MECHANICAL GENERAL NOTES

1. PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE MECHANICAL SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
2. CONTRACT DOCUMENT DRAWINGS FOR MECHANICAL WORK ARE DIAGRAMMATIC AND ARE INTENDED TO CONVEY SCOPE AND GENERAL ARRANGEMENT ONLY.
3. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING AND FOLLOWING OWNERS RULES AND STANDARDS PRIOR TO BID, WORK AND COMPLETION OF PROJECT.
4. INSTALL ALL MECHANICAL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURERS' RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS.
5. DUCTWORK AND PIPING LAYOUTS ARE SCHEMATIC AND ARE INTENDED TO SHOW GENERAL ARRANGEMENT, SIZE, AND CAPACITY AND DO NOT INDICATE WHICH DUCT OR PIPE IS ABOVE OR BELOW THE OTHER. ALL OFFSETS ARE NOT NECESSARILY SHOWN. THE MC SHALL ARRANGE AND COORDINATE THE WORK, PROVIDE NECESSARY OFFSETS AND FITTINGS TO AVOID CONFLICT WITH OTHER MECHANICAL, PLUMBING, FIRE PROTECTION AND ELECTRICAL SERVICES AND STRUCTURAL AND ARCHITECTURAL ELEMENTS WITHOUT ADDITIONAL COST TO THE OWNER. IF AREAS OF CONFLICT ARE ENCOUNTERED, THE MC SHALL SUBMIT RECOMMENDATIONS FOR CORRECTIVE ACTION TO THE ENGINEER OF RECORD FOR APPROVAL PRIOR TO WORK BEING PERFORMED.
6. ALL HVAC SYSTEMS MOVING AIR IN EXCESS OF 2,000 CFM SHALL BE PROVIDED WITH A DUCT MOUNTED SMOKE DETECTOR MOUNTED IN THE SUPPLY & RETURN AIR STREAM IN ACCORDANCE WITH THE LATEST EDITION OF THE STATE'S MECHANICAL CODE WHERE THE SMOKE DETECTOR IS MOUNTED EXPOSED TO THE OUTDOORS, THE DETECTOR HEAD SHALL BE MOUNTED IN AN APPROVED WEATHERPROOF ENCLOSURE. THE DUCT MOUNTED SMOKE DETECTORS SHALL BE FURNISHED AND WIRED BY DIV. 27 AND MOUNTED BY DIV. 23. PROVIDE AUXILIARY CONTACTS FOR ALL AIR-HANDLING UNIT FAN MOTOR STARTERS AND THEIR RESPECTIVE SMOKE DETECTORS FOR SHUT-DOWN OF FANS UPON SENSING OF THE PRODUCTS OF COMBUSTION. WHERE SMOKE DETECTORS ARE FACTORY-INSTALLED IN THE MECHANICAL EQUIPMENT, MEANS SHALL BE PROVIDED BY DIV. 26 FOR INTEGRATION WITH THE CENTRAL FIRE ALARM SYSTEM. THE MC SHALL COORDINATE WITH DIV. 26.
7. PROVIDE VIBRATION ISOLATION FOR ALL MECHANICAL EQUIPMENT TO PREVENT TRANSMISSION OF VIBRATION TO BUILDING STRUCTURE.
8. COORDINATE CONSTRUCTION OF ALL MECHANICAL WORK WITH ELECTRICAL WORK, ETC., SHOWN ON OTHER CONTRACT DOCUMENT DRAWINGS.
9. MAINTAIN A MINIMUM OF 7'-6" CLEARANCE TO UNDERSIDE OF PIPES, DUCTS, CONDUITS, SUSPENDED EQUIPMENT, ETC., THROUGHOUT ACCESS ROUTES IN MECHANICAL ROOMS.
10. ALL TESTS SHALL BE COMPLETED BEFORE ANY MECHANICAL EQUIPMENT, DUCTWORK OR PIPING INSULATION IS APPLIED.
11. LOCATE ALL TEMPERATURE, PRESSURE, AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP- AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER FOR GOOD ACCURACY.
12. TESTING, ADJUSTING, AND BALANCING AGENCY SHALL BE A MEMBER OF THE ASSOCIATED AIR BALANCE COUNCIL (AABC) OR THE NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB). TESTING, ADJUSTING, AND BALANCING SHALL BE PERFORMED IN ACCORDANCE WITH THE AABC STANDARDS.
13. WHERE TWO OR MORE ITEMS OF THE SAME TYPE OF EQUIPMENT ARE REQUIRED, THE PRODUCT OF ONE MANUFACTURER SHALL BE USED.
14. COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURERS' CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATION.
15. ALL CONTROL WIRE AND CONDUIT SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE AND DIVISION 26 OF THE SPECIFICATION
16. WHERE BEAMS ARE INDICATED TO BE PENETRATED WITH DUCTWORK OR PIPING, COORDINATE DUCTWORK AND PIPING LAYOUT WITH BEAM OPENING SIZE AND OPENING LOCATIONS. COORDINATION SHALL BE DONE PRIOR TO FABRICATION OF DUCTWORK, CUTTING OF PIPING, OR FABRICATION OF BEAMS.
17. WHEN MECHANICAL WORK (HVAC, PLUMBING, SHEET METAL, FIRE PROTECTION, ETC.) IS SUBCONTRACTED, IT SHALL BE THE MECHANICAL CONTRACTOR'S RESPONSIBILITY TO COORDINATE SUBCONTRACTORS AND THE ASSOCIATED CONTRACTS. WHEN DISCREPANCIES ARISE PERTAINING TO WHICH CONTRACTOR PROVIDES A PARTICULAR ITEM OF THE MECHANICAL CONTRACT OR WHICH CONTRACTOR PROVIDES FINAL CONNECTIONS FOR A PARTICULAR ITEM OF THE MECHANICAL CONTRACT, IT SHALL BE BROUGHT TO THE ATTENTION OF THE MECHANICAL CONTRACTOR, WHOSE DECISION SHALL BE FINAL.
18. THE LOCATIONS OF ALL ITEMS SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS THAT ARE NOT DEFINITELY FIXED BY DIMENSIONS ARE APPROXIMATE ONLY. THE EXACT LOCATIONS NECESSARY TO SECURE THE BEST CONDITIONS AND RESULTS MUST BE DETERMINED BY THE PROJECT SITE CONDITIONS AND SHALL HAVE THE APPROVAL OF THE ENGINEER BEFORE BEING INSTALLED. DO NOT SCALE DRAWINGS.
19. ALL MISCELLANEOUS STEEL REQUIRED TO ENSURE PROPER INSTALLATION AND AS SHOWN IN DETAILS FOR PIPING, DUCTWORK, AND EQUIPMENT (UNLESS OTHERWISE NOTED) SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR. ALL STEEL SHALL BE GALVANIZED WITH (2) COATS OF A RUST PROHIBITIVE PRIMER.
20. WHERE ANY MECHANICAL COMPONENTS REQUIRING MAINTENANCE OR ADJUSTMENT, (I.E. VOLUME & CONTROL DAMPERS, VALVES, PIPING SPECIALTIES, FIRE, SMOKE & COMBINATION FIRE/SMOKE DAMPERS, MECHANICAL EQUIPMENT, ETC.), ARE LOCATED IN INACCESSIBLE AREAS, FURNISH APPROPRIATELY SIZED ACCESS DOORS OR PANELS AND TURN OVER TO THE GENERAL CONTRACTOR (GC) FOR INSTALLATION. THE MECHANICAL CONTRACTOR SHALL COORDINATE WITH THE GC FOR THE PROPER LOCATIONS.
21. ALL OPENINGS IN FIRE WALLS DUE TO DUCTWORK, PIPING, CONDUIT, ETC., SHALL BE FIRE STOPPED WITH A PRODUCT SIMILAR TO 3M OR APPROVED EQUAL.
