMENT.
4. THE PRIMARY NETWORK SHALL PROVIDE A HIGH-SPEED DATA TRANSFER RATES FOR ALARM REPORTING, QUICK REPORT GENERATION FROM MULTIPLE CONTROLLERS AND UPLOAD/DOWNLOAD EFFICIENCY BETWEEN NETWORK DEVICES. SYSTEM PERFORMANCE SHALL INSURE THAT AN ALARM OCCURRING AT ANY CONTROL PANEL IS DISPLAYED AT ANY PC WORKSTATION, STANDALONE ALARM PRINTER AND/OR CONTROL PANEL WITHIN 5 SECONDS.
5. THE PRIMARY NETWORK SHALL PROVIDE MESSAGE AND ALARM BUFFERING TO PREVENT INFORMATION FROM BEING LOST, ERROR DETECTION, CORRECTION AND RE-TRANSMISSIONTO GUARANTEE DATA INTEGRITY.
6. THE PRIMARY NETWORK SHOULD BE CAPABLE TO DO SYNCHRONIZATION OF REAL-TIME CLOCKS BETWEEN SERVER, PRIMARY CONTROL PANELS, AND OPERATOR WORKSTATIONS, INCLUDING AUTOMATIC DAYLIGHT SAVINGS TIME CORRECTIONS.
7. THE DDC CONTRACTOR SHALL PROVIDE NETWORK WIRING AS REQUIRED TO ENSURE TOTAL SYSTEM OPERATION AND COMMUNICATION WITHOUT INTERRUPTION, EVEN IF THE NETWORK WIRING IS OPEN IN ONE (1) LOCATION.
8. THE PRIMARY NETWORK SHALL ALLOW THE PRIMARY CONTROL PANELS TO ACCESS ANY DATA FROM, OR SEND CONTROL COMMANDS AND ALARM REPORTS DIRECTLY TO, ANY OTHER PRIMARY CONTROL PANEL OR COMBINATION OF CONTROLLERS ON THE NETWORK WITHOUT DEPENDENCE UPON A CENTRAL OR INTERMEDIATE PROCESSING DEVICE.
9. THE PRIMARY CONTROL PANEL SHALL SEND ALARM REPORTS TO MULTIPLE OPERATOR WORKSTATIONS WITHOUT DEPENDENCE UPON A CENTRAL OR INTERMEDIATE PROCESSING DEVICE.
10. THE PEER-TO-PEER NETWORK SHALL ALSO ALLOW ANY DATA MANAGER CONTROL PANEL TO ACCESS, EDIT, MODIFY, ADD, DELETE, BACK UP, RESTORE ALL SYSTEM POINT DATABASE AND ALL PROGRAMS, ASSIGN PASSWORD ACCESS AND CONTROL PRIORITIES TO EACH SYSTEM INDIVIDUALLY. THE LOGON PASSWORD (AT ANY PC WORKSTATION OR PORTABLE OPERATOR TERMINAL) SHALL ENABLE THE OPERATOR TO MONITOR, ADJUST AND CONTROL ONLY THE SYSTEM THAT THE OPERATOR IS AUTHORIZED FOR.

SECONDARY NETWORK
1. THIS NETWORK SHALL CONNECT AND SUPPORT STAND-ALONE SECONDARY CONTROL PANELS AND SHALL COMMUNICATE BI-DIRECTIONALLY WITH THE PRIMARY NETWORK THROUGH ANY DATA MANAGER CONTROL PANELS FOR TRANSMISSION OF GLOBAL DATA. SUFFICIENT NUMBER OF DATA MANAGER CONTROL PANELS SHALL BE PROVIDED FOR CONNECTION OF SECONDARY NETWORKS BASED ON QUANTITY OF SECONDARY CONTROLS PANELS AND DISTANCE LIMITATIONS.
2. SECONDARY CONTROL PANELS SHALL BE ARRANGED ON THE SECONDARY NETWORK IN A FUNCTIONAL RELATIONSHIP MANNER WITH THE DATAMANAGER CONTROL PANELS. FOR EXAMPLE, A VAV SECONDARY CONTROL PANEL ON A SECONDARY NETWORK OF A PRIMARY CONTROL PANEL THAT IS CONTROLLING THE VAV'S CORRESPONDING AHU. PRIMARY CONTROL PANEL HARDWARE (DATA MANAGER)

PRIMARY CONTROL PANEL HARDARE (DATA MANAGER)
1. PROVIDE ONE (1) DATA MANAGER OR PRIMARY CONTROL PANEL AT EACH FLOOR OR LEVEL TO MONITOR AND SEQUENCING EQUIPMENT WITHIN ASSOCIATED FLOOR.
2. IT IS NOT ACCEPTABLE TO HAVE (1) DATA MANAGER OR PRIMARY CONTROLLER SERVING SEVERAL FLOORS UNLESS THE MECHANICAL EQUIPMENT IS INTERACTING WITH EACH OTHER FOR EXAMPLE: AN AHU UNIT IS LOCATED ON THE FIRST FLOOR AND ALL ASSOCIATED VAV BOXES ARE ON A SECOND FLOOR IF THIS IS THE CASE THEN IT IS ACCEPTABLE.
3. HVAC EQUIPMENT THAT INTERACT WITH EACH OTHER SHALL BE WITHIN THE SAME DATA MANAGER OR PRIMARY CONTROLLER.
4. DATA MANAGER CONTROLLER SHALL BE ASHRAE 135 COMPLIANCE AND USE THE LATEST VERSION OF BACNET/ASHRAE 135 PROTOCOL AND COMMUNICATE USING ISO 8802-3 (ETHERNET) DATALINK/PHYSICAL LAYER PROTOCOL.
5. ALL PRIMARY CONTROL PANELS SHALL BE INSTALLED WITH 30% SPARE MEMORY CAPACITY FOR FUTURE CONNECTIONS. PROVIDE ALL HARDWARE MODULES, SOFTWARE MODULES, PROCESSORS, POWER SUPPLIES, REPEATERS ETC. REQUIRED TO ENSURE ADDING A CONTROLLER TO THE SPARE MEMORY.
6. PROVIDE ALL PROCESSORS, POWER SUPPLIES AND COMMUNICATION CONTROLLERS SO THAT THE IMPLEMENTATION OF ADDING A CONTROLLER TO THE SPARE MEMORY ONLY REQUIRES THE ADDITION OF THE APPROPRIATE: END DEVICES AND FIELD WIRING.
7. THE DATA MANAGER OR PRIMARY NETWORK CONTROLLER SHALL BE PROVIDED WITH ALL COMMUNICATION CARDS NEEDED FOR PROJECT INCLUDING CARDS FOR SPARE PORTS LEFT ON CONTROLLER.
8. EACH DATA MANAGER SHALL BE EQUIPPED TO MONITOR ALL INDUSTRY STANDARD TYPES OF INTERFACE PROTOCOLS WITHOUT THE ADDITION OF EQUIPMENT TO THE DATA MANAGER CONTROL PANEL OR ADDITIONAL SOFTWARE DRIVERS.
9. THE OPERATOR SHALL HAVE THE ABILITY TO MANUALLY OVERRIDE AUTOMATIC OR CENTRALLY EXECUTED COMMANDS AT THE DATA MANAGER OR PRIMARY CONTROL PANELS VIA A DISPLAY MOUNTED ON THE FRONT DOOR (FOR EXAMPLE: DISTECH CONTROLS' HORYZON-C DISPLAYS OR EQUAL).
10. EACH DATA MANAGER PRIMARY CONTROL PANEL SHALL CONTINUOUSLY PERFORM SELF-DIAGNOSTICS ON ALL HARDWARE MODULES AND NETWORKCOMMUNICATIONS. THE PRIMARY CONTROL PANEL SHALL PROVIDE BOTH LOCAL AND REMOTE ANNUNCIATION OF ANY DETECTED COMPONENT FAILURES, OR REPEATED FAILURE TO ESTABLISH COMMUNICATION WITH ANY SYSTEM.

DATA MANAGER SOFTWARE
1. FURNISH SOFTWARE TO FORM COMPLETE OPERATING SYSTEM FOR BUILDING AND ENERGY MANAGEMENT.DATA MANAGER SOFTWARE
2. DDC SOFTWARE SHALL BE CAPABLE TO HOST AN UNLIMITED AMOUNT OF DATA MANAGER OR PRIMARY CONTROLLER FOR EXPANDABILITY (E.G., EC-NET 4 SUPERVISOR UNL OR EQUAL).
3. ALL PROGRAMS POINTS SHALL BE IDENTIFIED BY A 30 CHARACTER NAME AND A 16 CHARACTER POINT DESCRIPTOR. THE SAME NAMES SHALL BE DISPLAYED AT BOTH THE DATA MANAGER CONTROL PANEL(S) (VIA PORTABLE TERMINAL) AND THE VIRTUAL RACK SERVER OR ANY UI WORKSTATION(S). MULTI-SYSTEM CONSISTENCY ON POINT NAMES SHOULD BE MAINTAINED.
4. TREND DATA SHALL BE STORED AT THE DATAMANAGER CONTROL PANELS AND AUTOMATICALLY UPLOADED TO THE VIRTUAL DDC RACK SERVER.
5. UPLOADS SHALL OCCUR BASED ON USER-DEFINED INTERVALS, MANUAL COMMANDS, OR AUTOMATICALLY WHEN THE TREND BUFFER IS 80% FULL. ALL TREND DATA SHALL BE AVAILABLE FOR USE IN ANY 3RD PARTY PERSONAL COMPUTER APPLICATIONS LOCATED IN THE DDC.

SECONDARY CONTROL PANEL HARDWARE
1. EACH SECONDARY CONTROL PANEL SHALL OPERATE AS A STAND-ALONE CONTROLLER CAPABLE OF PERFORMING ITS USER SELECTABLE CONTROL ROUTINES INDEPENDENTLY OF ANY OTHER CONTROLLER IN THE SYSTEM. EACH SECONDARY CONTROL PANEL SHALL BE A MICROPROCESSOR-BASED, MULTI-TASKING, REAL-TIME DIGITAL CONTROL PROCESSOR.
2. EACH SECONDARY CONTROLLER SHALL INCLUDE ALL POINT INPUTS AND OUTPUTS NECESSARY TO PERFORM THE SPECIFIED CONTROL SEQUENCES. THE SECONDARY
CONTROLLER SHALL ACCEPT INPUT AND PROVIDE OUTPUT SIGNALS THAT COMPLY WITH INDUSTRY STANDARDS. CONTROLLERS UTILIZING PROPRIETARY CONTROL SIGNALS SHALL NOT BE ACCEPTABLE. OUTPUTS MAY BE UTILIZED EITHER FOR 2-STATE, MODULATING, FLOATING OR PROPORTIONAL CONTROL, ALLOWING FOR ADDITIONAL SYSTEM FLEXIBILITY.
3. CONTROL APPLICATIONS. OPERATING PROGRAMS SHALL BE FIELD-SELECTABLE FOR SPECIFIC APPLICATIONS. IN ADDITION, SPECIFIC APPLICATIONS MAY BE MODIFIED TO MEET THE USER'S EXACT CONTROL STRATEGY REQUIREMENTS, ALLOWING FOR ADDITIONAL SYSTEM FLEXIBILITY. CONTROLLERS THAT REQUIRE FACTORY CHANGES OF ALL APPLICATIONS ARE NOT ACCEPTABLE.
4. CONTROLLERS SHALL INCLUDE ALL POINT INPUTS AND OUTPUTS NECESSARY TO PERFORM THE SPECIFIED CONTROL SEQUENCES. AS A MINIMUM, 50% OF THE POINT OUTPUTS SHALL BE OF THE UNIVERSAL TYPE; THAT IS, THE OUTPUTS MAY BE UTILIZED EITHER AS MODULATING OR TWO-STATE, ALLOWING FOR ADDITIONAL SYSTEM FLEXIBILITY. IN LIEU OF UNIVERSAL OUTPUTS, PROVIDE A MINIMUM OF 50% SPARE OUTPUTS OF EACH TYPE VIA ADDITIONAL POINT TERMINATION BOARDS OR CONTROLLERS. ANALOG OUTPUTS SHALL BE INDUSTRY STANDARD, ALLOWING FOR INTERFACE TO A VARIETY OF END DEVICES. TERMINAL EQUIPMENT CONTROLLERS UTILIZING PROPRIETARY CONTROL SIGNALS AND ACTUATORS SHALL NOT BE ACCEPTABLE.
5. PROVIDE A SECONDARY CONTROL PANEL FOR EACH OF THE FOLLOWING TYPES OF EQUIPMENT (IF APPLICABLE):
• ROOFTOP UNITS (UNLESS IT HAS BEEN SPECIFIED AS A FACTORY PROVIDED SECONDARY CONTROLLER WITH INTEGRATED CAPABILITY)
• AHU (UNLESS IT HAS BEEN SPECIFIED AS A FACTORY PROVIDED SECONDARY CONTROLLER WITH INTEGRATED CAPABILITY)
• VARIABLE AIR VOLUME (VAV) BOXES.
• VRF CONDENSING UNITS AND FAN COIL UNITS
• PERIMETER HEATING CONTROLS
• HEAT EXCHANGER SYSTEM.
• HEAT PUMP SYSTEMS
• HYDRONIC PUMPS
• RADIANT FLOOR SYSTEM
• AC UNITS (UNLESS IT IS A FACTORY PROVIDED SECONDARY CONTROLLER WITH INTEGRATED CAPABILITY)
• UNIT/CABINET UNIT HEATERS.
• EXHAUST FANS.
• OTHER TERMINAL CRITICAL EQUIPMENT.
6. EACH SECONDARY CONTROL PANEL SHALL, AT A MINIMUM, BE PROVIDED WITH:
• APPROPRIATE NEMA RATED ENCLOSURE FOR ITS APPLICATION.
• A STAND-ALONE REAL-TIME DIGITAL CONTROL MICROPROCESSOR MODULE.
• BUILT-IN DISPLAY OR DOOR MOUNTED TYPE (WITH THE EXCEPTION OF VAV CONTROLLERS)
• SECONDARY NETWORK COMMUNICATIONS ABILITY.
• POWER SUPPLIES AS REQUIRED FOR ALL ASSOCIATED MODULES, SENSORS, ACTUATORS, ETC.
• EXPANSION CAPABILITIES
7. THERE SHALL BE PROVISIONS FOR BURO HAPPOLD TO HAVE REMOTE ACCESS VIA A USERNAME AND PASSWORD TO THE DDC SYSTEM FOR THE COLLECTION OF DATA PERFOMANCE OF ALL SYSTEM.

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Key Plan

Description	Date
Filing Set	06/17/22

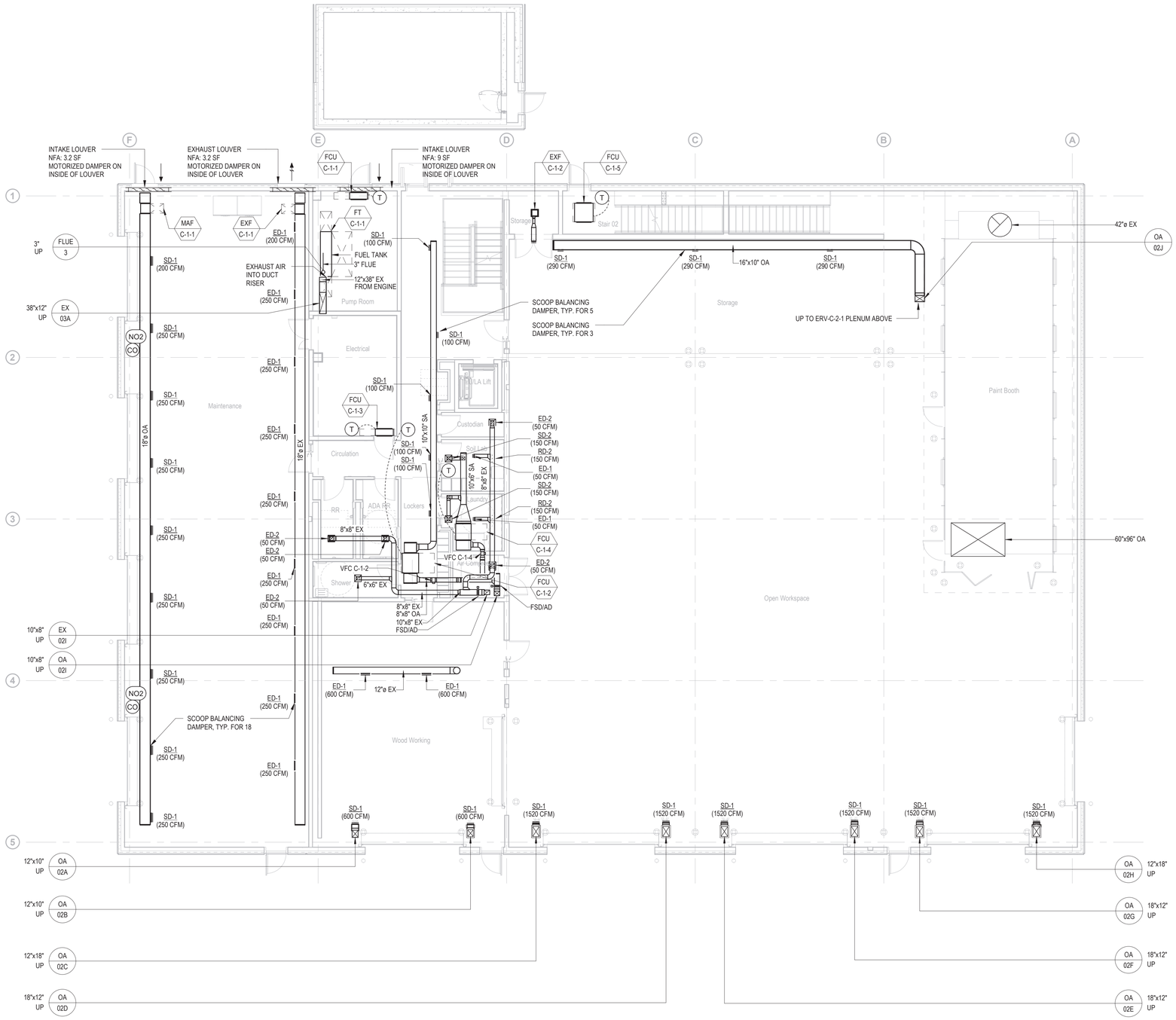
Project
Storm King
Art Center
C.F.M.
Building

Seal

NOT FOR CONSTRUCTION

Drawing Title
General Notes

Date	06/17/22
Scale	Not to Scale
Drawing Number	M-C-002
Sheet Size	ARCH D



GENERAL NOTES

DRAWINGS ARE PRESENTED HERE AT A 90% CONSTRUCTION DOCUMENTS LEVEL. WHERE DETAIL IS NOT YET SHOWN, PROVIDE ALL COMPONENTS REQUIRED FOR A FULLY FUNCTIONAL HVAC SYSTEM INCLUDING, BUT NOT LIMITED TO:

- THERMOSTATS FOR ALL ZONES ASSOCIATED WITH HEATING AND COOLING UNITS
- C02 SENSORS IN ALL DENSELY OCCUPIABLE AREAS
- FACTORY PACKAGED CONTROLS FOR ALL COMPLEX EQUIPMENT.
- FULL STORM KING FACILITY CENTRAL BUILDING MANAGEMENT SYSTEM, CONNECTING ALL CURRENT AND FUTURE BUILDINGS, AS DESCRIBED ON THE MECHANICAL COVER SHEET
- BALANCING DAMPERS AT ALL AIR TERMINALS
- ACOUSTIC DUCT LINING 10FT UPSTREAM AND DOWNSTREAM OF ALL FANS
- DUCT SILENCERS AT ALL DUCT CONNECTIONS TO AIR HANDLING UNITS AND ROOF MOUNTED UNITS
- FIRE DAMPERS AND FIRE/SMOKE DAMPERS AT ALL DUCT PENETRATIONS THROUGH RATED WALLS
- INSULATION ON ALL AIR DUCT, HYDRONIC PIPES AND REFRIGERANT PIPES
- DOUBLE-WALL CONSTRUCTION ON ALL EXPOSED DUCT VISIBLE FROM OCCUPIED SPACES.
- SHUTOFF VALVES AT ALL PIPED COMPONENTS
- SPRING VIBRATION ISOLATION AT ALL EQUIPMENT WITH MOVING PARTS
- FIRESTOPPING OF ALL DUCT AND PIPE PENETRATIONS THROUGH ALL WALLS
- HEAT TRACING FOR ALL HYDRONIC PIPING OUTSIDE OF THE BUILDING ENVELOPE
- CONDENSATE DRAIN PIPING FROM ALL COOLING COILS TO DRAIN (INCLUDE CONDENSATE PUMPS WHERE NECESSARY FOR GRAVITY DRAIN)
- AUXILIARY DRIP PANS AND LEAK DETECTION UNDERNEATH ANY HYDRONIC EQUIPMENT (INCLUDING ASSOCIATED VALVING/TRIM)
- AIRFLOW MONITORING STATIONS ON AHUS
- VFDS FOR ANY FAN OR PUMP MOTOR WHICH IS NOT AN ECM
- ACOUSTICALLY LINED RETURN AIR TRANSFER DUCTWORK ABOVE CEILINGS WHERE WALLS EXTEND TO UNDERSIDE OF STRUCTURE ABOVE.
- ALL COMPONENTS REQUIRED FOR A FULLY FUNCTIONAL VRF SYSTEM INCLUDING VALVING AND CONTROL WIRING
- DIFFUSERS TO BE DURABLE INDUSTRIAL GRADE

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Key Plan

N

Description	Date
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Project

Storm King Art Center

C.F.M. Building

Seal

NOT FOR CONSTRUCTION

Drawing Title

Duct Plan - Ground Level

Date	06/17/22
Scale	1/8" = 1'-0"
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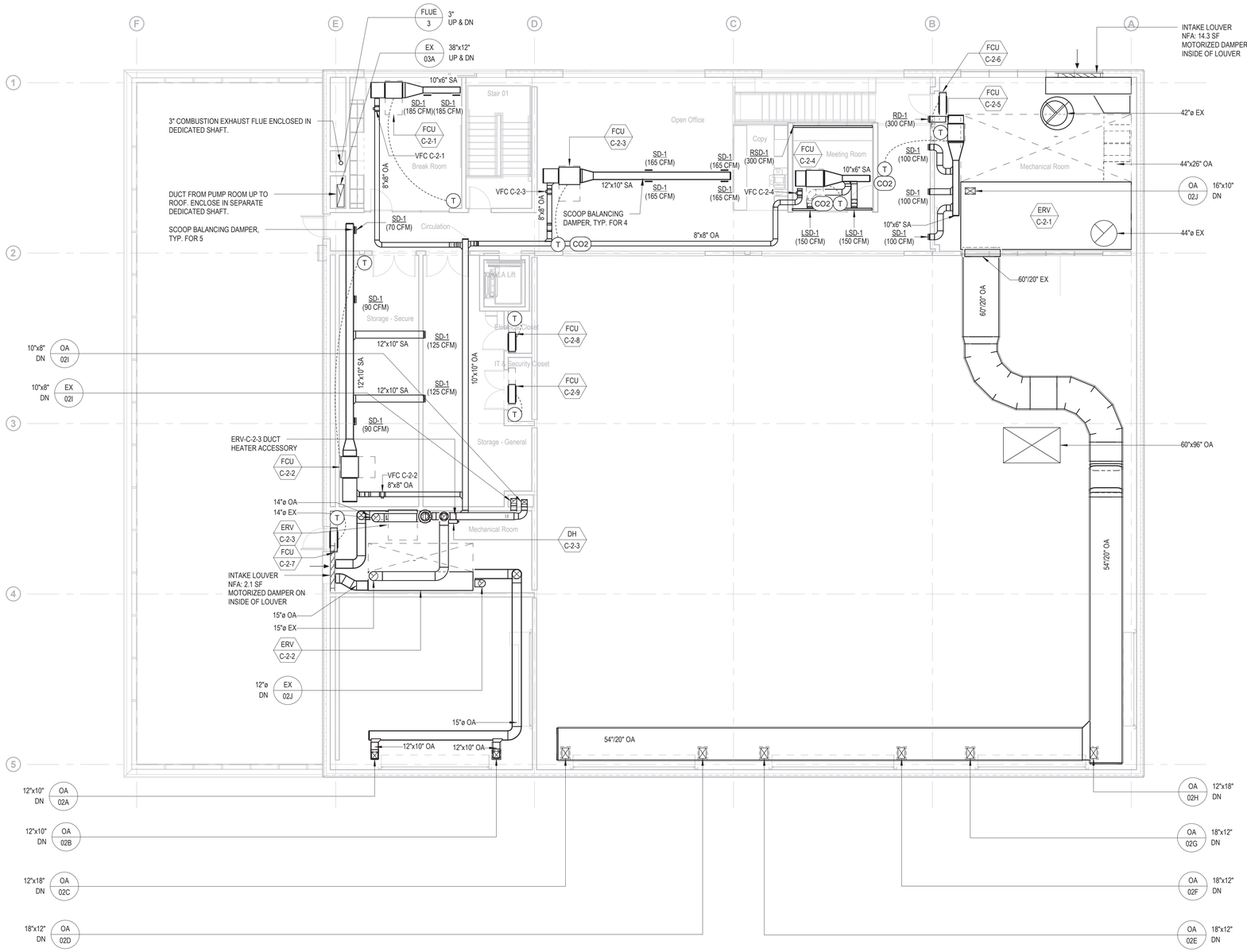
Sheet Size	ARCH D



GENERAL NOTES

DRAWINGS ARE PRESENTED HERE AT A 90% CONSTRUCTION DOCUMENTS LEVEL. WHERE DETAIL IS NOT YET SHOWN, PROVIDE ALL COMPONENTS REQUIRED FOR A FULLY FUNCTIONAL HVAC SYSTEM INCLUDING, BUT NOT LIMITED TO:

- THERMOSTATS FOR ALL ZONES ASSOCIATED WITH HEATING AND COOLING UNITS
- CO2 SENSORS IN ALL DENSELY OCCUPIABLE AREAS
- FACTORY PACKAGED CONTROLS FOR ALL COMPLEX EQUIPMENT.
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Key Plan