22. SEISMICALLY RESTRAIN ALL MECHANICAL EQUIPMENT, PIPING AND DUCT AS REQUIRED BY CODE.
23. PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE PIPING AND DUCT SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
24. UNLESS OTHERWISE NOTED, ELEVATIONS AS SHOWN ON THE DRAWINGS FOR PIPING ARE TO THE CENTERLINE OF ALL PRESSURE PIPING AND TO THE INVERT OF ALL GRAVITY PIPING. ELEVATIONS AS SHOWN ON THE DRAWINGS FOR DUCTWORK ARE TO BE THE "BOTTOM-OF-DUCT" (BOD).
25. OTHERWISE NOTED, ALL PIPING AND DUCTS ARE OVERHEAD, TIGHT TO UNDERSIDE OF STRUCTURE OR SLAB WITH SPACE FOR INSULATION IF REQUIRED.
26. INSTALL ALL PIPING WITHOUT FORCING OR SPRINGING.
27. ALL PIPING WORK SHALL BE COORDINATED WITH ALL TRADES INVOLVED. OFFSETS IN PIPING AROUND OBSTRUCTIONS SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.
28. UNLESS OTHERWISE NOTED, THE LOCATION OF LIGHTING AND SPRINKLER HEADS TAKES PRECEDENCE OVER THE LOCATIONS OF REGISTER, GRILLES & DIFFUSERS (RGDs). ALSO, CONTRACTOR SHALL COORDINATE WITH OWNER SUPPLIED AND/OR INSTALLED EQUIPMENT. COORDINATION DRAWINGS MUST BE SUBMITTED BEFORE ANY MECHANICAL, PLUMBING, FIRE PROTECTION EQUIPMENT IS INSTALLED. IF NOT, THE MECHANICAL CONTRACTOR WILL BE REQUIRED TO REMOVE/RELOCATE AT THEIR EXPENSE.
29. PROVIDE CABLE OPERATED VOLUME DAMPERS AT ALL LOCATIONS WHERE THE DAMPER IS IN AN INACCESSIBLE LOCATION AND ACCESS DOORS CANNOT BE PROVIDED. THE MECHANICAL CONTRACTOR SHALL COORDINATE THE LOCATION OF THE OPERATORS TO ALLOW FOR CONVENIENT OPERATION.
30. ROOM TEMPERATURE, HUMIDITY & CARBON DIOXIDE SENSORS SHALL BE MOUNTED TO THE WALL IN STRICT ACCORDANCE WITH THE MANUFACTURER'S INSTALLATIONS INSTRUCTIONS. THE SENSORS SHALL BE MOUNTED AT A HEIGHT THAT SATISFIES THE LATEST ANSI 117.1 REQUIREMENTS. COORDINATE SENSOR LOCATIONS W/ LIGHT SWITCHES AND OTHER DEVICES THAT ARE BY OTHER SECTIONS/DIVISIONS. IN AREAS THAT ARE SUBJECT TO PHYSICAL ABUSE (I.E. GYMNASIUM, ETC.), PROVIDE A PROTECTIVE ENCLOSURE THAT WILL NOT AFFECT THE DEVICES PERFORMANCE.
31. WHERE AUTOMATIC TEMPERATURE CONTROLS DEVICES ARE TO BE MOUNTED TO CONCRETE OR MASONRY WALLS, THEY SHALL BE SURFACE MOUNTED. RUN THE WIRING IN METALLIC CONDUIT, CONCEALED IN THE BLOCK WALLS. WHERE CONDUIT RUNS CANNOT BE CONCEALED, SURFACE MOUNT AND PAINT THE CONDUIT TO MATCH THE SURFACE IT IS INSTALLED ON. COORDINATE COLOR WITH ARCHITECTS.
32. PROVIDE A FLEXIBLE DUCT SECTION OR FLEXIBLE PIPING EXPANSION LOOPS, AT ALL LOCATIONS WHERE DUCTWORK AND PIPING CROSS BUILDING EXPANSION/SEISMIC JOINTS. THE MECHANICAL CONTRACTOR SHALL COORDINATE ALL LOCATIONS ON ARCH. DRAWINGS. SUPPORT DUCT AND PIPING ON BOTH SIDES OF THE JOINT. ALLOW FOR A MIN. OF 2" OF MOVEMENT IN ANY DIRECTION.
33. PROVIDE GALV., SCH. 40 PIPE SLEEVES AT ALL WALL AND FLOOR PENETRATIONS. SLEEVES TO BE WATERPROOF AT ALL BELOW GRADE OR SLAB-ON-GRADE PENETRATIONS. REFER TO M500 SERIES DETAILS AND DIV. 23 & 07 SPECIFICATIONS.
34. FIRE SEAL AROUND ALL DUCT AND PIPING PENETRATIONS THROUGH FIRE RATED ASSEMBLIES. COORDINATE WITH ARCH. DWGS. FOR ASSEMBLY TYPES AND LOCATIONS. PROVIDE ALL NECESSARY MATERAILS/COMPONENTS AND INSTALL IN STRICT ACCORDANCE WITH U.L. REQUIREMENTS BASED ON THE ASSEMBLIES COMPOSITION. REFER TO DIV. 23 SPECIFICATIONS AND DIV. 07 SPEC. FOR ADDITIONAL INFORMATION.
35. HANGERS FOR PIPES, DUCTS, CONDUITS, PANELS, TRANSFORMERS, MECHANICAL AND PLUMBING EQUIPMENT, ETC... ARE INTENDED TO BE SUPPORTED BY MISC. GALV. STEEL ANGELS OR CHANNELS OR SIMILAR DEVICES MEETING MSS STANDARDS AND SECURELY ATTACHED TO BUILDING STRUCTURAL STEEL COMPONENTS. IT IS NOT INTENDED FOR HANGERS TO BE PRIMARILY SUPPORTED FROM THE FLOOR SLAB. WHERE UNAVOIDABLE, REFER TO DIV. 05, STEEL DECKING, FOR REQUIREMENTS PERTAINING TO HANGERS SUPPORTED BY THE FLOOR DECK. DO NOT INSTALL ANY HANGERS DIRECTLY TO THE ROOF DECK. ALL ATTACHMENTS TO STEEL BAR JOISTS, TRUSSES, OR JOIST GIRDERS SHALL BE AT PANEL POINTS. ALL CONNECTIONS SHALL BE COORDINATED WITH GENERAL CONTRACTOR. WELDING TO STRUCTURAL MEMBERS SHALL NOT BE PERMITTED.
36. FOR CEILING TYPE DIFFUSERS SHOWN IN AREAS WITHOUT CEILINGS, DO NOT USE FLEXIBLE BRANCH DUCTWORK AT ALL. RIDIGLY MOUNT THE DIFFUSER TO THE BRANCH DUCT WITH AMPLE STRAIGHT RUN AS INDICATED IN THE DETAIL. INSTALL ALL DIFFUSERS, LEVEL, WITH THE FACE PARALLEL TO THE FLOOR AT A HEIGHT THAT WILL ALLOW FOR MAX. HEADROOM. ALL DIFFUSERS WITHIN THE SAME SPACE SHALL BE MOUNTED AT THE SAME ELEVATION. MC TO COORDINATE FINAL DIFFUSER ELEVATION WITH ARCHITECT. TYPICAL.
37. PROVIDE CONDENSATE PUMPS (CPs) AT ALL HVAC EQUIPMENT USED FOR COOLING. MOUNT THE CPs TO THEIR RESPECTIVE EQUIPMENT WHERE FEASIBLE OR IN CLOSE PROXIMITY USING GALV. STEEL CHANNEL SYSTEM SECURED TO THE BUILDING STRUCTURE. THE UNIT'S CONDENSATE DISCHARGE (CD) SHALL BE PITCHED DOWNWARD, AND RUN AS SHORT AS POSSIBLE, WITHOUT ANY OBSTRUCTIONS OR LOW POINTS, TO THE CP INLET.
38. A WEATHERPROOF DUPLEX. 120V., GFCI CONVENIENCE OUTLETS SHALL BE PROVIDED AT ALL EQUIPMENT LOCATED OUTDOORS. WHERE APPLICABLE, THE OUTLETS SHALL BE FACTORY MOUNTED AND WIRED BY THE UNIT'S MANUFACTURER. RECEPTACLE USE SHALL BE INDEPENDENT OF UNIT OPERATION AND SHALL BE ACTIVE, EVEN IF UNIT IS DISABLED. WHERE THIS IS NOT FEASIBLE, COORDINATE WITH DIV. 26. TO PROVIDE A RECEPTACLE WITH A DEDICATED CIRCUIT, MOUNTED TO OR NEAR THE UNIT.

MECHANICAL ABBREVIATIONS

A	AMPS, AMPERE
A/C	AIR CONDITIONER
ABC	ABOVE COUNTER
ABV	ABOVE
AC	ALTERNATING CURRENT
ADJ	ADJACENT
AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISH GRADE
AHU	AIR HANDLING UNIT
AMB	AMBIENT
AUX	AUXILIARY, AUXILIARIES
AV	AUDIO VISUAL
BLDG	BUILDING
BMS	BUILDING MANAGEMENT SYSTEM
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT PER HOUR
CAT	CATALOGUE
CD	CONDENSATE DRAIN
CF	CIRCULATION FAN
CFH	CUBID FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CI	CAST IRON
CKT	CIRCUIT
CLG	CEILING
CO	CLEAN OUT, CARBON MONOXIDE
CO2	CARBON DIOXIDE
COL	COLUMN
COMM	COMMUNICATION
CONC	CONCRETE
CONN	CONNECT
CONST	CONSTRUCTION
CONT	CONTINUOUS
COP	COEFFICIENT OF PERFORMANCE
CRAC	COMPUTER ROOM AIR CONDITIONING UNIT
CT	COOLING TOWER
CU	CONDENSING UNIT
CVO	COLD WATER VALVED OPENING
CW	COLD WATER
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
D	DEPTH
DB	DRY BULB
DCV	DEMAND CONTROLLED VENTILATION
DEMARC	TELECOMMUNICATION DEMARCATION BOARD
DIA	DIAMETER
DIFF	DIFFUSER
DN	DOWN
DOAS	DEDICATED OUTSIDE AIR SYSTEM
DTL	DETAIL
DTL	DETAIL
DWG	DRAWING
EA	EACH
EAT	ENTERING AIR TEMPERATURE
EC	ELECTRICAL CONTRACTOR
EDH	ELECTRIC DUCT HEATER
EER	ENERGY EFFICIENCY RATIO
EL	ELEVATION
ELEC	ELECTRICAL
ELEV	ELEVATOR
EMER	EMERGENCY
EQUIP	EQUIPMENT
ER	EXISTING TO BE REMOVED
ERV	ENERGY RECOVERY VENTILATOR
ESP	EXTERNAL STATIC PRESSURE
ETR	EXISTING TO REMAIN
EUH	ELECTRIC UNIT HEATER
EWT	ENTERING WATER TEMPEARTURE
EXH	EXHAUST
EXIST, EXG	EXISTING
EXP	EXPANSION
F	DEGREES FAHRENHEIT
F/A	FROM ABOVE
F/B	FROM BELOW
FA	FREE AREA
FC	FLEXIBLE CONNECTION
FCU	FAN COIL UNIT
FD	FIRE DAMPER
FPB	FAN POWERED VAV TERMINAL UNIT
FPM	FEET PER MINUTE
FT	FEET
G	GROUND
GA	GAUGE
GAL	GALLONS
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GEN	GENERATOR
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
H	HEIGHT, HYDROGEN
HD	HEAD
HORIZ	HORIZONTAL
HP	HORSEPOWER
HTG	HEATING
HUM	HUMIDITY
HVAC	HEATING, VENTILATION & AIR CONDITIONING
HVLS	HIGH VOLUME LOW SPEED
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
IDF	INDIVIDUAL DISTRIBUTION FRAME - DATA
IN	INCHES
IN WC	INCHES WATER COLUMN
KVA	KILOVOLT AMPERES

MECHANICAL ABBREVIATIONS

KW	KILOWATT
KWH	KILOWATT - HOUR
L	LENGTH
LAT	LEAVING AIR TEMPERATURE
LAT	LATENT (BTU)
LB	POUNDS (WEIGHT)
LIN FT	LINEAR FOOT
LTG	LIGHTING
LWT	LEAVING WATER TEMPERATURE
mA	MILI AMPS
MAX	MAXIMUM
MBH	THOUSAND BRITISH THERMAL UNIT PER HOUR
MC	MECHANICAL CONTRACTOR
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MDF	MAIN DISTRIBUTION FRAME - DATA
MECH	MECHANICAL
MH	METHANE
MIN	MINIMUM
MISC	MISCELLANEOUS
MTD	MOUNTED
MTG	MOUNTING
MTL	METAL
MTR	MOTOR
MTRZD	MOTORIZED
#	NUMBER
NA	NOT APPLICABLE
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NO2	NITROGEN DIOXIDE
OA	OUTSIDE AIR
OBD	OPPOSED BLADE DAMPER
OC	ON CENTER
OCC	OCCUPANCY
OD	OUTSIDE DIAMETER
OED	OPEN-ENDED DUCT
OZ	OUNCE
PD	PRESSURE DROP
PE	PHOTO-ELECTRIC
PERF	PERFORATED
PF	POWER FACTOR
PH	PHASE
PLBG	PLUMBING
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH - ABSOLUTE
PSIG	POUNDS PER SQUARE INCH - GAUGE
PVC	POLYVINYL CHLORIDE
PWR	POWER
RA	RETURN AIR
RCP	REFLECTED CEILING PLAN
REC	RECEPTACLE
REF	REFERENCE
REFR	REFRIGERATOR
REQ	REQUIRED
RH	RELATIVE HUMIDITY
RLA	RUNNING LOAD AMPS
RM	ROOM
RPM	REVOLUTIONS PER MINUTE
RQ	REQUIREMENT
RT	RAINTIGHT
RTU	ROOFTOP UNIT
SA	SUPPLY AIR
SEER	SEASONAL ENERGY EFFICIENCY RATIO
SEF	SMOKE EXHAUST FAN
SENS	SENSIBLE (BTU)
SHT	SHEET
SHT MTL	SHEET METAL
SP	STATIC PRESSURE
SPECS	SPECIFICATIONS
SPEF	SMOKE PURGE EXHAUST FAN
SPKR	SPEAKER
SQ	SQUARE
SQFT, SF	SQUARE FEET
STD	STANDARD
SURF	SURFACE
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
SYM	SYMMETRICAL
T-STAT	THERMOSTAT
TC	TIMECLOCK
TELE	TELEPHONE
TOT	TOTAL (BTU)
TYP	TYPICAL
UF	UNDERFLOOR
UON	UNLESS OTHERWISE NOTED
V	VOLT
VA	VALVE
VAC	VACUUM
VAV	VARIABLE AIR VOLUME
VERT	VERTICAL
VT	VENT
VTL	VENTILATION
VV	VARIABLE VOLUME TERMINAL UNIT
W	WATTS
W	WIDTH
WB	WET BULB
WH	WATER HEATER
WMS	WIRE MESH SCREEN
WP	WEATHERPROOF
WT	WEIGHT

MECHANICAL DRAWING LIST

SHEET NO.	SHEET TITLE
M001	MECHANICAL NOTES, SYMBOL LEGEND, & ABBREVIATIONS
M002	MECHANICAL SPECIFICATIONS
M003	MECHANICAL SPECIFICATIONS
M401	ENLARGED MECHANICAL PLANS
M402	ENLARGED MECHANICAL PLANS
M501	MECHANICAL DETAILS
M502	MECHANICAL DETAILS
M601	MECHANICAL SCHEDULES