N

Description	Date
Filing Set	06/17/22

Project

Storm King Art Center

C.F.M. Building

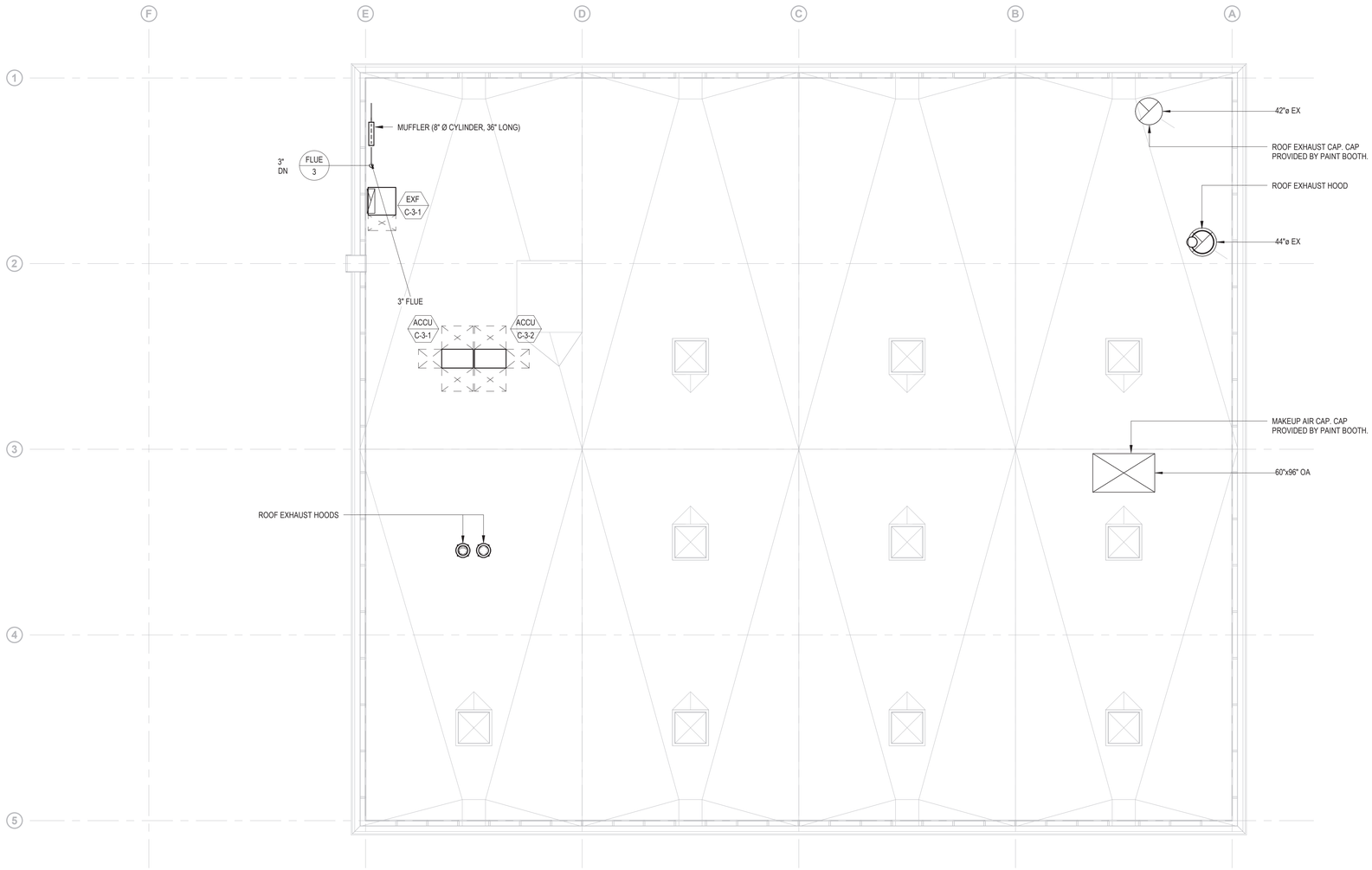
Seal

NOT FOR CONSTRUCTION

Drawing Title

Duct Plan - Second Level

Date	06/17/22
Scale	1/8" = 1'-0"
Drawing Number	M-C-102
Sheet Size	ARCH D



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Key Plan

N

Description	Date
Filing Set	06/17/22

Project

Storm King Art Center

C.F.M. Building

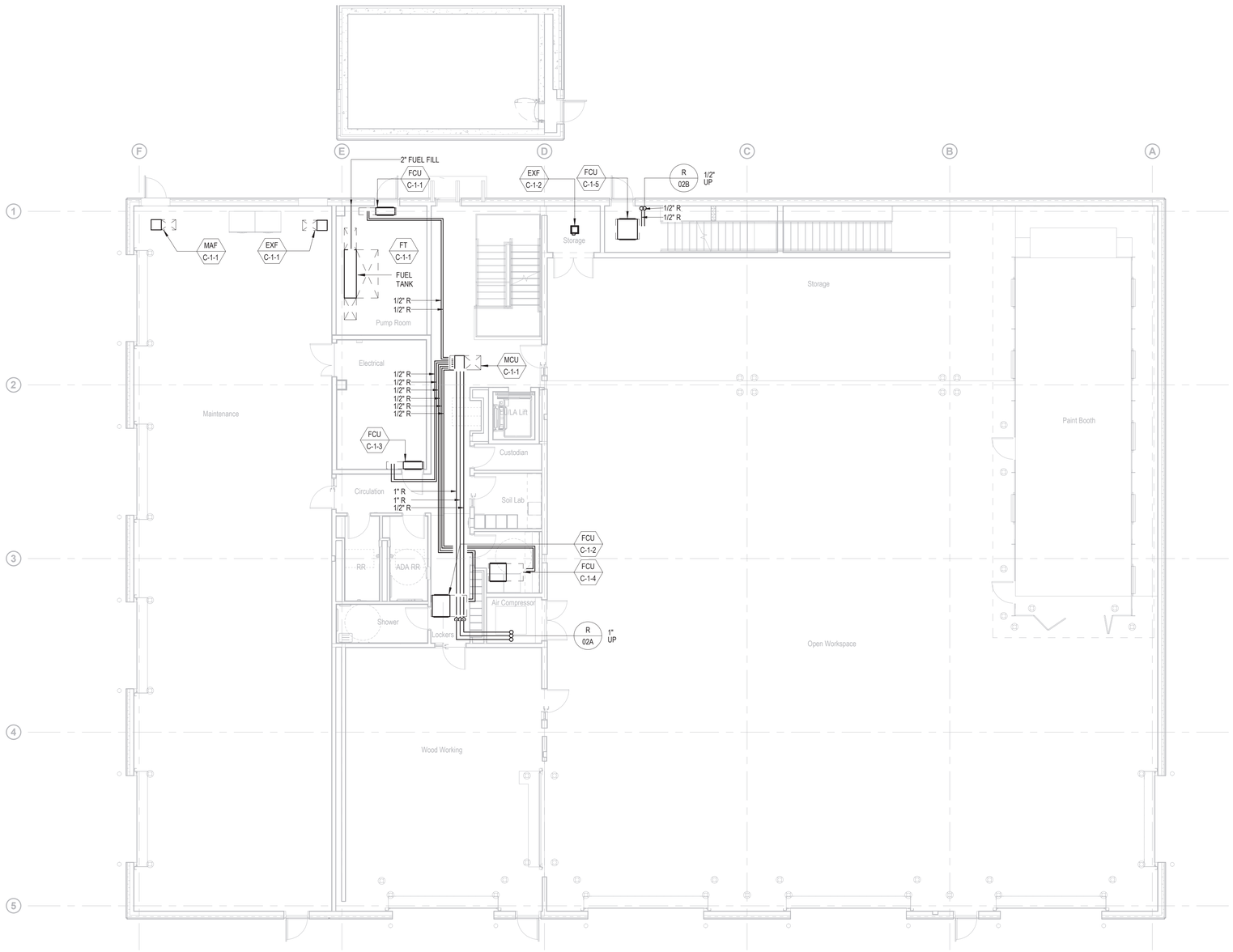
Seal

NOT FOR CONSTRUCTION

Drawing Title

Duct Plan - Roof Level

Date	06/17/22
Scale	1/8" = 1'-0"
Drawing Number	M-C-103
Sheet Size	ARCH D



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Key Plan

N

Description	Date
Filing Set	06/17/22

Project

Storm King Art Center

C.F.M. Building

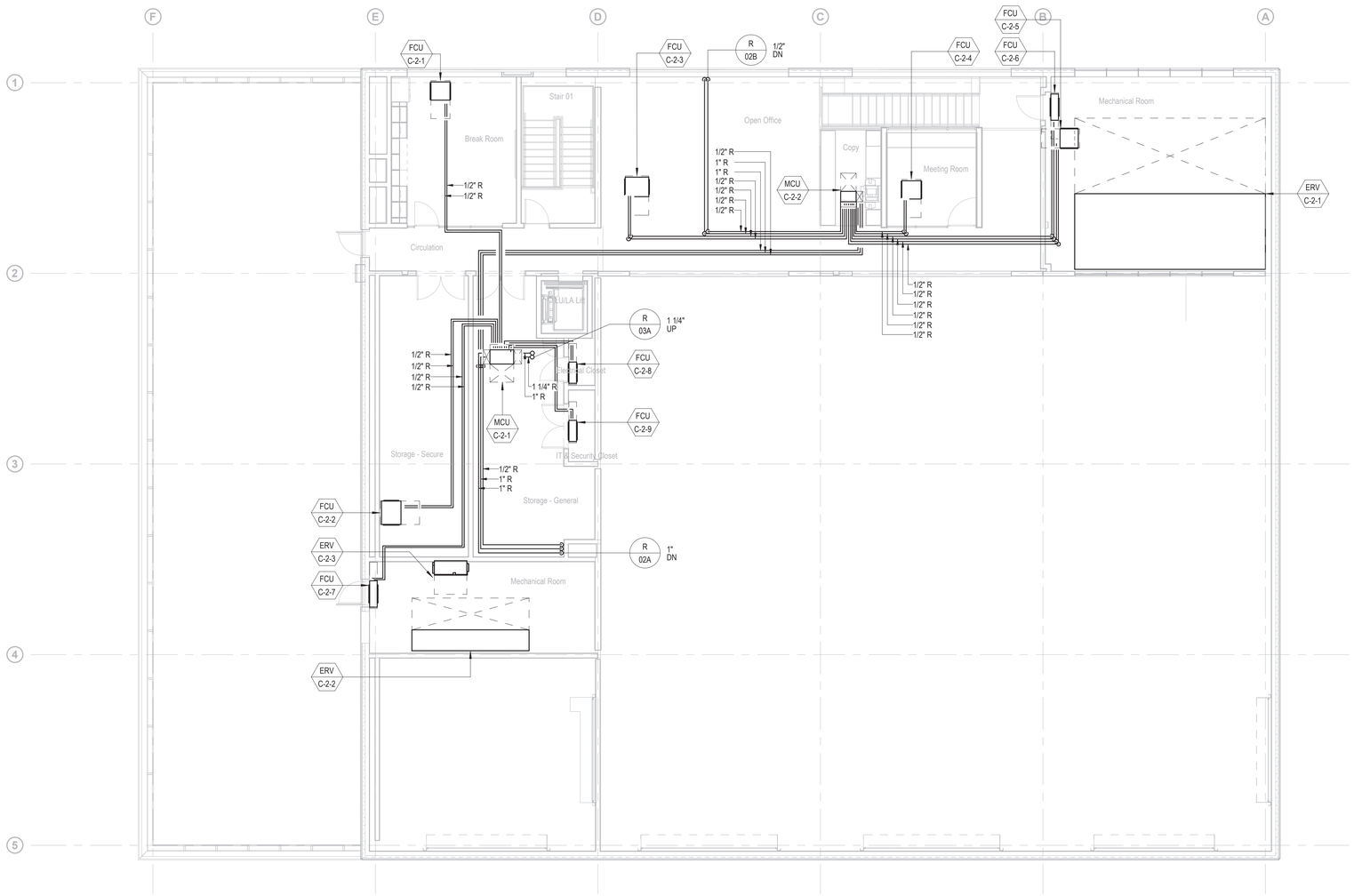
Seal

NOT FOR CONSTRUCTION

Drawing Title

Pipe Plan - Ground Level

Date	06/17/22
Scale	1/8" = 1'-0"
Drawing Number	M-C-201
Sheet Size	ARCH D



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Key Plan

N

Description	Date
Filing Set	06/17/22

Project

Storm King Art Center

C.F.M. Building

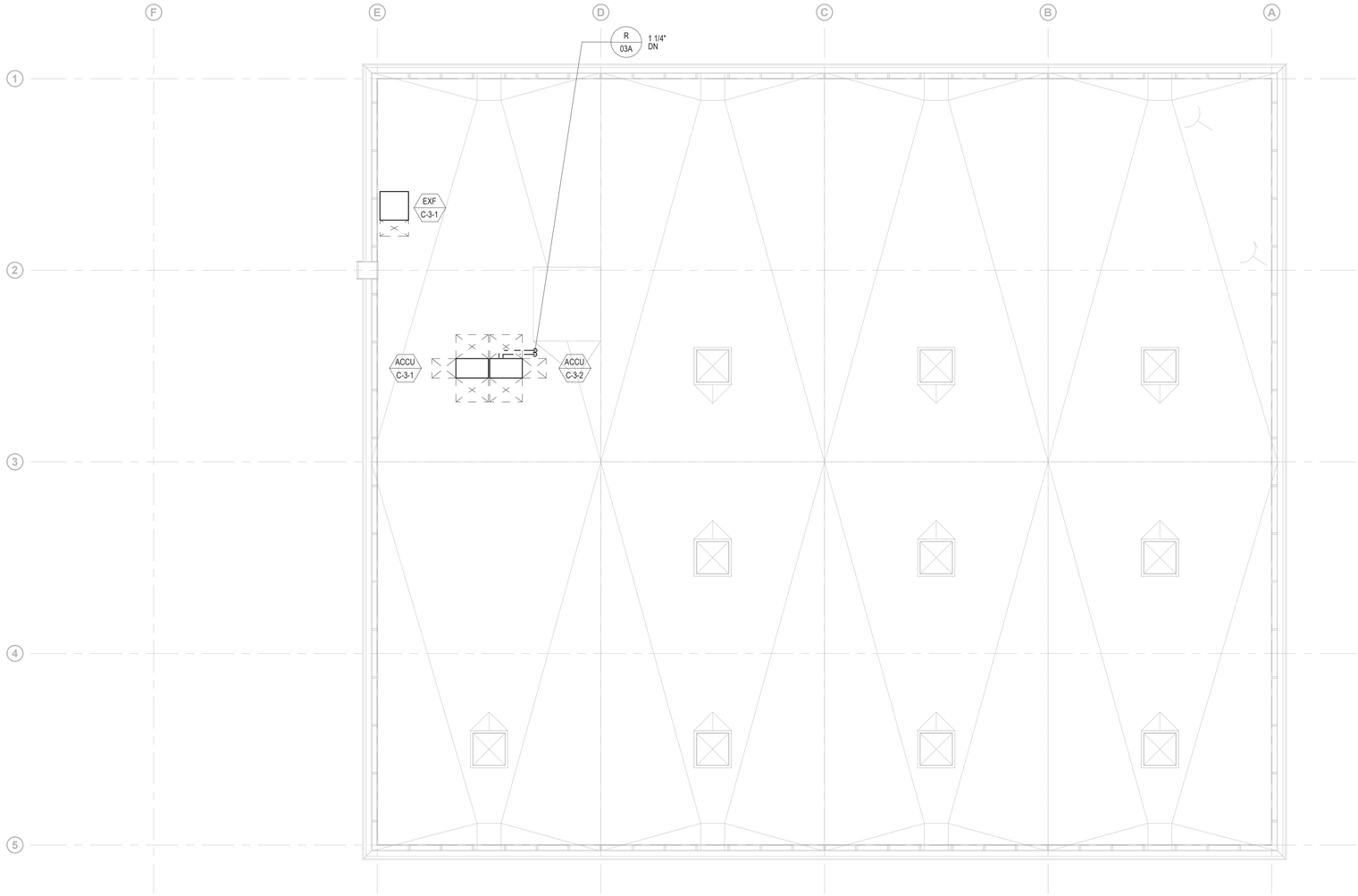
Seal

NOT FOR CONSTRUCTION

Drawing Title

Pipe Plan - Second Level

Date	06/17/22
Scale	1/8" = 1'-0"
Drawing Number	M-C-202
Sheet Size	ARCH D



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Key Plan

N

Description	Date
Filing Set	06/17/22

Project

Storm King Art Center

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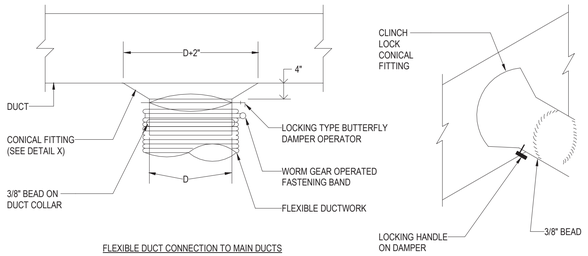
Seal

NOT FOR CONSTRUCTION

Drawing Title

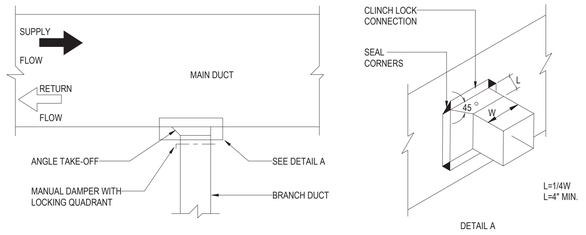
Pipe Plan - Roof Level

Date	06/17/22
Scale	1/8" = 1'-0"
Drawing Number	M-C-203
Sheet Size	ARCH D



FLEXIBLE DUCT CONNECTION TO MAIN DUCTS

DETAIL X

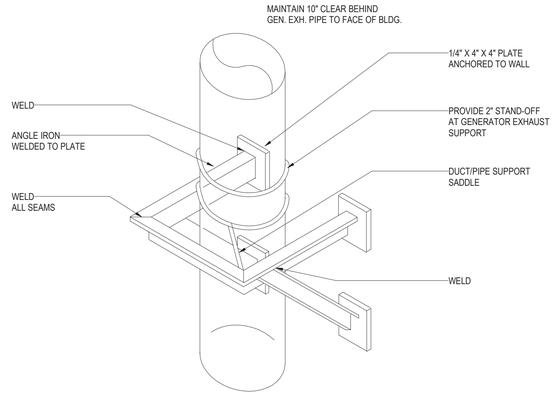


BRANCH DUCT CONNECTION

DETAIL A

1 LOW PRESSURE BRANCH DUCT CONNECTIONS

NOT TO SCALE



3 SUPPORT SYSTEM FOR VERTICAL DUCTS

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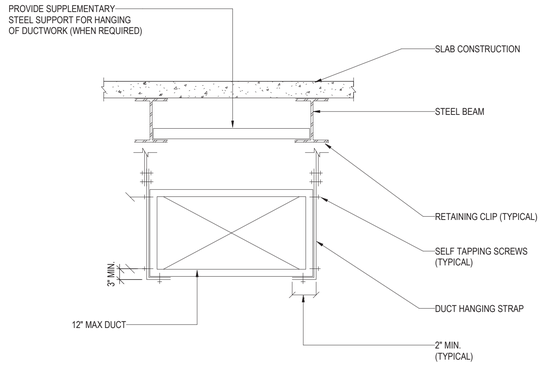
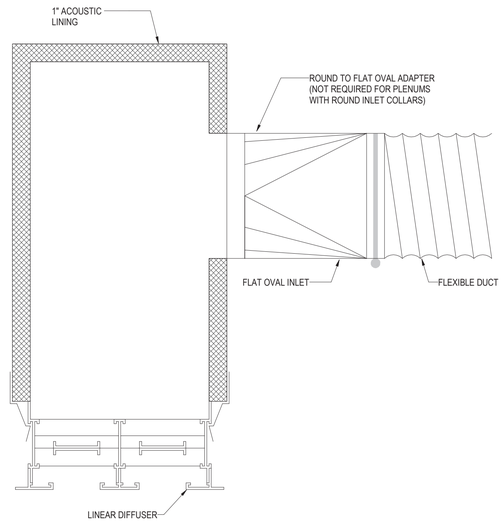


NOTES:
1. DUCT SHALL BE SUSPENDED WITH GALVANIZED BAND IRON STRAPS SECURELY FASTENED TO THE BOTTOM AND SIDE OF THE DUCT. STRAPS TO BE SIZED IN ACCORDANCE WITH SMACNA TABLE 4-1 OR ACCORDING TO LOCAL CODES, WHICHEVER IS MORE STRINGENT.
2. DUCTS WIDER THEN 60 INCHES TO BE SUPPORTED BY THE TRAPEZE ANGLES IN ACCORDANCE WITH SMACNA TABLE 4-3.
3. REFRENCE SHALL ALSO BE MADE TO SPECIFICATION SECTION 230548

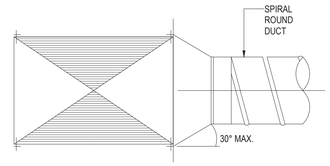
4 DUCT HANGING FROM STRUCTURAL STEEL

NOT TO SCALE

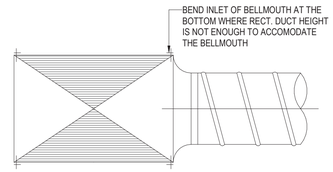


5 LINEAR DIFFUSER PLENUM

NOT TO SCALE



CONICAL



BELLMOUTH

NOTE:
1. SECURE ALL CONNECTIONS TO COMPLY WITH THE REQUIREMENTS OF THE PRESSURE CLASS SPECIFIED.
2. SUPPLY ROUND DUCT TAKE-OFF IS SHOWN. RETURN/EXHAUST SIMILAR.
3. "SPIN-INS" PERMITTED ONLY W/DUCT CONSTRUCTION OF 2" W.C. OR LESS.

6 ROUND TAKE OFF CONNECTION FROM RECTANGULAR

NOT TO SCALE

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Key Plan

Description	Date
Filing Set	06/17/22

Project

Storm King Art Center

C.F.M. Building

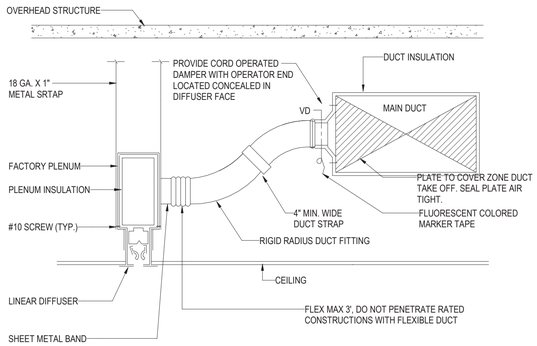
Seal

NOT FOR CONSTRUCTION

Drawing Title

Mechanical Details

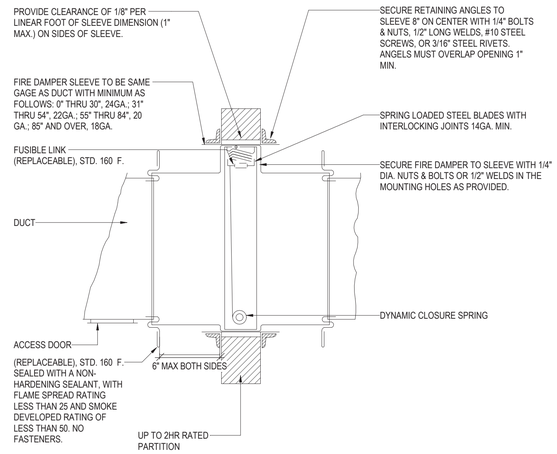
Date	06/17/22
Scale	Not to Scale
Drawing Number	M-C-501
Sheet Size	ARCH D



NOTE:
1. FLEX DUCT INSTALLED PER MANUFACTURERS LISTING.

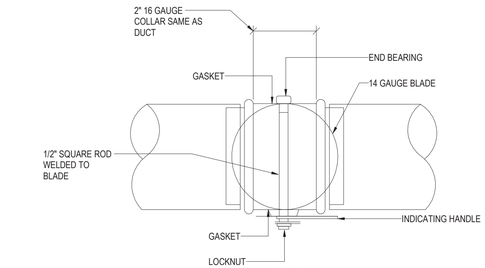
1 LINEAR DIFFUSER CONNECTION

NOT TO SCALE

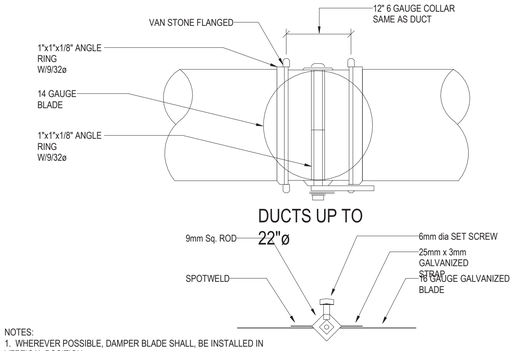


2 DYNAMIC FIRE DAMPER

NOT TO SCALE



DUCTS UP TO 14"ø



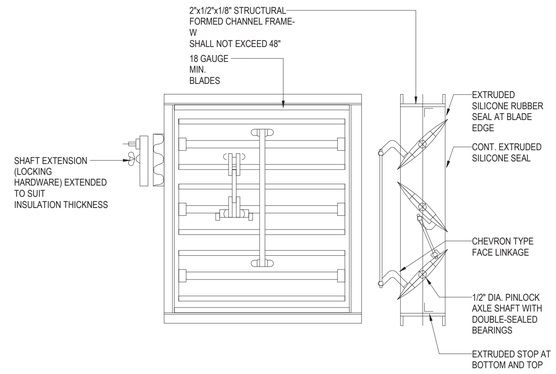
DUCTS UP TO 22"ø

NOTES:
1. WHEREVER POSSIBLE, DAMPER BLADE SHALL, BE INSTALLED IN VERTICAL POSITION.
2. FOR DUCTS OVER 22ø USE OPPOSED BLADE VOLUME DAMPER.
3. ALL QUADRANT OPERATORS SHALL BE EXTENDED TO OUTSIDE OF INSULATION

SECTION

3 ROUND VOLUME DAMPER

NOT TO SCALE

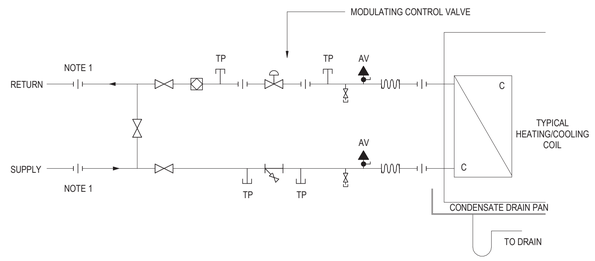


OPPOSED BLADE ACTION DAMPER

NOTES:
1. ALL BRANCH DUCTS SHALL HAVE VOLUME DAMPERS.

4 OPPOSED BLADE ACTION DAMPER

NOT TO SCALE

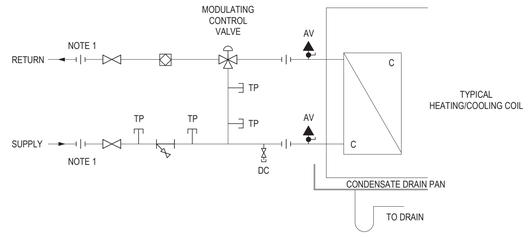


NOTE:
1. ELECTROLYTICALLY ISOLATED COUPLING

ADDITIONALLY:
ALL VALVES AND FITTINGS SHALL BE LINE SIZE

5 FCU AND VAV HEATING OR COOLING 2 WAY VALVE

NOT TO SCALE



NOTE:
1. ELECTROLYTICALLY ISOLATED COUPLING

ADDITIONALLY:
- ALL VALVES AND FITTINGS SHALL BE LINE SIZE

6 FCU AND VAV HEATING OR COOLING 3 WAY VALVE

NOT TO SCALE

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Key Plan

Description	Date
Filing Set	06/17/22

Project

Storm King Art Center

C.F.M. Building

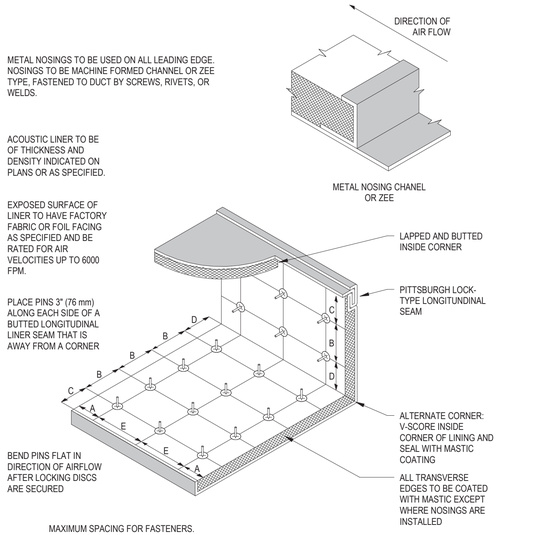
Seal

NOT FOR CONSTRUCTION

Drawing Title

Mechanical Details

Date	06/17/22
Scale	Not to Scale
Drawing Number	M-C-502
Sheet Size	ARCH D



MAXIMUM SPACING FOR FASTENERS.
ACTUAL INTERVALS ARE APPROXIMATE.

VELOCITY	DIMENSIONS				
	A	B	C	D	E
0-2500 FPM (0-12.7 MPS)	3" (76.2)	12" (305)	4" (102)	6" (152)	18" (457)
2501-6000 FPM (12.7-30.5 MPS)	3" (76.2)	6" (152)	4" (102)	6" (152)	16" (406)

REFERENCE SMACNA FIG. 2-19, AS MODIFIED

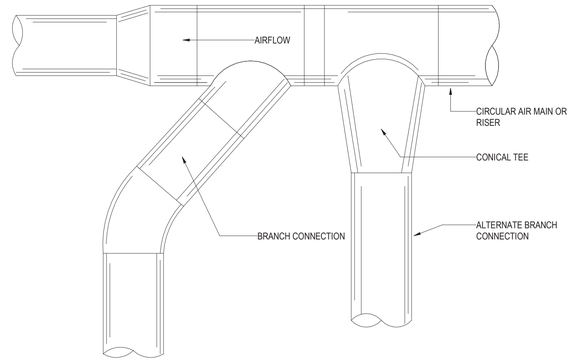
LINER TO BE ADHERED TO THE DUCT WITH 90% MIN. AREA COVERAGE OF ADHESIVE, AND BE FASTENED WITH MECHANICAL WELD PINS. DO NOT USE ADHESIVE BASE PINS.

ALL DIMENSIONS SHOWN ON PLANS ARE INSIDE CLEAR

U.O.N. EXTERNAL THERMAL INSULATION MAY BE OMITTED WHERE DUCTS ARE INTERNALLY LINED

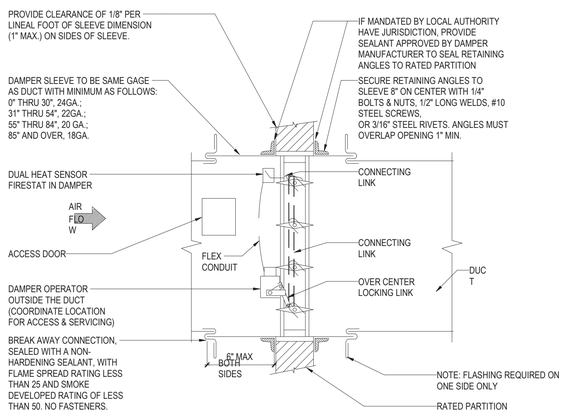
2 DUCTWORK ACOUSTIC LINING

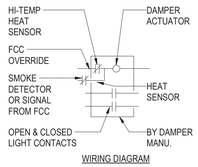
NOT TO SCALE



3 CIRCULAR DUCT CONNECTIONS

NOT TO SCALE





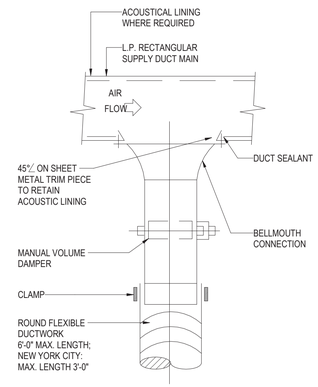
WIRING DIAGRAM

NOTES:

1. DAMPER TO BE U.L. LABELED N.F.P.A. 90A APPROVED.
2. N.F.P.A. APPROVED INSTALLATION DETAILS TO BE PART OF SUBMISSION OF COMBINATION FIRE & SMOKE DAMPER FOR APPROVAL, WHICH SHALL MEET N.F.P.A. STANDARD 90A.
3. DETAILS SHOWN ARE FOR COMBINATION FIRE SMOKE DAMPERS IN HORIZONTAL DUCTWORK. FOR DAMPERS IN VERTICAL DUCTWORK, DETAIL IS SIMILAR.
4. INSTALL DAMPER IN ACCORDANCE WITH MANUFACTURERS REQUIREMENTS.
5. ACTUATOR TO HAVE AN ADDRESSABLE DAMPER POSITION INDICATOR.

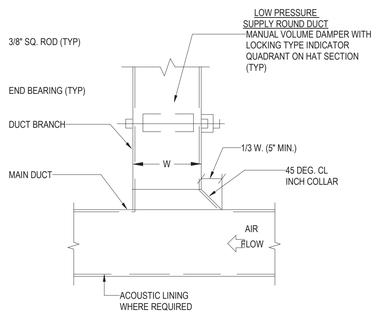
4 COMBINATION FIRE AND SMOKE DAMPER

NOT TO SCALE



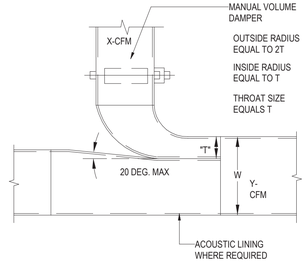
NOTE:

FLEXIBLE DUCT CONNECTIONS ARE ONLY PERMITTED IN AREAS WITH PNC-35 OR GREATER.



NOTE:

FURNISH THIS TYPE CONNECTION WHEN SINGLE-LINE DUCTWORK IS INDICATED AS THIS FOR ⊥ BRANCHES WITH LESS THAN 25% OF THE TOTAL AIR FLOW.



LOW PRESSURE SUPPLY RECTANGULAR DUCT

NOTES:

1. FURNISH THIS TYPE CONNECTION WHEN SINGLE-LINE DUCTWORK IS INDICATED AS THIS FOR BRANCHES WITH LESS THAN 25% OF THE TOTAL AIR FLOW.
2. THIS TYPE OF CONNECTION MUST BE USED WHEN W 36 IN.
3. T=X (BRANCH DUCT) x W
   Y (TOTAL CFM)

5 LOW PRESSURE SUPPLY CONNECTION DETAILS

NOT TO SCALE

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Key Plan

Description	Date
Filing Set	06/17/22

Project

Storm King Art Center

C.F.M. Building

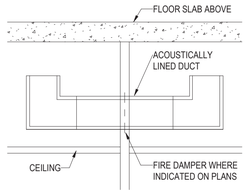
Seal

NOT FOR CONSTRUCTION

Drawing Title

Mechanical Details

Date	06/17/22
Scale	Not to Scale
Drawing Number	M-C-503
Sheet Size	ARCH D



NOTES:

1. REFER TO DRAWINGS AND SPECIFICATIONS FOR ACOUSTICAL INSULATION THICKNESS AND DENSITY.

2. PROVIDE TRANSFER DUCT WHERE INDICATED ON PLANS.

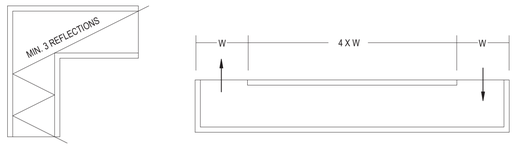
3. REFER TO SCHEDULE BELOW FOR TRANSFER DUCT SIZE.

4. FOR AIR QUANTITIES IN EXCESS OF 2000 CFM USE MULTIPLE TRANSFER DUCTS

5. TRANSFER DUCT SIZES ARE INSIDE CLEAR

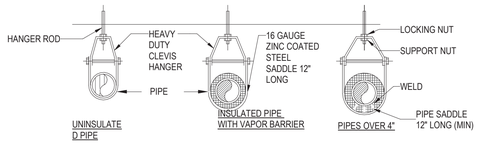
6. EQUIVALENT DUCT SIZES ALLOWED

TRANSFER AIR QUANTITY (CFM)	TRANSFER AIR DUCT SIZE (W x H)
0-500	18 x 10
501-1000	20 x 18
1001-1500	30 x 20
1501-2000	30 x 24



1 ACOUSTIC AIR TRANSFER DUCT

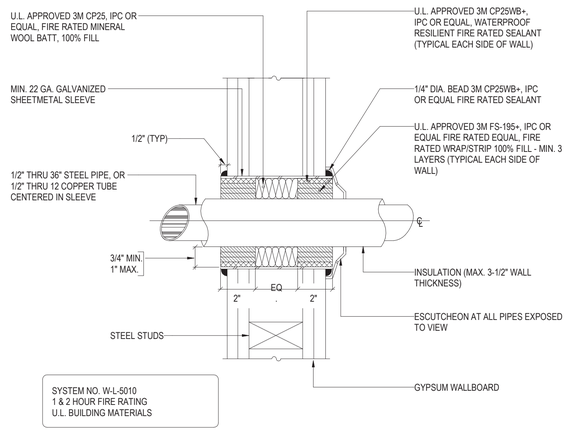
NOT TO SCALE



INDIVIDUAL PIPE HANGER ROD & SPACING SCHEDULE											
NOMINAL PIPE OR TUBE SIZE-INCHES	3/4	1	1 1/2	2	2 1/2	3	4	5	6	8	--
HANGER ROD SIZE-INCHES	3/8	3/8	3/8	3/8	1/2	1/2	5/8	5/8	7/8	7/8	--
MAXIMUM SPACING BETWEEN PIPE SUPPORT-FEET	6	7	9	10	11	12	14	16	17	19	--
MAXIMUM SPACING BETWEEN CU. TUBE SUPPORT-FEET	6	6	8	9	10	10	12	14	14	16	--
NOTES: TRAPEZE SPACING SHALL BE BASED ON SPACING OF SMALLEST PIPE ON TRAPEZE. TRAPEZE SHALL BE DESIGNED WITH A FACTOR OF SAFETY 5 FOR CENTER OF SPAN CONCENTRATED LOAD. METHOD OF HANGING, TYPE OF INSERT, BEAM CLAMP, ROD, ETC. MUST BE APPROVED BY STRUCTURAL ENGINEER PER SHOP DRAWINGS.											

4 TYPICAL CLEVIS HANGER SUPPORTS

NOT TO SCALE



6 INSULATED PIPE THROUGH FIRE RATED GYPSUM WALLS

NOT TO SCALE

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Key Plan

Description	Date
Filing Set	06/17/22

Project

Storm King Art Center

C.F.M. Building

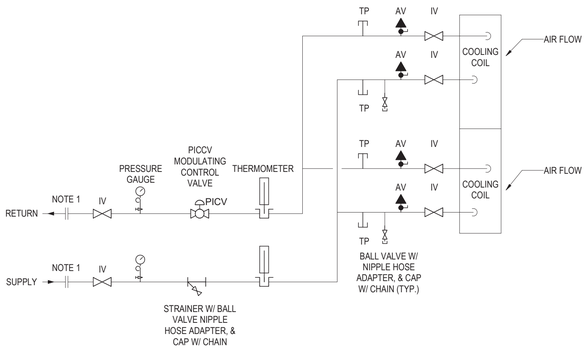
Seal

NOT FOR CONSTRUCTION

Drawing Title

Mechanical Details

Date	06/17/22
Scale	Not to Scale
Drawing Number	M-C-504
Sheet Size	ARCH D

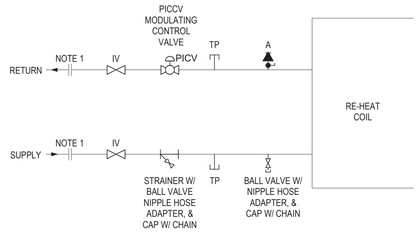


NOTES:

1. ELECTROLYTICALLY ISOLATED COUPLING. (ONLY REQUIRED WHERE THERE IS A CHANGE IN PIPING MATERIAL.)
2. ALL VALVES AND FITTINGS SHALL BE LINE SIZE
3. MODULATING CONTROL VALVE TO BE SELECTED BY CONTROLS CONTRACTOR TO PROVIDE APPROPRIATE CONTROL VALVE AUTHORITY.
4. PROVIDE EXTENSIONS FOR ALL PIPING ACCESSORIES IN ORDER TO PERTRUDE BEYOND AND AVOID DAMAGE TO PIPE INSULATION.
5. PROVIDE APPROPRIATELY FITTED REMOVABLE INSULATION COVERS AT ALL PIPING ACCESSORY LOCATIONS REQUIRING FUTURE ACCESS.
6. CONNECT HHWS DOWN STREAM OF COIL IN RELATION TO AIR FLOW.