MECHANICAL SYMBOL LEGEND

NOT ALL SYMBOLS MAY APPLY OR ON DRAWINGS

SYMBOL	DESCRIPTION
	90° ELBOW DOWN
	90° ELBOW UP
	ROUND RADIUS ELBOW
	45° ELBOW
	90° ELBOW DOWN
	90° ELBOW UP
	RECTANGULAR RADIUS ELBOW
	RECTANGULAR ELBOW WITH TURNING VANES
	BRANCH TAKE-OFF WITH ANGLED TAP & VOLUME DAMPER
	REDUCER, ECCENTRIC
	REDUCER, CONCENTRIC
	INTERNAL ACOUSTICALLY LINED DUCTWORK
	INSULATED DUCTWORK
	SUPPLY DUCT
	RETURN DUCT
	EXHAUST DUCT
∅	ROUND DUCT
	FLEXIBLE DUCT CONNECTION
	EXISTING DUCT TO REMAIN
	EXISTING DUCT TO BE REMOVED
	NEW DUCT
	SUPPLY AIR DIFFUSER
	RETURN GRILLE
	EXHAUST GRILLE
	MANUAL VOLUME DAMPER
M	MOTERIZED DAMPER
BD	BACKDRAFT DAMPER
FD	FIRE DAMPER
SD	SMOKE DAMPER
FSD	COMBINATION FIRE-SMOKE DAMPER
NO2 CO	SPACE COMBINATION NITROGEN DIOXIDE AND CARBON MONOXIDE SENSOR
FCP	FAN CONTROL PANEL
TH	COMBINATION TEMPERATURE AND RELATIVE HUMIDITY SENSOR
SD	DUCT SMOKE DETECTOR
CO2	SPACE OR DUCT CARBON DIOXIDE SENSOR
CO	SPACE CARBON MONOXIDE SENSOR
H	SPACE HYDROGEN SENSOR
T	SPACE OR DUCT TEMPERATURE THERMOSTAT
RH	SPACE OR DUCT RELATIVE HUMIDITY SENSOR
N2	SPACE NITROGEN DIOXIDE SENSOR
OCC	SPACE OCCUPANCY SENSOR
1/2" U	UNDERCUT DOOR - NUMBER DENOTES DOOR UNDERCUT
	RETURN / EXHAUST AIRFLOW DIRECTION
	SUPPLY AIRFLOW DIRECTION
	WATER FLOW DIRECTION
	PIPING GUIDE
	PIPING ANCHOR
	DISCONNECTION POINT
	CONNECTION POINT
#	KEYNOTE

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MECHANICAL NOTES, SYMBOL LEGEND, & ABBREVIATIONS

Sheet No.
M001

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PART 1 GENERAL

1.01 GENERAL REQUIREMENTS:
- a. INSTALL ALL NEW WORK IN A NEAT WORKMANLIKE MANNER READILY ACCESSIBLE FOR OPERATION, MAINTENANCE AND REPAIR.
- b. CODES, PERMITS, AND INSPECTIONS:
  1. ALL WORK SHALL COMPLY WITH REQUIREMENTS OF STATE BUILDING CODE, LOCAL BUILDING DEPARTMENT, BUILDING MANAGEMENT, AND ALL AUTHORITIES HAVING JURISDICTION AND APPLICABLE NATIONAL, STATE AND LOCAL CODES, LAWS, AND REGULATIONS GOVERNING OR RELATING TO ANY PORTION OF THIS WORK SHALL BE INCORPORATED INTO AND MADE A PART OF THESE SPECIFICATIONS. CONTRACTOR IS TO INFORM ENGINEER OF ANY EXISTING WORK OR MATERIALS WHICH VIOLATE ANY OF THE ABOVE LAWS AND REGULATIONS, ANY WORK DONE BY THE CONTRACTOR CAUSING SUCH VIOLATION SHALL BE CORRECTED AT CONTRACTOR'S EXPENSE BY THIS CONTRACTOR AND AT NO EXPENSE TO THE OWNER.
  2. THIS CONTRACTOR SHALL PERFORM ALL CONTROLLED INSPECTIONS IF REQUIRED AND OBTAIN ALL EQUIPMENT USE PERMITS AS REQUIRED BY STATE AND LOCAL AUTHORITIES. PERMITS SHALL BE TURNED OVER TO OWNER AT JOB COMPLETION.
  3. ALL APPLICABLE EQUIPMENT SHALL HAVE AN "M.E.A OR B.S.A NUMBER."
- c. SITE VERIFICATION:
  1. PRIOR TO SUBMISSION OF THE BID, THIS CONTRACTOR SHALL VISIT THE JOB SITE TO ASCERTAIN THE ACTUAL FIELD CONDITIONS AS THEY RELATE TO THE WORK INDICATED ON THE DAWNING AND DESCRIBED HEREIN. DISCREPANCIES, IF ANY, SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION PRIOR TO SUBMISSION OF THE BID, AND IF NOT RESOLVED TO SATISFACTION, SHALL BE SUBMITTED AS A WRITTEN QUALIFICATION OF THE BID. SUBMISSION OF A BID SHALL BE EVIDENCE OF SITE VERIFICATION HAS BEEN PREFORMED AS DESCRIBED ABOVE.
- d. CONTRACT DOCUMENTS:
  1. PRIOR TO SUBMISSION OF A FORMAL BID, THIS CONTRACTOR SHALL REVIEW ALL DRAWINGS OF THE ENTIRE PROJECT INCLUDING GENERAL CONSTRUCTION, DEMOLITION, ARCHITECTURAL, MECHANICAL, ELECTRICAL, PLUMBING AND SPRINKLER, AND SHALL INCLUDE ANY WORK REQUIRED IN THE BID WHICH IS INDICATED OR IMPLIED TO BE PREFORMED BY THIS TRADE IN OTHER SECTIONS OF THE WORK.
  2. DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENTS OF WORK AND APPROXIMATE LOCATIONS OF EQUIPMENT. REFER TO ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS AND COORDINATE FINAL LOCATIONS OF DIFFUSERS, GRILLS, REGISTERS, THERMOSTATS SENSORS, SWITCHES, AND ANY WALL MOUNTED DEVICES. ALL WORK SHALL BE COORDINATED WITH OTHER TRADES TO AVOID CONFLICT.
  3. IF A CONFLICT OCCURS IN THE SPECIFICATIONS AND/OR ON THE DRAWINGS, THE MORE STRINGENT SITUATION SHALL APPLY.
  4. ANY EQUIPMENT, PARTS, MATERIALS, ACCESSORIES, OR LABOR THAT IS NECESSARY FOR PROPER PERFORMANCE OF THE MECHANICAL WORK ALTHOUGH NOT SPECIFICALLY MENTIONED HEREIN OR SHOWN ON THE DRAWINGS, SHALL BE FURNISHED AND INSTALLED WITHOUT ADDITIONAL COSTS.
- e. GUARANTEE:
  1. ALL MATERIALS AND WORKMANSHIP SHALL BE GUARANTEED FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL ACCEPTANCE OF THIS WORK. FINAL ACCEPTANCE SHALL BE DEFINED AS THE TIME AT WHICH THE MECHANICAL WORK IS TAKEN OVER AND ACCEPTED BY THE OWNER, AND IS UNDER CARE, CUSTODY, AND CONTROL OF THE OWNER. ENSURE THE SERVICES OF VARIOUS MANUFACTURERS SUPPLYING THE EQUIPMENT FOR THE PROPER STARTUP AND OPERATION OF ALL SYSTEMS INSTALLED. INSTRUCT THE OWNERS PERSONNEL IN THE PROPER OPERATION AND SERVICING OF THE SYSTEM.
  2. THE CONTRACTOR SHALL GUARANTEE TO REPLACE OR REPAIR PROMPTLY AND ASSUME RESPONSIBILITY FOR ALL EXPENSES INCURRED FOR ANY WORKMANSHIP AND EQUIPMENT IN WHICH DEFECTS DEVELOP WITHIN THE GUARANTEE PERIOD. THIS WORK SHALL INCLUDE RESPONSIBILITY FOR ALL EXPENSES INCURRED IN REPAIRING AND REPLACING WORK OF OTHER TRADES AFFECTED BY DEFECTS, REPAIRS OR REPLACEMENTS IN EQUIPMENT SUPPLIED BY THIS CONTRACTOR.
  3. THIS CONTRACTOR IS RESPONSIBLE FOR THE MAINTENANCE AND OPERATION OF ALL SYSTEMS UNTIL THE FINAL ACCEPTANCE OF THE WORK.
  4. ALL AIR CONDITIONING UNIT COMPRESSORS AND REFRIGERATION COMPONENTS SHALL HAVE A 5-YEAR WARRANTY.
- f. THE "GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION" AIA DOCUMENT A201. LATEST EDITION, OR AS REQUIRED BY THE ARCHITECT DOCUMENTS, AND/OR THE STRUCTURAL ENGINEER'S DOCUMENTS, AS APPLICABLE, ARE PART OF THIS CONTRACT.
- g. DEFINITIONS:
  1. MECHANICAL CONTRACTOR, "THIS CONTRACTOR" - THE PARTY OR PARTIES HAVE BEEN DULY AWARDED THE CONTRACT FOR AND ARE THEREBY MADE RESPONSIBLE FOR THE MECHANICAL WORK AS DESCRIBED HEREIN.
  2. "THIS CONTRACT", "THE CONTRACT" - THE AGREEMENT COVERING THE WORK TO BE PREFORMED BY "THIS CONTRACTOR".
  3. "APPROVED", "EQUAL", "SATISFACTORY", "ACCEPTABLE", "EQUIVALENT" - SUITABLE FOR USE ON THE PROJECT, AS DETERMINED BY THE ENGINEER BASED ON DOCUMENTS PRESENTED FOR SUCH DETERMINATION.
  4. "SPECIFICATIONS", "THIS SECTION, PART, DIVISION" (OF THE SPECIFICATION) - THE DOCUMENT SPECIFYING THE WORK TO BE PREFORMED BY "THIS CONTRACTOR".
  5. "THE MECHANICAL WORK", "THIS WORK" - ALL LABOR MATERIALS, EQUIPMENT, APPARATUS, CONTROLS, ACCESSORIES, AND OTHER ITEMS REQUIRED FOR A PROPER AND COMPLETE INSTALLATION BY THE MECHANICAL CONTRACTOR.
  6. "ARCHITECT", "ENGINEER", "OWNER'S REPRESENTATIVE" - THE PARTY OR PARTIES RESPONSIBLE FOR INTERPRETING, ACCEPTING, AND OTHER WISE RULING ON THE PERFORMANCE UNDER THIS CONTRACT.
  7. "FURNISH" - PURCHASE AND DELIVER TO THE PROJECT SITE COMPLETE WITH EVERY NECESSARY APPARATUS AND SUPPORT, ALL AS PART OF THE MECHANICAL WORK.
  8. "INSTALL" - UNLOAD AT THE DELIVERY POINT AT THE SITE AND PERFORM EVERY OPERATION NECESSARY TO ESTABLISH SECURE MOUNTING INSTALLATION AND CORRECT OPERATION AT THE PROPER LOCATION IN THE PROJECT, ALL AS PART OF THE MECHANICAL WORK.
  9. "PROVIDE" - "FURNISH" AND "INSTALL".
  10. "NEW" - MANUFACTURED WITHIN THE PAST TWO YEARS AND NEVER BEFORE USED.
  11. "RELOCATE" - MOVE EXISTING EQUIPMENT AND ALL ACCESSORIES AS REQUIRED.
  12. "REMOVE" - DISMANTLE AND CART AWAY FROM SITE INCLUDING ALL RELATED ACCESSORIES. ALL ITEMS SHALL BE LEGALLY DISPOSED OF. ALL OTHER EQUIPMENT AND OPERATIONS IN ANY WAY EFFECTED BY THE REMOVAL IS TO REMAIN IN FULL OPERATION. PROVIDE ALL NECESSARY COMPONENTS TO MAINTAIN SUCH OPERATION.