1 COOLING COILS (AHU)

SCALE 12" = 1'-0"

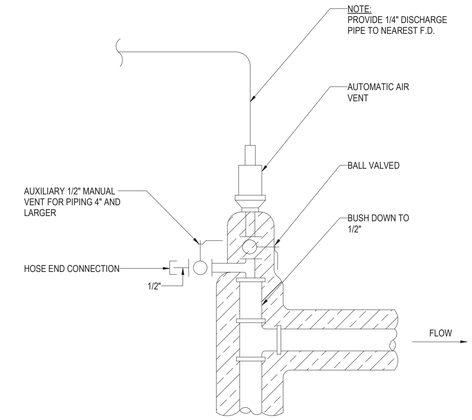


NOTES:

1. ELECTROLYTICALLY ISOLATED COUPLING. (ONLY REQUIRED WHERE THERE IS A CHANGE IN PIPING MATERIAL.)
2. ALL VALVES AND FITTINGS SHALL BE LINE SIZE
3. MODULATING CONTROL VALVE TO BE SELECTED BY CONTROLS CONTRACTOR TO PROVIDE APPROPRIATE CONTROL VALVE AUTHORITY.
4. PROVIDE EXTENSIONS FOR ALL PIPING ACCESSORIES IN ORDER TO PERTRUDE BEYOND AND AVOID DAMAGE TO PIPE INSULATION.
5. PROVIDE APPROPRIATELY FITTED REMOVABLE INSULATION COVERS AT ALL PIPING ACCESSORY LOCATIONS REQUIRING FUTURE ACCESS.
6. CONNECT HHWS DOWN STREAM OF COIL IN RELATION TO AIR FLOW.

2 RE-HEAT COIL & AHU HEATING COILS

SCALE 12" = 1'-0"

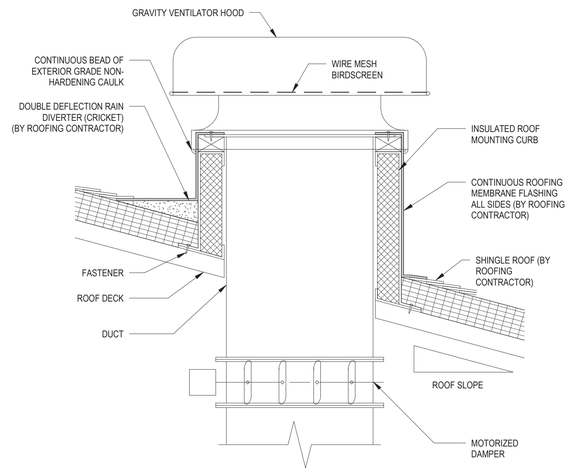


NOTES:

1. DETAIL TO BE USED AT ALL AUTOMATIC AIR VENT LOCATIONS, INCLUDING AT THE TOP OF ALL PIPE RISERS CONNECTING TWO OR MORE FLOORS.
2. AAV TO BE INSTALLED AT ALL PIPING HIGH POINTS.

3 AUTOMATIC AIR VENT DETAIL

SCALE 12" = 1'-0"



5 GRAVITY VENTILATOR AND ROOF CURB (SLOPED ROOFS)

SCALE 12" = 1'-0"

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Key Plan

Description	Date
Filing Set	06/17/22

Project

Storm King Art Center

C.F.M. Building

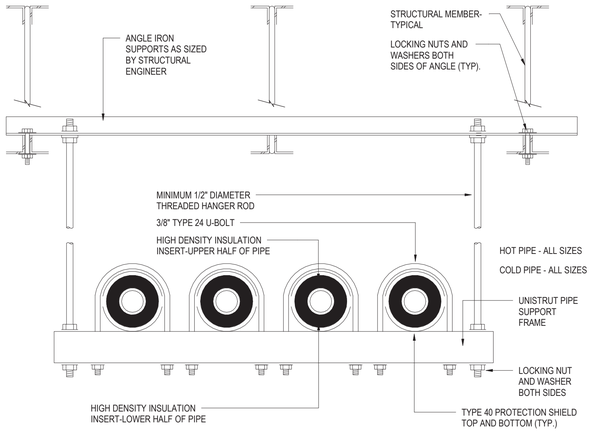
Seal

NOT FOR CONSTRUCTION

Drawing Title

Mechanical Details

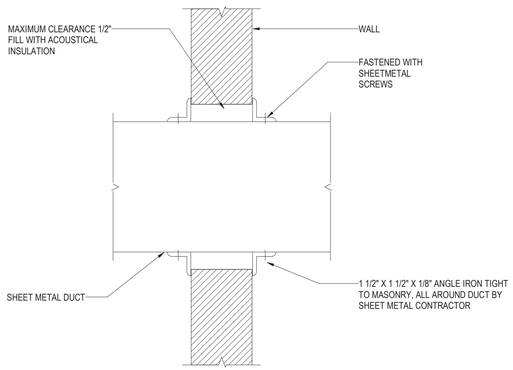
Date	06/17/22
Scale	Not to Scale
Drawing Number	M-C-505
Sheet Size	ARCH D



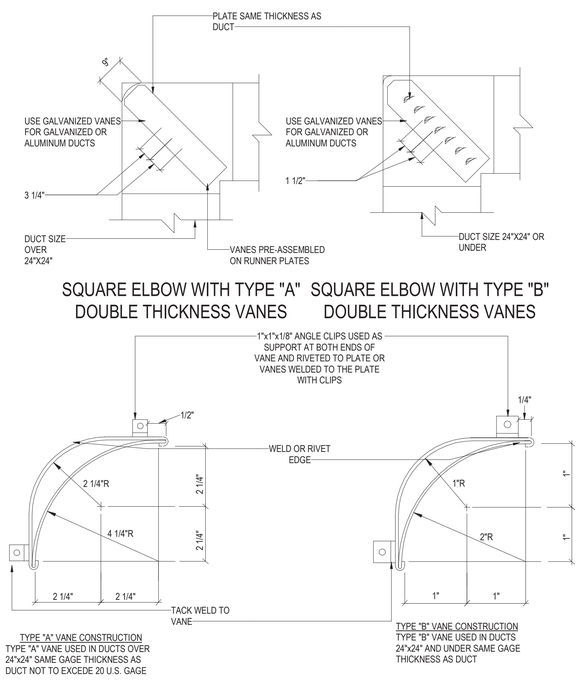
INDIVIDUAL PIPE HANGER ROD & SPACING SCHEDULE											
NOMINAL PIPE OR TUBE SIZE-INCHES	3/4	1	1 1/2	2	2 1/2	3	4	5	6	8	--
HANGER ROD SIZE-INCHES	3/8	3/8	3/8	3/8	1/2	1/2	5/8	5/8	7/8	7/8	--
MAXIMUM SPACING BETWEEN INCHES	6	7	9	10	11	12	14	16	17	19	--
MAXIMUM SPACING BETWEEN CU, TUBE SUPPORT IN FEET	6	6	8	9	10	10	12	14	14	16	--

NOTES:
TRAPEZE HANGER ROD SPACING SHALL BE BASED ON SPACING OF SMALLEST PIPE ON TRAPEZE. TRAPEZE SHALL BE DESIGNED WITH A FACTOR OF
SAFETY OF 5 FOR CENTER OF SPAN CONCENTRATED LOAD. METHOD OF HANGING, TYPE OF INSERT, BEAM CLAMP, ROD, ETC. MUST BE APPROVED BY STRUCTURAL ENGINEER PER SHOP DRAWINGS

1 TRAPEZE PIPE HANGER (MULTIPLE PIPES)
NOT TO SCALE



4 DUCT PENETRATING NON - RATED WALLS
NOT TO SCALE



5 TURNING VANE CONSTRUCTION (RECTANGULAR)
NOT TO SCALE

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Key Plan

Description	Date
Filing Set	06/17/22

Project

Storm King Art Center

C.F.M. Building

Seal

NOT FOR CONSTRUCTION

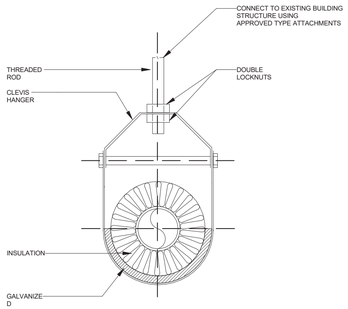
Drawing Title

Mechanical Details

Date	06/17/22
Scale	Not to Scale
Drawing Number	M-C-506
Sheet Size	ARCH D

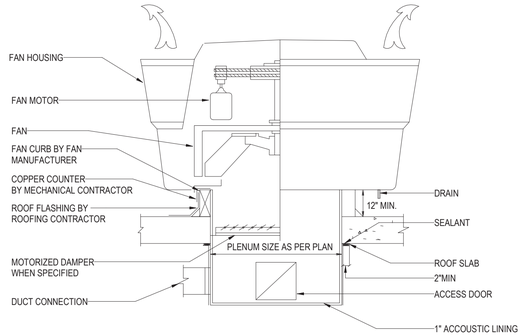
WITHOUT INCOMPRESSIBLE INSULATING BLOCK AT HANGER		
PIPE DIAMETER	SHIELD LENGTH	SHIELD THICKNESS USSG
UP TO 3"	6"	18

WITHOUT INCOMPRESSIBLE INSULATING BLOCK AT HANGER		
PIPE DIAMETER	SHIELD LENGTH	SHIELD THICKNESS USSG
UP TO 3"	12"	18



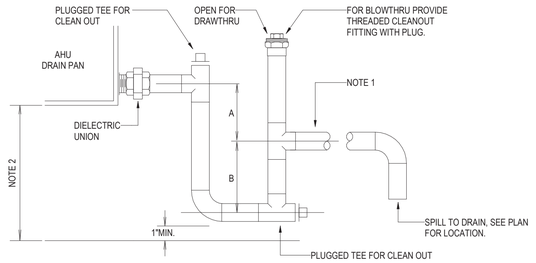
NOTE:
HANGER, ROD & INSERT SHALL BE DIPPED IN ZINC CHROMATE PRIMER PRIOR TO INSTALLATION

1 TYPICAL INSULATION OF PIPES SMALLER THAN 3
NOT TO SCALE



2 ROOF EXHAUST FAN UPBLAST
NOT TO SCALE

CONDENSATE PIPE SIZE	
EQUIPMENT CAPACITY	MIN. PIPE SIZE
TONS	INCH
UP TO 20	3/4
21-40	1
41-90	1 1/4
91-125	1 1/2
126-250	2



DRAWTHRU :

A = GREATER OF 4" OR 1/2" PLUS AHU TOTAL PRESSURE IN INCHES-WC

BLOWTHRU :

B = GREATER OF 4" OR 1/2" PLUS AHU TOTAL PRESSURE IN INCHES-WC

NOTES:

1. REF. PLAN DWG'S FOR CONDENSATE DRAIN PIPE SIZE, (1"MIN. AT EACH AHU DRAIN CONNECTION POINT). REF. SPECIFICATIONS FOR PIPE AND INSULATION MATERIAL REQUIREMENTS.
2. AHU TO BE ELEVATED ON HOUSEKEEPING PAD OR MOUNTING STRUCTURE AS REQUIRED FOR TRAP HEIGHT ABOVE FLOOR

3 MECHANICAL UNIT CONDENSATE DRAIN
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C.F.M. Building

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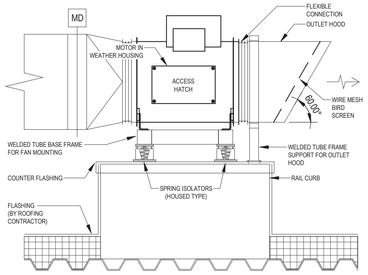
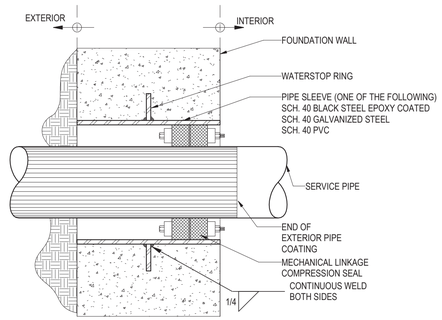
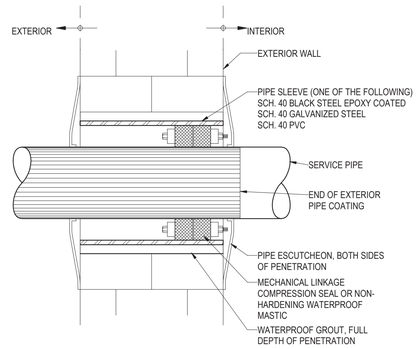


NOTES:
1. ALL EXTERIOR DUCTWORK TO BE STAINLESS STEEL

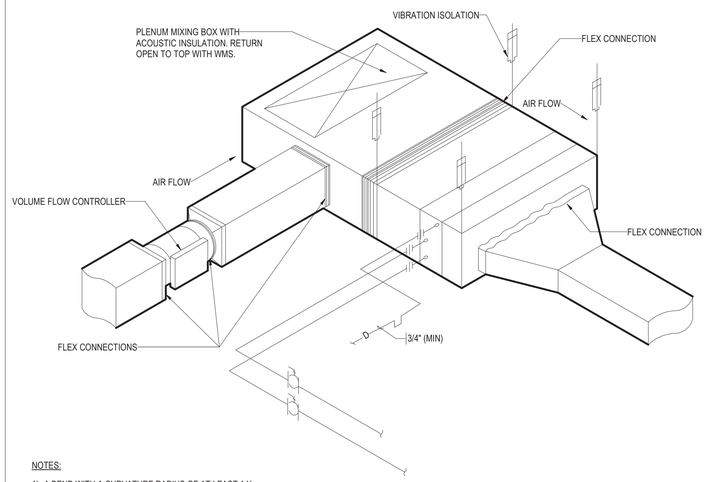
1 MIXED FLOW INLINE FAN
NOT TO SCALE



2 PIPE PENETRATION THROUGH FOUNDATION WALLS
NOT TO SCALE



3 PIPE PENETRATIONS THROUGH EXTERIOR WALLS ABOVE GRADE
NOT TO SCALE



NOTES:

1) A BEND WITH A CURVATURE RADIUS OF AT LEAST 1 X DIAMETER, WITHOUT AN ADDITIONAL STRAIGHT DUCT SECTION UPSTREAM OF THE FLOW CONTROLLER, IS RECOMMENDED BY THE MANUFACTURER AS HAVING A NEGLIGIBLE EFFECT ON VOLUME FLOW RATE ACCURACY.
2) A STRAIGHT DUCT SECTION OF AT LEAST 1.5 X DIAMETER IS REQUIRED UPSTREAM THE FLOW CONTROLLER. SHORTER UPSTREAM SECTIONS REQUIRE A PERFORATED PLATE IN THE BRANCH AND BEFORE THE FLOW CONTROLLER.
3) FLOW CONTROLLER REQUIRES AT LEAST 1' OF CLEARANCE IN ALL DIRECTIONS FOR COMMISSIONING AND MAINTENANCE.
4) INSTALL COMPONENTS SUCH THAT A SINGLE COMMON CLEARANCE AREA FOR MAINTENANCE ACCESS IS PROVIDED TO FCU, FLOW CONTROLLER, FILTER REPLACEMENT AND REFRIGERANT VALVING.
5) PROVIDE ACOUSTIC LINING IN SUPPLY DUCT FOR 10 FT DOWN STREAM FROM FCU.

4 HORIZONTAL VRF FAN COIL UNIT
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Storm King Art Center

C.F.M. Building

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Date	06/17/22
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Sheet Size	ARCH D

M - VRF OUTDOOR UNIT SCHEDULE

DESIGNATION	SERVICE	LOCATION	TOTAL COOLING CAPACITY (MBH)	TOTAL HEATING CAPACITY (MBH)	COOLING EER	HEATING COP	ELECTRICAL					REFRIGERANT TYPE	DIMENSIONS			WEIGHT (LB)	MANUFACTURER	MODEL NUMBER	REMARKS
							VOLTAGE	PHASE	FREQUENCY	MCA	MOCP		LENGTH (IN)	WIDTH (IN)	HEIGHT (IN)				
ACCU - C-3-1	VRF ZONES	OUTSIDE	96	108	12.7	3.66	460 V	3	60	14 A	20	R410A	4' - 0 7/8"	2' - 5 5/32"	5' - 11 5/8"	649	TRANE	TURYE0964AN40A	AIR-COOLED
ACCU - C-3-2	VRF ZONES	OUTSIDE	96	108	12.7	3.66	460 V	3	60	14 A	20	R410A	4' - 0 7/8"	2' - 5 5/32"	5' - 11 5/8"	649	TRANE	TURYE0964AN40A	AIR-COOLED

M - VRF FCU SCHEDULE

DESIGNATION	SERVICE	LOCATION	COOLING AT AHRI		HEATING AT AHRI	ELECTRICAL				FAN			MANUFACTURER	MODEL NUMBER	REMARKS
			TOTAL COOLING CAPACITY (MBH)	SENSIBLE COOLING CAPACITY (MBH)	TOTAL HEATING CAPACITY (MBH)	VOLTAGE	PHASE	FREQUENCY	MCA	MOTOR CONTROL	CFM	EXTERNAL STATIC PRESSURE (IN WG)			
FCU-C-1-1	PUMP ROOM	LEVEL 01	6.0	-	6.7	208 V	1	60	0 A	ECM	210 CFM	-	MITSUBISHI	TPKFYP006BM142B	WALL MOUNTED
FCU-C-1-2	CIRCULATION	LEVEL 01	15.0	11.4	17	208 V	1	60	1 A	ECM	494 CFM	0.6	MITSUBISHI	TPEFYP015MA143A	
FCU-C-1-3	ELECTRICAL RM	LEVEL 01	6.0	-	6.7	208 V	1	60	0 A	ECM	210 CFM	-	MITSUBISHI	TPKFYP006BM142B	WALL MOUNTED
FCU-C-1-4	LAUNDRY/SOIL LAB	LEVEL 01	6.0	4.9	6.7	208 V	1	60	1 A	ECM	300 CFM	0.6	MITSUBISHI	TPEFYP006MA143A	
FCU-C-1-5	STAIR 02	LEVEL 01	15.4	-	17.1	220 V	1	60	1 A	ECM	636 CFM	0	MITSUBISHI	PLFY-P40VEM-A	CEILING CASSETTE
FCU-C-2-1	BREAK ROOM	LEVEL 02	12.0	9.1	13.5	208 V	1	60	1 A	ECM	371 CFM	0.6	MITSUBISHI	TPEFYP012MA143A	
FCU-C-2-2	STORAGE/CIRCULATION	LEVEL 02	15.0	11.4	17	208 V	1	60	1 A	ECM	494 CFM	0.6	MITSUBISHI	TPEFYP015MA143A	
FCU-C-2-3	OPEN OFFICE	LEVEL 02	24.0	19.2	27.0	208 V	1	60	2 A	ECM	671 CFM	1.0	MITSUBISHI	TPEFYP024MH142A	
FCU-C-2-4	MEETING ROOM	LEVEL 02	6.0	4.9	6.7	208 V	1	60	1 A	ECM	300 CFM	0.6	MITSUBISHI	TPEFYP006MA143A	
FCU-C-2-5	OPEN OFFICE	LEVEL 02	6.0	4.9	6.7	208 V	1	60	1 A	ECM	300 CFM	0.6	MITSUBISHI	TPEFYP006MA143A	
FCU-C-2-6	MECHANICAL RM	LEVEL 02	8.0	-	9.0	208 V	1	60	0 A	ECM	413 CFM	-	MITSUBISHI	TPKFYP008HM142A	WALL MOUNTED
FCU-C-2-7	MECHANICAL RM	LEVEL 02	8.0	-	9.0	208 V	1	60	0 A	ECM	413 CFM	-	MITSUBISHI	TPKFYP008HM142A	WALL MOUNTED
FCU-C-2-8	ELECTRICAL CLOSET	LEVEL 02	6.0	-	6.7	208 V	1	60	0 A	ECM	210 CFM	-	MITSUBISHI	TPKFYP006BM142B	WALL MOUNTED
FCU-C-2-9	IT/SECURITY CLOSET	LEVEL 02	6.0	-	6.7	208 V	1	60	0 A	ECM	210 CFM	-	MITSUBISHI	TPKFYP006BM142B	WALL MOUNTED

M - FAN SCHEDULE

DESIGNATION	SERVICE	LOCATION	AIR QUANTITY (CFM)	EXTERNAL STATIC PRESSURE (IN WG)	MAX FAN SPEED (RPM)	FAN TYPE	MOTOR/ELECTRICAL DATA					APPROXIMATE WEIGHT (LB)	EMERGENCY POWER	STANDBY POWER	VFD	MANUFACTURER	MODEL NUMBER	REMARKS
							HP	RPM	VOLTAGE	PHASE	FREQUENCY							
EXF - C-1-1	MAINTENANCE EXHAUST	LEVEL 01	2,200	1	3,500	AXIAL	3/4	3,500	460 V	3	60	89	Yes	Yes	Yes	GREENHECK	AX-36-160-0413	CEILING-HUNG
EXF - C-1-2	STORAGE 118	LEVEL 01	50	0.5	820	DIRECT DRIVE	0.015	820	115 V	1	60	10	Yes	Yes	Yes	GREENHECK	SP-AP0511W	CEILING-HUNG
EXF - C-3-1	PUMP ROOM	ROOF	6,000	1.5	1,189	CENTRIFUGAL	3	1,189	460 V	3	60	161	Yes	Yes	Yes	GREENHECK	GB-240HP	ROOF-MOUNTED
MAF - C-1-1	MAINTENANCE MAKEUP	LEVEL 01	2,200	1	3,500	AXIAL	3/4	3,500	460 V	3	60	89	Yes	Yes	Yes	GREENHECK	AX-36-160-0413	CEILING-HUNG

M - VRF MODE CONTROL UNIT SCHEDULE

DESIGNATION	LOCATION	TOTAL CAPACITY (MBH)	NUMBER OF PORTS	DIMENSIONS			ELECTRICAL DATA					MANUFACTURER	MODEL NUMBER	REMARKS
				HEIGHT	LENGTH	WIDTH	VOLTAGE	PHASE	FREQUENCY	MCA	MOCP			
MCU-C-1-1	LEVEL 1	126	8	0' - 9 7/8"	2' - 0"	1' - 4"	208 V	1	60	1 A	15	TRANE	TCMBS0108KB11N4	SUB BC CONTROLLER
MCU-C-2-1	LEVEL 1	336	8	0' - 9 7/8"	3' - 0"	1' - 10"	208 V	1	60	1 A	15	TRANE	TCMBM0108JA11N4	MAIN BC CONTROLLER
MCU-C-2-2	LEVEL 1	126	8	0' - 9 7/8"	2' - 0"	1' - 4"	208 V	1	60	1 A	15	TRANE	TCMBS0108KB11N4	SUB BC CONTROLLER

M - DIFFUSER AND GRILLE SCHEDULE

DESIGNATION	USAGE	MAX CFM	MAX CFM/FT	MAX NC	FACE SIZE	DIFFUSER HEIGHT (IN)	SLOT SIZE	LENGTH (IN)	MANUFACTURER	MODEL NUMBER	REMARKS
ED-1	OED EXHAUST	-	-	25	-	-	-	-	PRICE	RPD	
ED-2	EXHAUST	250	-	25	12"x12"	-	-	-	PRICE	SCD	
LSD-1	SUPPLY	-	30	25	-	6	1	48	PRICE	SDS	2
RD-1	OED RETURN	-	-	25	-	-	-	-	PRICE	RPD	
RD-2	RETURN	250	-	25	12"x12"	6"	-	-	PRICE	SCD	
RSD-1	RETURN	-	30	25	-	6	1	48	PRICE	SDS	2
SD-1	OED SUPPLY	-	-	25	-	-	-	-	PRICE	RPD	
SD-2	SUPPLY	250	-	25	12"x12"	-	-	-	PRICE	SCD	

NOTES:
1. LINEAR BAR DIFFUSERS IN SOFFITS TO BE CONTINUOUS WITH ACTIVE SECTIONS FOR SUPPLY AND INACTIVE SECTIONS FOR RETURN BACK TO FCU.
2. PROVIDE WITH PLENUM.
3. DIFFUSERS TO BE DURABLE INDUSTRIAL GRADE.

M - VFC SCHEDULE

DESIGNATION	SERVES	DESIGN CFM	DROP AT MIN FLOW (IN W.G)	ROUND DUCT CONNECTION SIZE (IN)	MOTORIZED DAMPER CONTROL VIA	MANUFACTURER	MODEL NUMBER	REMARKS
VFC C-1-2	FCU C-1-2	250 CFM	0.20	8"	CO2	ALDES	18147	
VFC C-1-4	FCU C-1-4	100 CFM	0.20	6"	CO2	ALDES	18133	
VFC C-2-1	FCU C-2-1	110 CFM	0.20	6"	CO2	ALDES	18134	
VFC C-2-2	FCU C-2-2	190 CFM	0.20	8"	CO2	ALDES	18145	
VFC C-2-3	FCU C-2-3	180 CFM	0.20	8"	CO2	ALDES	18145	
VFC C-2-4	FCU C-2-4	70 CFM	0.20	5"	CO2	ALDES	18124	

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Project

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Mechanical Schedules

Date	06/17/22
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Sheet Size	ARCH D

M - ENERGY RECOVERY VENTILATOR SCHEDULE

					ENERGY RECOVERY PERFORMANCE DATA																				SUPPLY FAN DATA						RETURN FAN DATA						ELECTRICAL								
						SUMMER								WINTER																															
						OUTDOOR AIR		SUPPLY AIR		RETURN AIR		EXHAUST AIR		OUTDOOR AIR		SUPPLY AIR		RETURN AIR		EXHAUST AIR																											
DESIGNATION	SERVICE	LOCATION	SUPPLY AIR QUANTITY (CFM)	EXHAUST AIR QUANTITY (CFM)	SUPPLY AIR QUANTITY ENTERING	DB	WB	DB	WB	DB	WB	DB	WB	DB	WB	DB	WB	DB	WB	DB	WB	% EFFECTIVENESS WINTER/SUMMER	CFM	SUPPLY FAN QTY	EXTERNAL STATIC PRESSURE (IN WG)	BHP	HP	VFD	CFM	RETURN FAN QTY	EXTERNAL STATIC PRESSURE (IN WG)	BHP	HP	VFD	VOLTAGE	PHASE	FREQ	SINGLE POINT CONNECTION	APPROXIMATE WEIGHT (LB)	MANUFACTURER	MODEL NUMBER	REMARKS
ERV - C-2-1	OPEN WORKSPACE	MECHANICAL ROOM 210	10,000	10,000	10,000	89 °F	73 °F	80 °F	70 °F	75 °F	63 °F	85 °F	66 °F	-2 °F	-2 °F	34 °F	25 °F	50 °F	38 °F	17 °F	16 °F	60.1 / 27.1	5,000	2	4.97	5.97	7.5	YES	5,000	2	5.990	7.14	10	YES	460 V	3	60	Yes	4,024	TRANE	CUSTOM	
ERV - C-2-2	WOOD WORKING	MECHANICAL ROOM 212	1,200	1,200	1,200	89 °F	73 °F	80 °F	70 °F	75 °F	63 °F	84 °F	66 °F	-2 °F	-2 °F	33 °F	25 °F	50 °F	38 °F	17 °F	17 °F	68.2 / 65.4	1,200	1	3.93	1.366	1.5	YES	1,200	1	4.44	1.54	2	YES	460 V	3	60	Yes	2,566	TRANE	CUSTOM	
ERV - C-2-3	OFFICES, STORAGE, RESTROOMS	MECHANICAL ROOM 212	900	900	900	89 °F	73 °F	79 °F	67 °F	75 °F	63 °F	85 °F	69 °F	-2 °F	-2 °F	49 °F	45 °F	70 °F	58 °F	19 °F	19 °F	-	900	1	1.00	-	0.5	YES	900	1	1.00	-	0.5	YES	208 V	1	60	Yes	278	RENEWAIRE	HE1XINH EC	INCLUDE 11.5 KW DUCT HEATER ACCESSORY

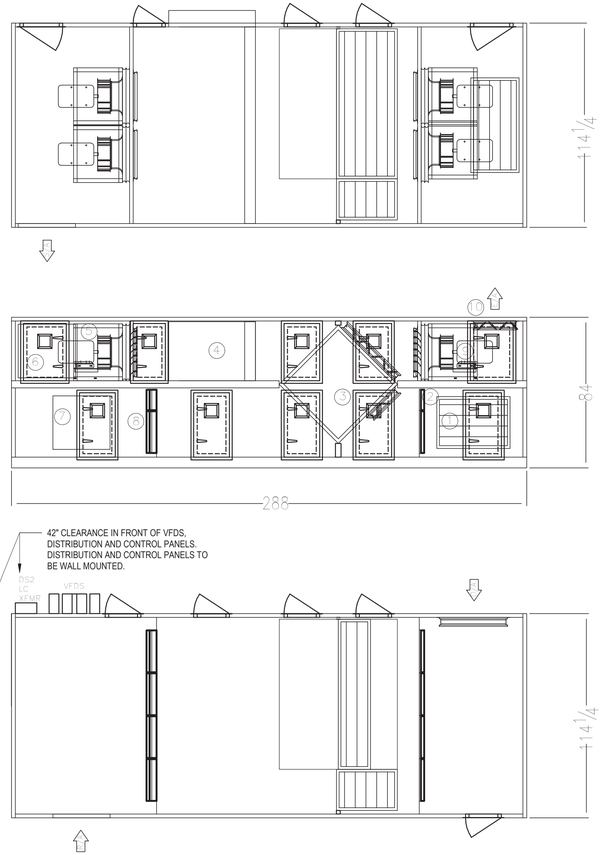
M - ELECTRIC DUCT HEATER SCHEDULE

DESIGNATION	SERVICE	LOCATION	CFM	EAT (°F)	LAT (°F)	CAPACITY (kW)	MANUFACTURER	MODEL NUMBER	REMARKS
DH-C-2-3	OFFICES, STORAGE, RESTROOMS	MECHANICAL ROOM 212	900	0 °F	50 °F	11.5	RENEWAIRE	RH SERIES	PROVIDE SCR CONTROL

ERV-C-2-1 EQUIPMENT LIST:

1 OA DAMPER 26x38
2 FILTERS
  2" MERV 8
  24x24 QTY 4
  24x12 QTY 4
3 ATA HEAT EXCHANGER
4 ELECTRIC HEATER
5 SUPPLY FAN: MPQN 182 CLASS II
  QTY 2
6 SA OPENING 30x32
7 RA OPENING 30x32
8 FILTERS
  2" MERV 8
  4" MERV 14
  24x24 QTY 4
  24x12 QTY 4
9 EXHAUST FAN: MPQN 182 CLASS II
  QTY 2
10 EA DAMPER 24x50

ERV-C-2-1

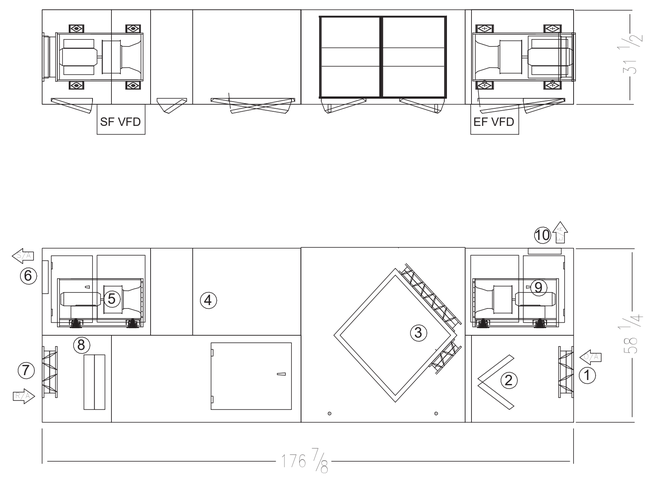


UPPER LEVEL PLAN

ELEVATION

LOWER LEVEL PLAN

ERV-C-2-2



ERV-C-2-2 EQUIPMENT LIST:

1 OA DAMPER 17x16.25
2 ANGLED FILTERS
3 ATA HEAT EXCHANGER
  W/ BACK BYPASS DAMPER
  W/ BACK-BOTTOM FROST DAMPER
4 ELECTRIC HEATER
5 SUPPLY FAN W/ PLENUM
6 SA OPENING 11x14
7 RA DAMPER 17x16.25
8 COMBO FILTERS
9 EXHAUST FAN W/ PLENUM
10 EA OPENING 14x11