1.02 SCOPE OF WORK
- a. PROVIDE ALL LABOR, MATERIAL, EQUIPMENT, AND CONTRACTOR'S SERVICES NECESSARY FOR COMPLETE, SAFE INSTALLATION OF ALL MECHANICAL WORK. THE SCOPE OF WORK SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING:
  1. DEMOLITION AND REMOVAL OF ITEMS AS REQUIRED.
  2. DUCTWORK AND DUCTWORK ACCESSORIES
  3. AIR DISTRIBUTION SYSTEM
  4. PIPING AND PIPING ACCESSORIES INCLUDING ALL VALVING.
  5. EQUIPMENT (PUMPS, AIR CONDITIONING UNITS, FANS, ETC.)
  6. INSULATION OF DUCTWORK.
  7. SOUND EXTENUATORS AND SOUND LINING.
  8. AUTOMATIC TEMPERATURE CONTROLS.
  9. TESTING AND BALANCING.
  10. CUTTING AND PATCHING.
  11. SHOP DRAWINGS.
  12. AS-BUILT DRAWINGS.
  13. OPERATING AND MAINTENANCE MANUALS.
  14. FULL COORDINATION WITH OTHER TRADES.
  15. WARRANTY GUARANTEE.
  16. PHASING AS REQUIRED BY OWNER, CONSTRUCTION MANAGER, GENERAL CONTRACTOR, OR BUILDING MANAGEMENT.
  17. PREMIUM TIME FOR WORK TO BE PREFORMED AFTER-HOURS AS REQUIRED BY BUILDING MANAGEMENT AND/OR OWNER.
  18. FILING, PERMITS, CONTROLLED INSPECTIONS.
  19. FULL TESTING AND STARTUP OF ALL SYSTEMS.
- b. SECURE CERTIFICATES, PAY ALL FEES AND CHARGES FOR ALL WORK INSTALLED, CERTIFYING COMPLIANCE WITH ALL AUTHORITIES AND ARTICLES 27-132 (C26-106.3), 27-179 (C26-130.1), 27-779 (C26-130.2), 27-780 (C26-130.3, 27-781 (C26-130.4). CONTRACTOR TO PERFORM REQUIRED CONTROLLED INSPECTION AND OBTAIN ALL EQUIPMENT USE PERMITS. DELIVER CERTIFICATES TO OWNER FOR SIGNING BEFORE FILING.

1.03 COORDINATION WITH BUILDING MANAGEMENT
- a. THIS CONTRACTOR IS TO OBTAIN A COPY OF THE BUILDING RULES AND REGULATIONS PRIOR TO BID SUBMISSION TO DETERMINE REQUIREMENTS AND THE EXTENT OF PREMIUM TIME WORK REQUIRED BY BUILDING.
- b. HIS CONTRACTOR IS RESPONSIBLE FOR ADHERING TO THE BUILDING OWNER'S RULES AND REGULATIONS. ANY DISCREPANCIES BETWEEN THE CONTRACT DOCUMENTS AND THE BUILDING RULES AND REGULATIONS SHALL BE SUBMITTED IN WRITING TO THE ARCHITECT/ENGINEER FOR REVIEW, WITH BID SUBMISSION.
- c. COORDINATE WITH BUILDING OWNER FOR ANY SERVICE INTERRUPTION OF EXISTING SYSTEMS AND GIVE NOTICE AS REQUIRED BY BUILDING RULES AND REGULATIONS OR A MINIMUM OF TWO(2) DAYS PRIOR TO ANY WORK, WHICHEVER IS MORE STRINGENT. CONTRACTOR IS TO PERFORM WORK ON PREMIUM TIME, IF SO DIRECTED BY BUILDING OWNER, SO AS NOT TO DISTURB EXISTING TENANTS ON OTHER FLOORS.

1.04 SHOP DRAWINGS
- a. SUBMIT SHOP DRAWINGS CERTIFIED BY ALL TRADES THAT COORDINATION HAS BEEN COMPLETED. SUBMIT ALL CERTIFIED EQUIPMENT CUTS WITH CONSTRUCTION WIRING DIAGRAMS AND AUTOMATIC TEMPERATURE CONTROL REQUIREMENTS. SHOP DRAWINGS SUBMISSION SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING.
  1. DUCTWORK - PROVIDE DUCT SHOP STANDARDS AND LEAKAGE TESTS CERTIFICATION, AS REQUIRED, AND 3/8 SCALE DUCT LAYOUT.
  2. INSULATION FOR DUCTWORK, PIPING AND EQUIPMENT.
  3. CERTIFIED AIR AND WATER BALANCING REPORT.
  4. EQUIPMENT CATALOG CUTS FOR ALL ITEMS TO BE UTILIZED ON PROJECT (FANS, PUMPS, AC UNITS, ETC.)
  5. AIR OUTLETS (DIFFUSERS, REGISTERS, GRILLES, ETC.,)
  6. AUTOMATIC TEMPERATURE CONTROL DIAGRAMS, DEVICES AND SEQUENCE OF OPERATION.
  7. AS-BUILT DRAWINGS AT PROJECT COMPLETION OF THE INSTALLED CONDITION OF WORK.
- b. THE QUANTITY OF SHOP DRAWINGS SHALL AS A MINIMUM BE FOUR(4) COPIES OF 8-1/2"x11" SUBMISSIONS AND ONE(1) REPRODUCIBLE AND ONE(1) PRINT OF ALL DRAWINGS. SPECIAL JOB REQUIREMENTS MAY BE MORE STRINGENT AND CONTRACTOR IS RESPONSIBLE TO OBTAIN REQUIREMENTS FROM CONSTRUCTION MANAGER, GENERAL CONTRACTOR OR ARCHITECT.

1.05 MAINTENANCE MANUALS
- a. SUBMIT THREE(3) LOOSE-LEAF BOUND OPERATING AND MAINTENANCE MANUALS WITH INDEX AND INDEX TABS TO INCLUDE THE FOLLOWING:
  1. OPERATING AND MAINTENANCE INSTRUCTIONS ON ALL SYSTEMS.
  2. MANUFACTURERS' CATALOG CUTS ON ALL EQUIPMENT.
  3. AUTOMATIC TEMPERATURE CONTROL SYSTEMS WITH SEQUENCE OF OPERATIONS, CATALOG CUTS OF ALL DEVICES AND POINT-TO-POINT WIRING DIAGRAMS.
  4. CERTIFIED FINAL AIR AND WATER BALANCING REPORT.
  5. DUCT AND PIPING AS-BUILT DRAWINGS WITH VALVE CHART AND KEY PLAN DRAWINGS INSERTED IN BINDER.
  6. ALL ITEMS SUBMITTED FOR REVIEW IN SHOP DRAWING SECTION.

1.06 AS-BUILT DRAWINGS
- a. CONTRACTOR SHALL MAINTAIN RECORD DRAWING PRINTS ON JOB SITE AND RECORD, AT TIME OF OCCURRENCE, DEVIATIONS FROM CONTRACT DOCUMENTS DUE TO FIELD COORDINATION, BULLETINS, OR ADDENDA.
- b. CONTRACTOR SHALL REVISE SHOP DRAWINGS TO CONFORM TO RECORD DRAWINGS AND SUBMIT AN AS-BUILT CONDITION (PIPING AND DUCTWORK) DRAWINGS UPON COMPLETION OF PROJECT. FINAL SUBMISSION OF REPRODUCIBLE AS-BUILT DRAWINGS ARE TO BE SIGNED AND CERTIFIED BY INSTALLING CONTRACTOR THAT THIS IS THE AS-BUILT CONDITION OF THE WORK

1.07 SUBSTITUTIONS
- a. NO SUBSTITUTE MATERIAL OR MANUFACTURER OF EQUIPMENT SHALL BE PERMITTED WITHOUT A FORMAL WRITTEN SUBMITTAL TO THE ENGINEER WHICH INCLUDES ALL DIMENSIONAL, PERFORMANCE AND MATERIAL SPECIFICATIONS. ANY CHANGES IN LAYOUT, ELECTRICAL CHARACTERISTICS, STRUCTURAL REQUIREMENTS, OR DESIGN DUE TO THE USE OF A SUBSTITUTION SHALL BE SUBMITTED TO THE ENGINEER AS PART OF THIS PROPOSAL. THE CONTRACTOR TAKES FULL RESPONSIBILITY FOR THE SUBSTITUTION AND ALL CHANGES RESULTING FROM SUBSTITUTION. ALL ITEMS SHALL BE SUBMITTED FOR REVIEW IN CONJUNCTION WITH THE SUBMITTAL OF THE SUBSTITUTION. ANY SUBSTITUTION MUST BE SUBMITTED WITH AN EXPLANATION WHY A SUBSTITUTION IS BEING UTILIZED. IF THE SUBSTITUTED ITEM DEVIATES FROM THE SPECIFIED ITEM, THOSE DEVIATIONS ARE TO BE IDENTIFIED ON A LINE BY LINE BASIS. IF THE SUBSTITUTE IS BEING UTILIZED FOR FINANCIAL REASONS, THE ASSOCIATED CREDIT MUST BE SIMULTANEOUSLY SUBMITTED.
- b. ALL SUBSTITUTED EQUIPMENT SHALL CONFORM TO SPACE REQUIREMENTS AND PERFORMANCE REQUIREMENTS SHOWN ON CONTRACT DOCUMENTS. CONTRACTOR SHALL REPLACE ANY EQUIPMENT THAT DOES NOT MEET THESE REQUIREMENTS AT HIS OWN EXPENSE. ANY MODIFICATIONS TO ASSOCIATED SYSTEMS OR ADDITIONAL COSTS ATTRIBUTED TO THIS SUBSTITUTION SHALL BE AT THIS CONTRACTOR'S EXPENSE.
- c. CONTRACTOR SHALL SUBMIT BID BASED ON SPECIFIED ITEMS AND SHALL SUPPLY AS AN ALTERNATE PRICE ANY SUBSTITUTIONS.