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Key Plan

Description	Date
Filing Set	06/17/22

Project

Storm King Art Center

C.F.M. Building

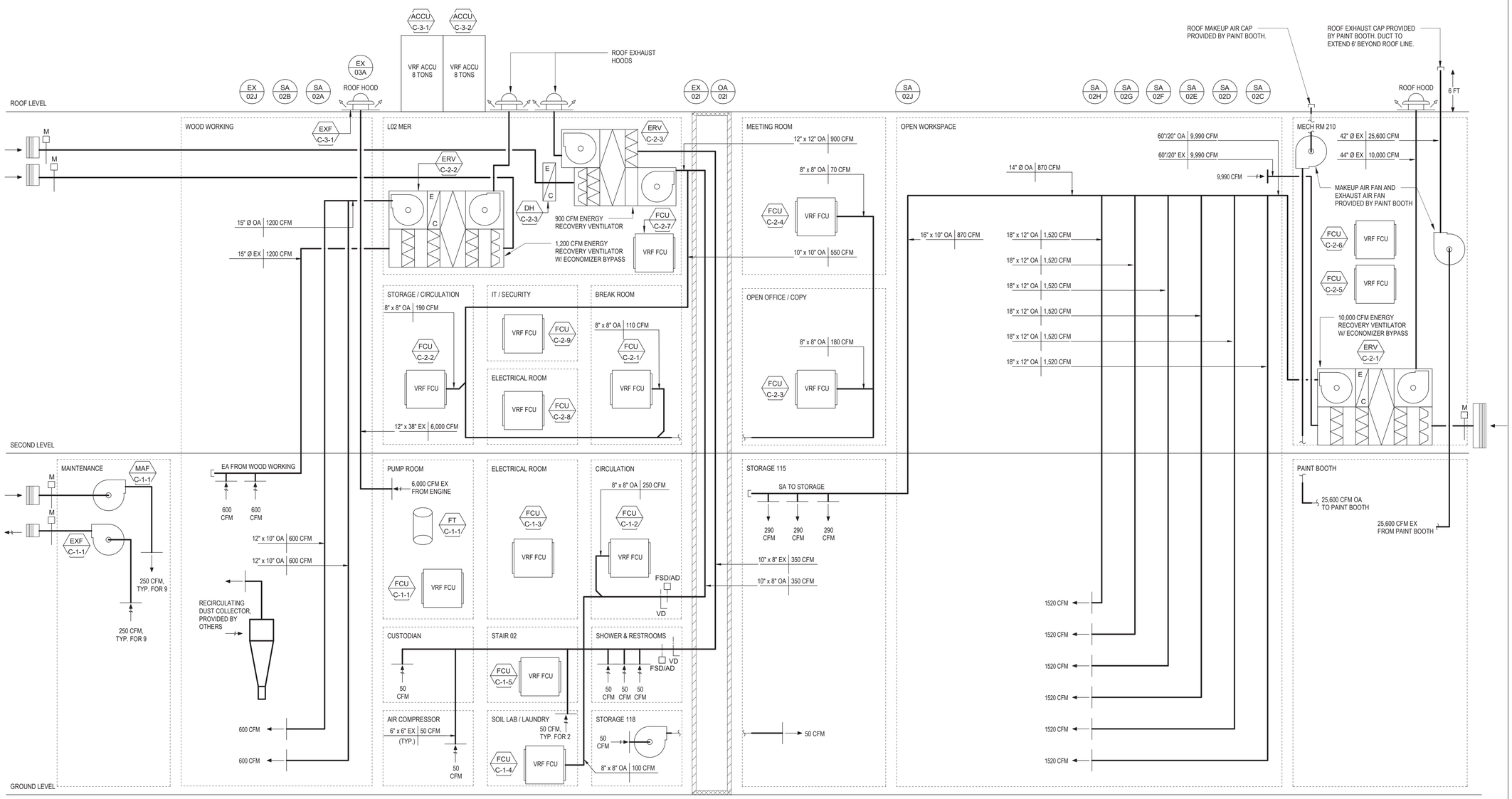
Seal

NOT FOR CONSTRUCTION

Drawing Title

Mechanical Schedules

Date	06/17/22
Scale	Not to Scale
Drawing Number	M-C-602
Sheet Size	ARCH D



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Key Plan

Description	Date
Filing Set	06/17/22

Project

Storm King Art Center

C.F.M. Building

Seal

NOT FOR CONSTRUCTION

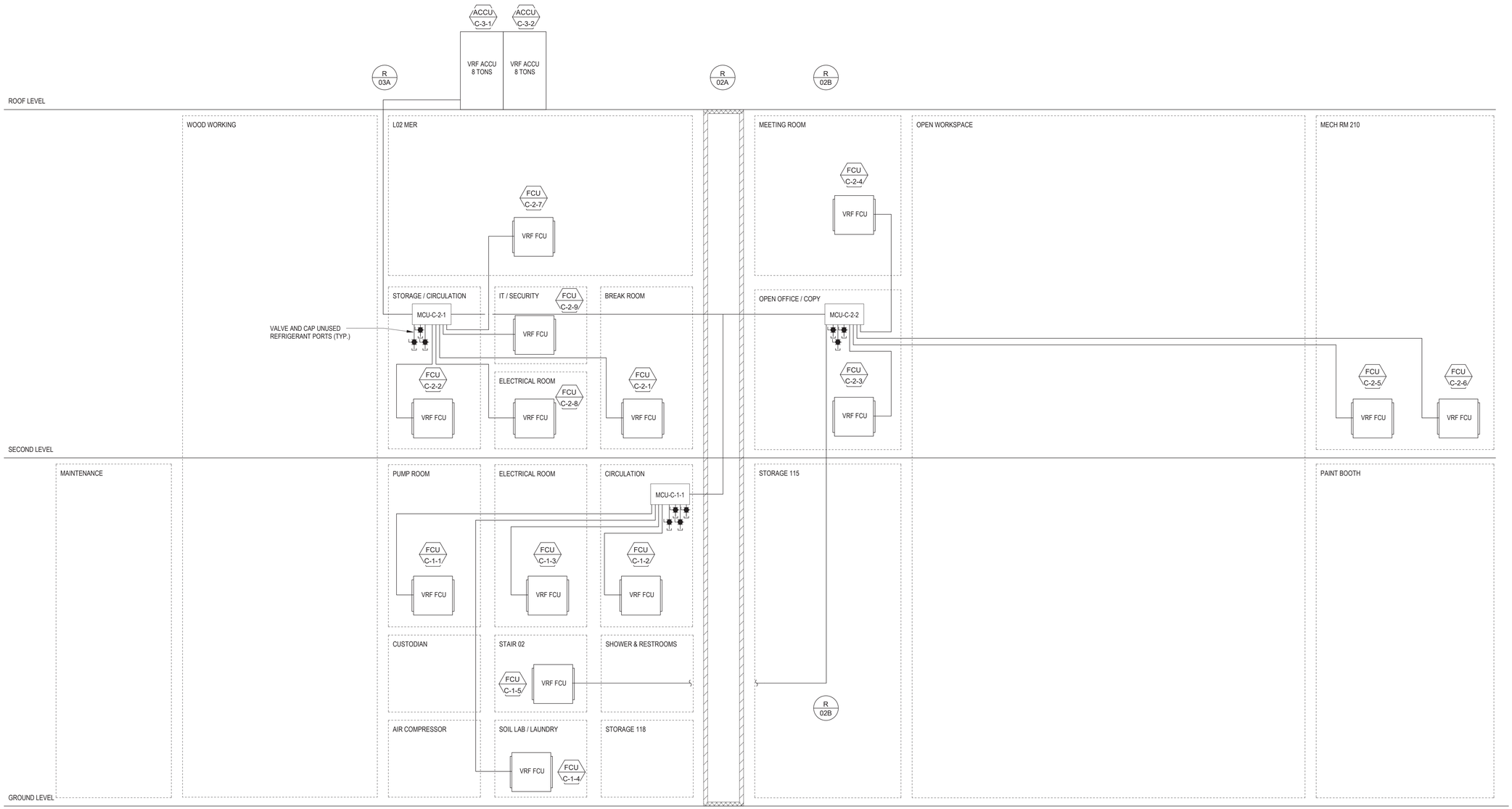
Drawing Title

Duct Riser

Date	06/17/22
Scale	Not to Scale
Drawing Number	M-C-701
Sheet Size	ARCH D

GENERAL NOTES

SINGLE LINES ARE INTENDED TO SHOW CONNECTIVITY OF REFRIGERANT SYSTEM. EACH LINE REPRESENTS 3X REFRIGERANT PIPES. MODE CONTROL UNIT (MCU) LAYOUT IS PRELIMINARY AND SUBJECT TO MANUFACTURER REQUIREMENTS.



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Key Plan

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Storm King Art Center

C.F.M. Building

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Drawing Title

Refrigerant Riser

Date	06/17/22
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Sheet Size	ARCH D

WELCOME PAVILIONS

- ERV-W-1-1
- DH-W-1-1
- VRF INTERFACE
- POWER METER MONITORING
- PLUMBING EQUIPMENT MONITORING
- WATER METER MONITORING
- RADIANT FLOOR MONITORING
- UNIT HEATERS

(T)

BUILDING IT

CONSERVATION, FABRICATION & MAINTENANCE BUILDING

- EXF-C-3-1 VFD INTEGRATION
- PAINT BOOTH CONTROL PANEL
- ERV-C-2-1
- ERV-C-2-2
- ERV-C-2-3
- DH-C-2-3
- EXF-C-1-1 VFD INTEGRATION
- MAF-C-1-1 VFD INTEGRATION
- VRF INTERFACE
- POWER METER MONITORING
- PLUMBING EQUIPMENT MONITORING

(T)

BUILDING IT

1 SITE PLAN

SCALE 1 : 6000

BMS ALARMS / MODES (ALL BLDGS/SYSTEMS)

- FREEZE PROTECTION
- HIGH/LOW SPACE TEMPERATURE
- HIGH/LOW SPACE HUMIDITY
- FILTER STATUS
- UNIT FAILURE
- ONLINE/OFFLINE
- OCCUPIED/UNOCCUPIED
- MORNING WARMUP/COOLDOWN
- HIGH/LOW DISCHARGE AIR TEMPERATURE
- VFD FAILURE
- HIGH/LOW CO2

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Key Plan

N

Description	Date
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Storm King Art Center

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Drawing Title

Controls Site Plan

Date	06/17/22
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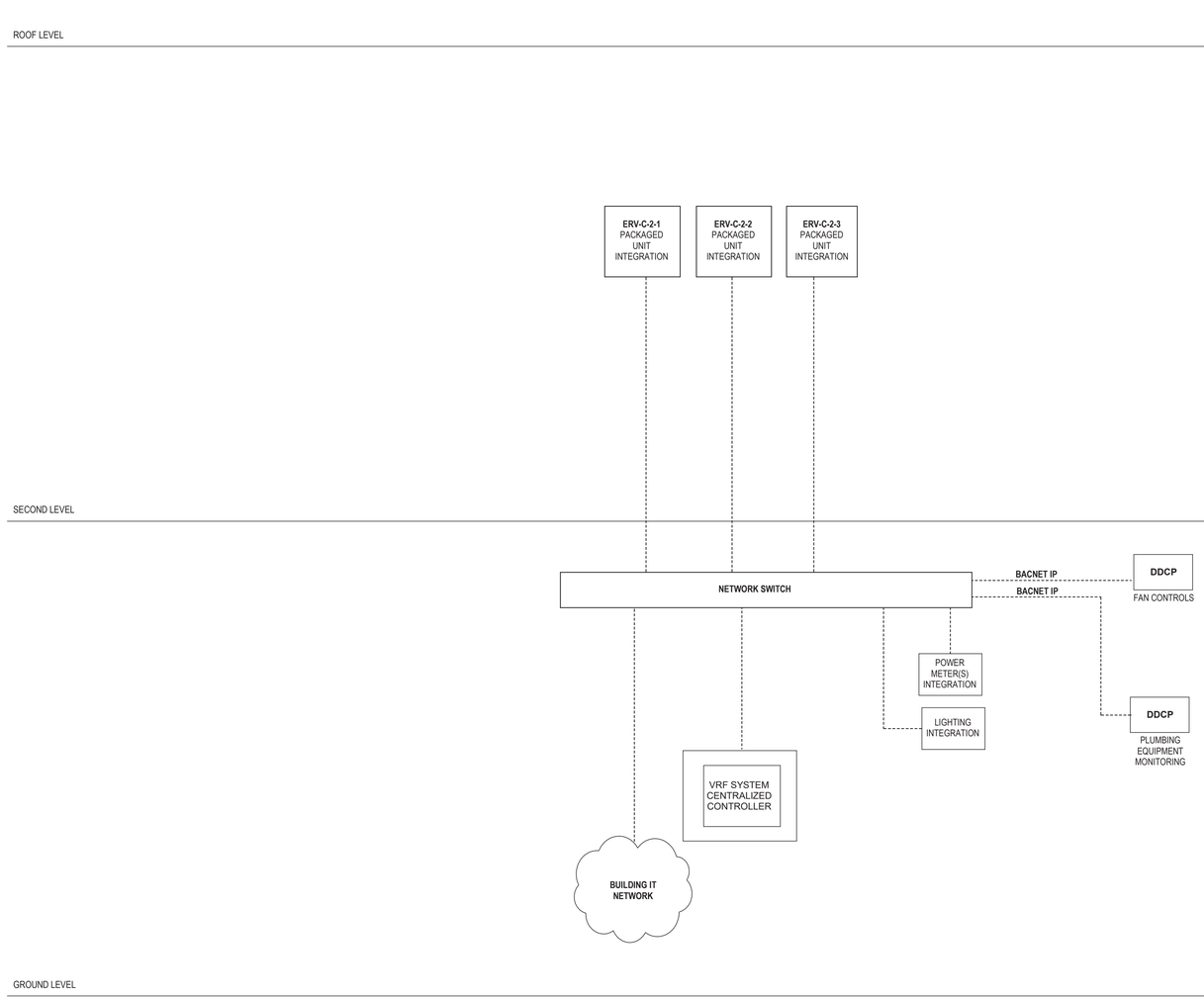
Sheet Size	ARCH D



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Key Plan

Description	Date
Filing Set	06/17/22

Project

Storm King Art Center

C.F.M. Building

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Drawing Title

Control Details

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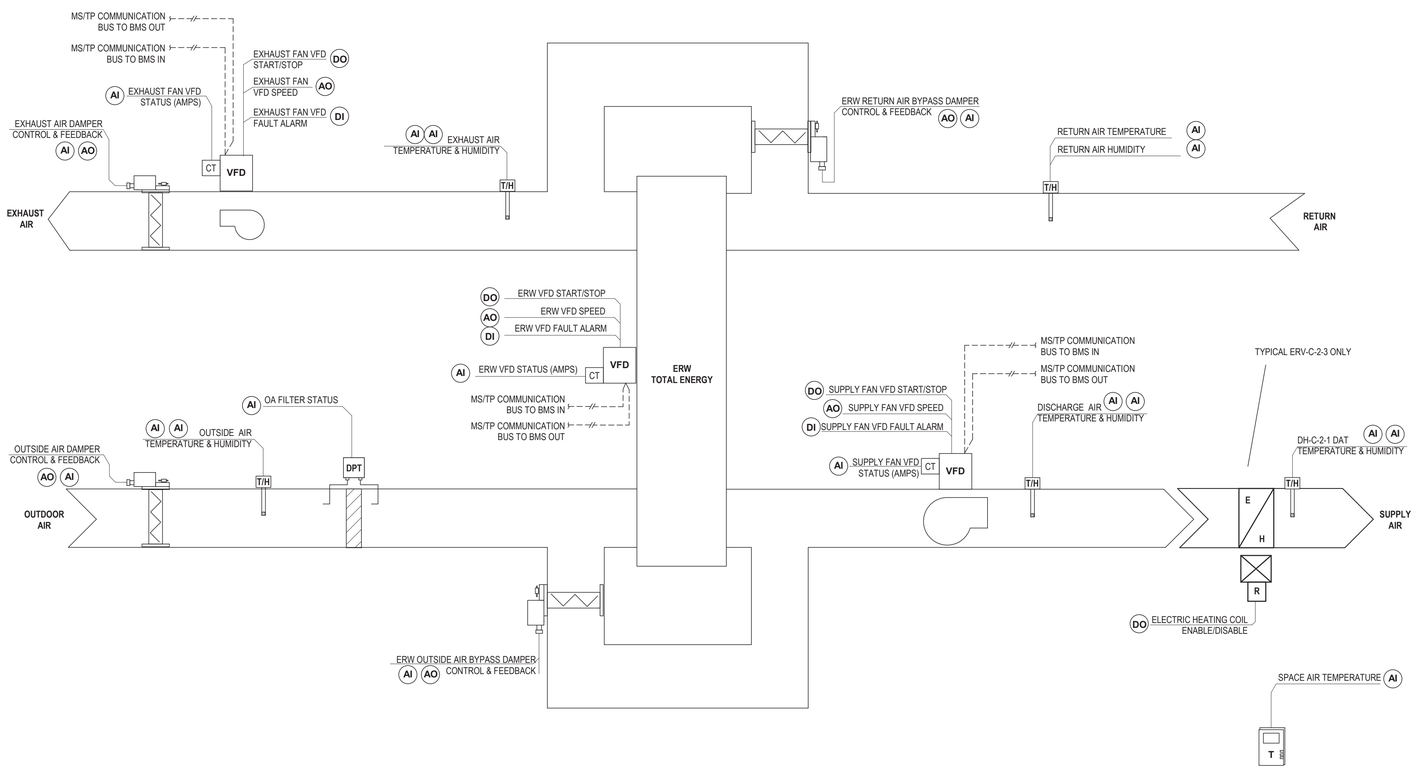
ERV-C-2-1, ERV-C-2-2 AND ERV-C-2-3 FLOW DIAGRAM



SEQUENCE OF OPERATIONS

ENERGY RECOVERY WHEEL CONTROL: ENERGY WHEEL IS EQUIPPED WITH BYPASS DAMPERS ON THE RETURN AND EXHAUST SIDE WITH END SWITCH TO INDICATE FULL OPEN, A VARIABLE FREQUENCY DRIVE TO CONTROLL ROTATION SPEED, AND A ROTATION DECTECTION MODULE. ALL VALUES SHALL BE DISPLAY AS 0% TO 100% WHERE 0% IS 0% OPEN MINIMUM, AND 100% IS FULL OPEN / MAXIMUM.