PART 2 PRODUCTS/APPLICATIONS

2.01 DUCTWORK AND ACCESSORIES
- a. ALL DUCTWORK SHALL BE FABRICATED AND INSTALLED IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE, 1995 OR LATEST EDITION, SMACNA HVAC AIR DUCT LEAKAGE TEST MANUAL, 1991 OR LATEST EDITION, AND NFPA 90A LATEST EDITION. THE MORE STRINGENT REQUIREMENT OF ANY CODES SHALL APPLY.
- b. PROVIDE ALL SUPPORTING AND HANGING DEVICES IN ACCORDANCE WITH STATE BUILDING CODE AND SMACNA.
- c. DUCTWORK LAYOUT AND ROUTING IS SCHEMATIC AND THE MECHANICAL CONTRACTOR IS RESPONSIBLE FOR ALL DUCT SIZE CHANGES AND RELOCATIONS TO ACCOMMODATE SPACE AND STRUCTURAL CONDITIONS. OFFSETS AND TRANS-DUCTWORK SHALL PRESERVE THE FULL INSIDE CROSS-SECTIONAL AREA OF DUCTWORK SHOWN ON THE DRAWINGS.
- d. DUCTWORK (NEW AND EXISTING TO BE REUSED) SHALL HAVE PRESSURE CLASSIFICATION, SEALING REQUIREMENTS AND LEAKAGE TESTING IN ACCORDANCE WITH SMACNA AND AS LISTED BELOW UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS:
  1. 2" CLASS: ALL OTHER LOW PRESSURE DUCTWORK. SEAL CLASS "C", LEAKAGE CLASS 24 - RECTANGULAR OR CLASS 12 - ROUND.
- e. LEAKAGE TESTING:
  1. ALL TESTING SHALL BE DONE IN THE PRESENCE OF THE ENGINEER OR OWNER'S REPRESENTATIVE. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL COLLARS, CAPS, ELECTRIC POWER, ETC... NECESSARY TO PERFORM THE TESTS. THE CONTRACTOR IS ALSO RESPONSIBLE FOR SCHEDULING THE TEST NO LESS THAN THREE(3) BUSINESS DAYS PRIOR TO THE INTENDED OCCURRENCE. LOW PRESSURE DUCTWORK (2"CLASS) SHALL BE TESTED ON AN AS-NEEDED BASIS AT THE ENGINEER'S DIRECTION. LEAKAGE TEST PROCEDURES SHALL FOLLOW THE OUTLINES AND CLASSIFICATIONS IN THE SMACNA HVAC DUCT LEAKAGE TEST MANUAL. IF SPECIMEN FAILS TO MEET ALLOTTED LEAKAGE LEVEL, THE CONTRACTOR SHALL MODIFY TO BRING IT INTO COMPLIANCE AND SHALL RETEST IT UNTIL ACCEPTABLE LEAKAGE IS DEMONSTRATED. TESTS AND NECESSARY REPAIR SHALL BE COMPLETED PRIOR TO CONCEALMENT OF DUCTS.
- f. MATERIALS:
  1. SHEET METAL: UNLESS OTHERWISE SPECIFIED OR INDICATED, DUCTS SHALL BE CONSTRUCTED OF HOT-DIPPED GALVANIZED SHEETMETAL WITH G60 COMMERCIAL COASTING ACCORDING TO ASTM 653 AND A924
  2. ALUMINUM: PROVIDE DUCTWORK OF ALUMINUM CONSTRUCTION, WHERE INDICATED. DUCTWORK SHALL BE ALLOY 3003-H14, OF THICKNESS REQUIRED BY THE SMACNA DUCT CONSTRUCTION STANDARDS. PROVIDE FOR ALL DUCTWORK EXPOSED TO WEATHER AND MOISTURE INCLUDING OUTSIDE AIR DUCTS WITHIN 10 FEET OF LOUVERS AND DISHWASHER EXHAUST.
  3. FLEXIBLE CONNECTIONS AT FANS SHALL BE NEOPRENE COATED, FLAME RETARDANT GLASS FABRIC (COMPLYING WITH NFPA 90 AND 96), 30 OZ./SQ. YD. WITH SEWED AND CEMENTED SEAMS.
  4. FLEXIBLE DUCTWORK SHALL NOT BE USED ON THIS PROJECT.
- g. FABRICATION:
  1. CONFORM TO SMACNA REQUIREMENTS FOR METAL THICKNESS, REINFORCING, JOINTS, AND SEALING FOR MAXIMUM STATIC PRESSURES INVOLVED. ALL SEAMS AND JOINTS SHALL BE SEALED AND TAPED.
  2. ELBOWS SHALL CONFORM TO SMACNA REQUIREMENTS AND THE FOLLOWING:
     - 2.1. PROVIDE LONG RADIUS TYPE WITH CENTERLINE RADIUS MINIMUM 1.5 TIMES DUCT WIDTH. PROVIDE SHORT RADIUS OR SQUARE ELBOWS WHERE INDICATED OR WHERE REQUIRED TO FIT RESTRICTED SPACES. PROVIDE DOUBLE THICKNESS TURNING VANES ON ALL SHORT RADIUS AND MITERED ELBOWS. CONFORM TO SMACNA FOR THE NUMBER OF VANES FOR FITTINGS
  3. BRANCH CONNECTIONS: PROVIDE 45° ENTRY OR CONICAL TAPS. PROVIDE RADIUS TYPE FITTINGS FOR DIVIDED FLOW BRANCHES.
- h. ACOUSTICALLY LINED DUCTWORK:
  1. PROVIDE MAT-FACED GLASS DUCT LINER, 1-INCH THICK -2LB/CF DENSITY. DUCT DIMENSIONS INDICATED ARE CLEAR (NET) INSIDE DIMENSIONS. FOR DUCT VELOCITIES GRATER THEN 2,000 FPM, FACE DUCT LINER WITH 24 GAUGE PERFORATED ALUMINUM OR GALVANIZED STEEL, FULLY COVERING DUCT LINER, AND SUSPENDED 12" ON CENTER. DO NOT EXTERNALLY INSULATE ACOUSTICALLY LINED DUCTWORK. CONFORM TO SMACNA REQUIREMENTS FOR INSTALLATION. PROVIDE ACOUSTICALLY LINED DUCT WHERE LISTED BELOW AND/OR SHOWN ON THE DRAWINGS:
     - 1.1. WITHIN MINIMUM 20 FEET OF ALL AC UNIT DISCHARGES
     - 1.2. WITHIN MINIMUM 20 FEET OF FAN INLET AND DISCHARGES
- i. VOLUME DAMPERS:
  1. GALVANIZED STEEL OR SAME AS DUCT CONSTRUCTION. CONFORM TO SMACNA HVAC DUCT CONSTRUCTION STANDARDS, 1995 OR LATEST EDITION, OPPOSED BLADE TYPE. PROVIDE BEARING AT BOTH ENDS OF DAMPER ROD AND QUADRANT, WITH LEVER AND LOCKSCREW, AT ONE END. INSTALL WITH LEVERS ACCESSIBLE THROUGH INSULATION. SPLITTER DAMPER OR AIR EXTRACTORS SHALL NOT BE USED ON THIS PROJECT.
  2. PROVIDE MANUAL BALANCING VOLUME DAMPERS AS REQUIRED TO PROPERLY BALANCE THE AIR DISTRIBUTION SYSTEM. IF THE LOCATION OF BALANCING DAMPERS ARE NOT DEFINED ON THE DRAWINGS, THE FOLLOWING MINIMUM STANDARDS SHALL GOVERN:
     - 2.1. LOW PRESSURE: ALL SUPPLY AIR MAIN BRANCHES FROM TRUCK, EACH SPLIT, AND ALL SUB-BRANCHES FROM MAINS SHALL BE PROVIDED WITH BALANCING DAMPERS.
     - 2.2. AS NOTED ON PLANS.
- j. DUCT ACCESS DOORS:
  1. CONFORM TO SMACNA WITH PIANO HINGES, TWO SASH LOCKS AND DOOR GASKETS. SCREWED ACCESS PANELS ARE NOT PERMITTED.
  2. PROVIDE REMOVABLE ACCESS DOORS WHERE DOOR SWING CAN NOT BE ACCOMMODATED.
  2. SIZE: MINIMUM 20"x14" EXCEPT DUCTS LESS THAN 16", ONE DIMENSION 20" AND THE OTHER DIMENSION, 2" LESS THAN THE DUCT WIDTH.
  3. PROVIDE ACCESS DOORS: AT ENTERING AND LEAVING SIDES OF COILS IN DUCTS; AUTOMATIC DAMPERS ON LINKAGE SIDE, MANUAL VOLUME DAMPERS 2 SQ. FT. AND LARGER, FIRE DAMPERS, SMOKE DAMPERS, COMBINATION FIRE/SMOKE DAMPERS, SMOKE DETECTION HEADS, FAN BEARINGS ENCLOSED IN DUCTS, SUCTION AND DISCHARGE SIDES OF CEILING MOUNTED FANS, FILTERS, REHEAT COILS, AT ALL EQUIPMENT REQUIRING ACCESS AND AS INDICATED ON DRAWINGS.
- k. FIRE DAMPERS:
  1. FUSIBLE LINK FIRE DAMPERS SHALL BE INSTALLED AS INDICATED ON DRAWINGS AND AS REQUIRED BY THE NEW YORK CITY BUILDING CODE. DAMPER SHALL BE UL LISTED AND LABELED AND IN CONFORMANCE WITH NFPA.
  2. FIRE DAMPERS SHALL BE FACTORY FABRICATED WITH FUSIBLE LINK SHUTTER TYPE MECHANISM OUT OF AIRSTREAM. THE HVAC CONTRACTOR SHALL PROVIDE AN ACCESS DOOR AT EACH DAMPER. DAMPER SHALL BE MANUFACTURED BY IMPERIAL, MODEL FD-150 (1-1/2 HR RATED) OR MODEL FD-3 (3 HR RATED) AS REQUIRED, TYPE "B", IM#4300-93-M OR APPROVED EQUAL.
- l. COMBINATION FIRE/SMOKE DAMPERS:
  1. COMBINATION FIRE/SMOKE DAMPERS SHALL BE INSTALLED AS INDICATED ON DRAWINGS AND AS REQUIRED BY STATE BUILDING CODE. DAMPERS TO BE UL 555S LISTED AND LABELED AND IN CONFORMANCE WITH NFPA.
  2. COMBINATION FIRE/SMOKE DAMPERS SHALL BE CLASS ONE(1), DUAL OVERRIDE REMOTE RESETTABLE, OPPOSED MULTIBLADE TYPE WITH FUSIBLE MECHANICAL HEAT RESPONSIVE DEVICE, 120-VOLT ACTUATOR AS REQUIRED MOUNTED OUT OF THE AIR STREAM, WITH DAMPER OPERATOR AND BLADE POSITION INDICATING SWITCHES MOUNTED ON DAMPER MOUNT BRACKET STRENGTHENER FOR DAMPERS OVER 10" IN HEIGHT. PROVIDE A 10 GAUGE WELDED VERTICAL STIFFENER AT EACH CORNER TO PREVENT DAMPER MISALIGNMENT.
  3. THE HVAC CONTRACTOR SHALL PROVIDE ALL DEVICES, RELAYS, END SWITCHES, E/P SWITCHES, CONTROL COMPONENTS, AIR PIPING, POWER WIRING, CONTROL WIRING .AND INTERLOCK WIRING AS REQUIRED TO ACCOMPLISH THE SEQUENCE OF OPERATION FOR THESE DAMPERS.
  4. DAMPERS SHALL BE MANUFACTURED BY IMPERIAL MODEL #770 (MEA #300-93-M) OR APPROVED EQUAL.
- m. SEAL OPENINGS AROUND DUCT THROUGH WALLS WITH MINERAL WOOL OR OTHER NON-COMBUSTIBLE MATERIAL. SEAL ALL DUCT PENETRATIONS THROUGH WALLS AIRTIGHT.
- n. ALL DUCTS EXPOSED TO MOISTURE SHALL BE ALUMINUM, SLOPED, AND DRAINED AND SHALL NOT BE INTERNALLY LINED.
- o. AUTOMATIC CONTROL DAMPERS:
  1. PROVIDE DAMPERS WITH PARALLEL BLADES FOR 2-POSITION CONTROL, OR OPPOSED BLADES FOR MODULATING CONTROL OF CONSTANT OR VARIABLE VOLUME SYSTEM.
  2. AUTOMATIC DAMPERS ARE TO BE LOW LEAKING TYPE WITH JAMB AND BLADE SEALS RATED FOR SMOKE DAMPER APPLICATION. CONSTRUCT BLADES OF 16 GAUGE GALVANIZED STEEL, PROVIDE HEAVY-DUSTY MOLDED SELF-LUBRICATING NYLON BEARINGS, 1/2" DIAMETER STEEL AXLES SPACED ON 9" CENTERS, BLADES TO BE MAXIMUM 10" HIGH, FRAME SHALL BE CONSTRUCTED OF 16 GAUGE X 4-3/8" GALVANIZED HAT SHAPED STEEL WITH MITERED AND WELDED CORNERS. PROVIDE GALVANIZED STEEL FINISH AND ALUMINUM TOUCH-UP.CO DAMPERS INSTALLED IN ALUMINUM DUCTS SHALL BE ALUMINUM WITH WEATHERPROOF COMPONENTS.
  4. DAMPER TO BE MANUFACTURED BY IMPERIAL OR APPROVED EQUAL.
- p. LOUVERS:
  1. ALL INTAKE AND EXHAUST LOUVERS SHALL MATCH THE BASE BUILDING STANDARD. PROVIDE ALL LOUVERS WITH BIRD SCREENS. ALL LOUVERS AND BIRD SCREENS SHALL CONFORM TO SMACNA. CONTRACTOR SHALL CONNECT DUCTWORK AND PLENUMS TO LOUVERS. SUBMIT SHOP DRAWINGS OF LOUVERS AND INSTALLATION DETAILS TO THE BUILDING MANAGEMENT FOR REVIEW AND APPROVAL PRIOR TO COMMENCING WORK.
  2. THE FIXED LOUVER PANEL SHALL BE MADE OF EXTRUDED ALUMINUM. LOUVER BLADES SHALL BE SPACED AT 4", 0.081" THICK AT 45° ANGLE DIRECTED FOR INTAKE OR DISCHARGE CONFIGURATION AS REQUIRED. JAMBS AND HEAD/SILL SHALL BE EXTRUDED ALUMINUM AND 0.081" THICK X 8" DEEP. FRAMES SHALL BE 18" THICK, BOX TYPE AND DRAINABLE WITH NECESSARY BRACES FOR RIGID REINFORCEMENT. PROVIDE STATIONARY TOP AND BOTTOM STOPS TO PREVENT AIR LEAKAGE. PROVIDE DIAMOND MESH BIRD/INSECT SCREEN. THE NET FREE AREA SHALL NOT BE LESS THAN 50% OF GROSS LOUVER AREA.
  3. COORDINATE LOUVER SIZES WITH DUCTWORK OR EQUIPMENT TO BE CONNECTED TO LOUVERS.
  4. LOUVERS SHALL BE MANUFACTURED BY IMPERIAL OR APPROVED EQUAL BY THE ENGINEER. COLOR AND FINISH TO BE AS PER BUILDING STANDARDS AND SELECTED BY THE ARCHITECT.