THE ENERGY WHEEL SHALL BE ENABLED/ DISABLED WITH THE AIR HANDLING UNIT SUPPLY FAN AND RETURN FAN.
WHEN THE AIR HANDLING UNIT SUPPLY AND RETURN FAN HAS PROVEN "ON" AND THE ENERGY WHEEL VARIABLE FREQUENCY DRIVE IS NOT IN FAULT THE DDC SYSTEM SHALL SEND A START COMMAND TO THE ENERGY WHEEL.

THE PROGRAM SHALL CALCULATE THE ENERGY WHEEL'S ENTHALPY, DEWPOINT, AND WETBULB TEMPERATURE FOR THE LEAVING SUPPLY SIDE AND THE ENTERING AND LEAVING EXHAUST SIDE. THESE VALUES SHALL BE BASED ON THE RESPECTIVE TEMPERATURE AND HUMIDITY INPUT VALUES.

THERE SHALL BE FOUR OPERATIONAL MODES FOR THE ENERGY WHEEL
1. FROST/CONDENSATE PREVENTION MODE
2. HEAT RECOVERY MODE
3. COOLING RECOVERY MODE

FROST/CONDENSATE PREVENTION MODE... SHALL BE CONTROLED WITH A DIRECT ACTING PROPOTIONAL AND INTEGRAL LOOP WITH THE LOOP OUT PUT REPRESENTED IN 0% TO 100% UNITS CALCULATED WITH THE DEVIATION BETWEEN THE PROCESS SET POINT AND THE PROCESS VARIABLE. THE PROCESS SET POINT SHALL BE THE VALUE OF THE ENERGY WHEEL'S CALCULATED FROST DEWPOINT PLUS FIVE DEGREES F. THE PROCESS VARIABLE SHALL BE REPRESENTED BY THE VALUE OF THE ENERGY WHEEL'S LEAVING EXHAUST TEMP.

HEAT RECOVERY MODE... SHALL BE ENABLED BY A DEAD BAND SWITCH BASED ON OUTDOOR AIR TEMPERATURE, "ON" AT 48 DEGREES F. AND "OFF" AT 52 DEGREES F. AND SHALL BE CONTROLED WITH A REVERSE ACTING PROPOTIONAL AND INTEGRAL LOOP WITH THE LOOP OUT PUT REPRESENTED IN 0% TO 100% UNITS CALCULATED WITH THE DEVIATION BETWEEN THE PROCESS SET POINT AND THE PROCESS VARIABLE. THE PROCESS SET POINT IS THE VALUE OF THE AIR HANDLING UNIT'S DISCHARGE AIR TEMPERATURE SET POINT. THE PROCESS VARIABLE SHALL BE REPRESENT BY THE VALUE OF THE ENERGY WHEEL LEAVING SUPPLY TEMPERATURE. THE COMMAND FOR THE ENERGY WHEEL'S VARIABLE FREQUENCY DRIVE SHALL BE THE MINIMUM VALUE OF THE ENERGY WHEEL ACCELL RAMP, FROST/CONDENSATE PREVENTION LOOP OUTPUT, AND THE HEAT RECOVERY LOOP OUTPUT, AND SHALL MODULATE TO MAINTAIN SETPOINT.

COOLING RECOVERY MODE... DURING THIS MODE A DEAD BAND SWITCH BASED ON OUTDOOR AIR TEMPERATURE MINUS THE AIR HANDLING UNIT'S RETURN AIR TEMPERATURE WILL BE ENABLED "ON" AT 5 DEGREES F. DEVIATION AND "OFF" AT 2 DEGREES F. DEVIATION. ADDITIONALLY IT SHALL BE CONTROLED WITH A DIRECT ACTING PROPOTIONAL AND INTEGRAL LOOP WITH THE LOOP OUT PUT REPRESENTED IN 0% TO 100% UNITS CALCULATED WITH THE DEVIATION BETWEEN THE PROCESS SET POINT AND THE PROCESS VARIABLE. THE PROCESS SET POINT IS THE VALUE OF THE AIR HANDLING UNIT'S DISCHARGE AIR TEMPERATURE SET POINT. THE PROCESS VARIABLE SHALL BE REPRESENT BY THE VALUE OF THE ENERGY WHEEL LEAVING SUPPLY TEMPERATURE. THE COMMAND FOR THE ENERGY WHEEL'S VARIABLE FREQUENCY DRIVE SHALL BE THE MINIMUM VALUE OF THE ENERGY WHEEL ACCELL RAMP, FROST/CONDENSATE PREVENTION LOOP OUTPUT, AND THE COOLING RECOVERY LOOP OUTPUT, AND SHALL MODULATE TO MAINTAIN SETPOINT.

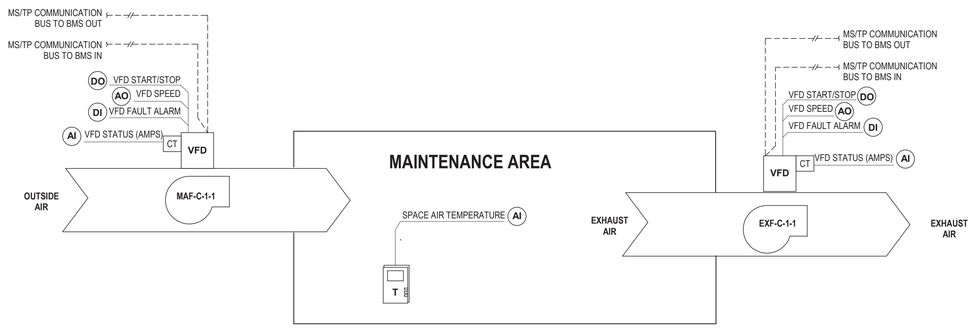
SYSTEM SHUT DOWN...THE DDC SYSTEM SHALL STOP THE ENERGY WHEEL AND OPEN THE BYPASS DAMPERS TO FULL BYPASS, SET ZERO IN ALL RAMPS AND CONTROLL OUTPUTS, AND DISABLE THE RATATION DETECTION CONTROL MODULE.

SUPPLY, RETURN AND ERW VFD COMMUNICATIONS BAS INTERFACE:
THE VFD INTERFACE SHALL BE CONNECT DIRECTLY TO THE MAIN DDC SYSTEM MS/TP NETWORK TRUNK TO MONITOR, DISPLAY, TREND AND REPORT THE FOLLOWING MINIMUM POINTS:

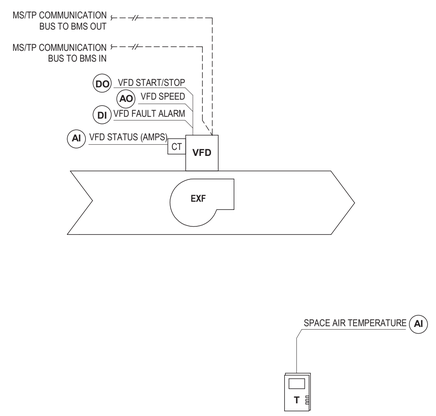
1. SPEED OUTPUT
2. HAND/AUTO SELECTION INDICATION
3. DRIVE AMPS
4. KW (COMPARE INSTANTANEOUS VALUE, THE CONNECTED MOTOR NAMPEPLATE HP/KW (CONSTANT) AND THE RATIO)
5. KWHRS (INCLUDE CALCULATED ENERGY SAVINGS FROM BASELINE IF MOTOR KW AT FULL SPEED KW RAN CONTINUOUSLY AT FULL SPEED)
6. OPERATING HOURS
7. WARNINGS
8. FAULTS

FILTER: THERE SHALL BE A DIFFERENTIAL PRESSURE TRANSMITTER MEASURING THE PRESSURE DIFFERENTIAL ACROSS THE FILTER BANKS. IF THE PRESSURE DIFFERENTIAL PRESSURE ACROSS THE FILTER BANKS IS ABOVE THE FILTER DP SETPOINT (ADJUSTABLE) THEN AN ALARM SHALL BE SEND TO THE DDC SYSTEM.

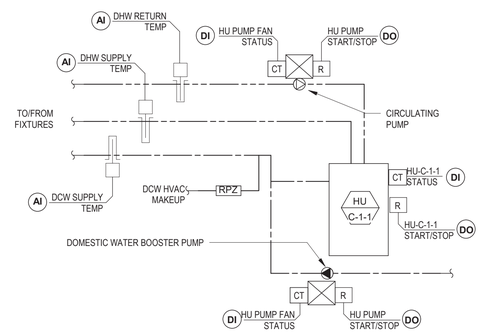
MAF-C-1-1 AND EXF-C-1-1 FLOW DIAGRAM



TYPICAL FLOW DIAGRAM FOR EXF-C-1-2 AND EXF-C-3-1



TYPICAL DOMESTIC WATER CONTROL STRATEGY



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Key Plan

Description	Date
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Project

Storm King Art Center

C.F.M. Building

Seal

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Drawing Title

Control Details

Date	06/17/22
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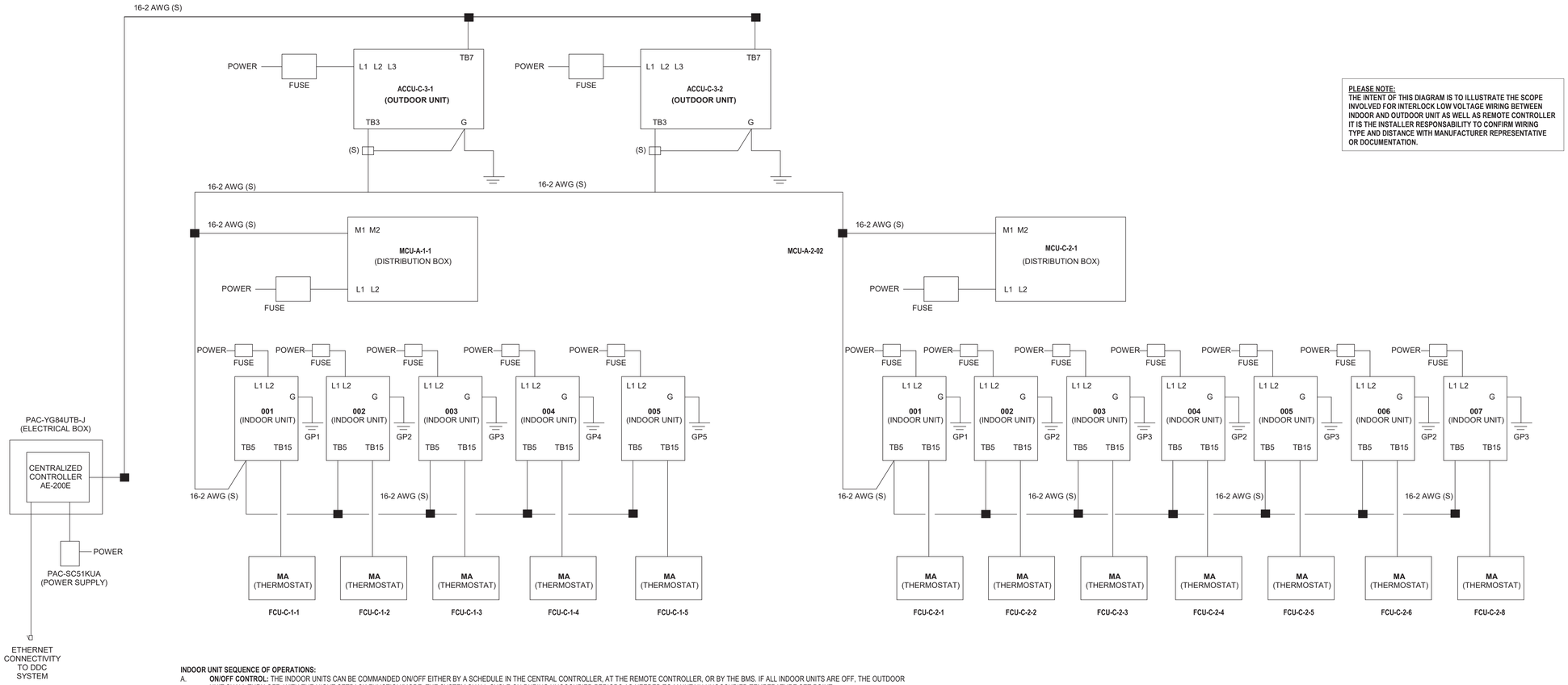
Sheet Size	ARCH D

FCU VRF SYSTEM FLOW DIAGRAM



PLEASE NOTE:
THE INTENT OF THIS DIAGRAM IS TO ILLUSTRATE THE SCOPE INVOLVED FOR INTERLOCK LOW VOLTAGE WIRING BETWEEN INDOOR AND OUTDOOR UNIT AS WELL AS REMOTE CONTROLLER IT IS THE INSTALLER RESPONSABILITY TO CONFIRM WIRING TYPE AND DISTANCE WITH MANUFACTURER REPRESENTATIVE OR DOCUMENTATION.

INDOOR UNIT SEQUENCE OF OPERATIONS:

A. **ON/OFF CONTROL:** THE INDOOR UNITS CAN BE COMMANDED ON/OFF EITHER BY A SCHEDULE IN THE CENTRAL CONTROLLER, AT THE REMOTE CONTROLLER, OR BY THE BMS. IF ALL INDOOR UNITS ARE OFF, THE OUTDOOR UNIT SHALL TURN OFF. WITH THE NIGHT SETBACK FUNCTION/MODE, THE SYSTEM SHALL CYCLE ON DURING UNOCCUPIED PERIODS AS NEEDED TO MAINTAIN UNOCCUPIED TEMPERATURE SET POINT.

B. **SPACE TEMPERATURE CONTROL:** THE INDOOR UNIT SHALL MODULATE ITS INTERNAL LINEAR EXPANSION VALVE (LEV) TO MAINTAIN THE TEMPERATURE SET POINT VIA THE INDOOR UNIT'S INTERNAL CONTROLS.
   1. THE SET POINT IS ADJUSTABLE AT THE REMOTE CONTROLLER, CENTRAL CONTROLLER, OR THROUGH A BMS INTERFACE. THE TEMPERATURE SET POINT CAN ALSO BE SCHEDULED AT THE REMOTE CONTROLLER OR THE CENTRAL CONTROLLER.

C. **MODE CONTROL:**
   1. **AUTO MODE:**
   2. THE INDOOR UNIT SHALL DETERMINE WHETHER IT SHOULD BE IN AUTO-HEAT MODE OR AUTO-COOL MODE BASED ON SPACE TEMPERATURE RELATIVE TO TEMPERATURE SET POINT. IF THE INDOOR UNIT IS IN AUTO HEAT MODE, THE INDOOR UNIT CONTROL BOARD SHALL FOLLOW THE HEAT MODE SEQUENCE. IF THE INDOOR UNIT IS IN AUTO COOL MODE, THE INDOOR UNIT CONTROL BOARD SHALL FOLLOW THE COOL MODE SEQUENCE.
   3. THE INDOOR UNIT SHALL SWITCH FROM AUTOHEAT TO AUTOCOOL WHEN THE SPACE TEMPERATURE RISES ABOVE AND REMAINS ABOVE THE TEMPERATURE SET POINT PLUS THE DEAD BAND FOR 3 MINUTES.
   4. THE INDOOR UNIT WILL SWITCH FROM AUTOCOOL TO AUTOHEAT WHEN THE SPACE TEMPERATURE DROPS BELOW AND REMAINS BELOW THE TEMPERATURE SET POINT MINUS THE DEAD BAND FOR 3 MINUTES.
   2. **HEATING MODE:** THE INDOOR UNIT SHALL MODULATE ITS LINEAR EXPANSION VALVE (LEV) TO MAINTAIN TEMPERATURE SET POINT.
   3. **COOLING MODE:** THE INDOOR UNIT SHALL MODULATE ITS LINEAR EXPANSION VALVE (LEV) TO MAINTAIN TEMPERATURE SET POINT.

D. **FAN/VANE CONTROL:** FAN SPEED AND VANE DIRECTION (IF APPLICABLE) SHALL BE ADJUSTABLE BY THE USER AT THE REMOTE CONTROLLER AND/OR THE CENTRAL CONTROLLER.

E. **SUPPLEMENTAL HEAT DURING DEFROST/ERROR:**
   1. **DUCTED INDOOR UNITS:** WHEN THE INDOOR UNIT IS OPERATING IN DEFROST OR ERROR CONDITIONS, A SERIES OF DIP SWITCH SETTINGS AND FAN SPEED JUMPER REMOVAL, THE FAN CAN EITHER BE DISABLED OR ENABLED, AND THE SUPPLEMENTAL HEATING CONTACT CAN EITHER BE ENERGIZED OR DE-ENERGIZED. IF THE FAN IS PERMITTED TO RUN, THE FAN SPEED SETTING DURING DEFROST AND ERROR CONDITIONS IS ADJUSTABLE VIA DIP SWITCHES.
   2. **NON-DUCTED INDOOR UNITS:** WHEN INDOOR UNIT IS OPERATING IN DEFROST OR ERROR CONDITIONS, THE FAN SHALL BE DISABLED AND THE SUPPLEMENTAL HEATING CONTACT SHALL BE ENERGIZED.

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