2.02 HYDRONIC PIPING, VALVES, AND SPECIALTIES:
- a. WHERE APPLICABLE, ALL SYSTEM COMPONENTS AND INSTALLATION SHALL BE CAPABLE OF WITHSTANDING THE FOLLOWING MINIMUM WORKING PRESSURES AND TEMPERATURES UNLESS OTHERWISE INDICATED:
  1. HOT-WATER HEATING PIPING: 30 PSIG AT 200 DEGREES F..
  2. CONDENSATE-DRAIN PIPING: 150 DEGREES F.
  3. BLOWDOWN-DRAIN PIPING: 200 DEGREES F.
  4. AIR VENT AND VACUUM-BREAKER PIPING: 200 DEGREES F.
  5. SAFETY-VALVE-INLET AND -OUTLET PIPING: EQUAL TO PRESSURE OF THE PIPING SYSTEM TO WHICH IT IS ATTACHED.
- b. COPPER TUBE AND FITTINGS:
  1. DRAWN-TEMPER COPPER TUBING: ASTM B88, TYPE M.
  2. WROUGHT-COPPER FITTINGS: ASME B16.22
- c. STEEL PIPE AND FITTINGS:
  1. STEEL PIPE: ASTM A53, BLACK STEEL, PLAIN ENDS, WELDED AND SEAMLESS, GRADE B, AND SCHEDULE AS INDICATED BELOW. CAST-IRON THREADED FITTINGS: ASME B16.4; CLASSES 125, 150, AND 300 AS INDICATED BELOW.
  3. WROUGHT-STEEL FITTINGS: ASTM A234, WALL THICKNESS TO MATCH ADJOINING PIPE.
  4. WROUGHT CAST- AND FORGED STEEL FLANGES AND FLANGED FITTINGS: ASME B16.5, INCLUDING BOLTS, NUTS, AND GASKETS OF THE FOLLOWING MATERIAL GROUP, END CONNECTIONS, AND FACINGS:
     - 4.1. MATERIAL GROUP: 1.1.
     - 4.2. END CONNECTIONS: ASME BUTT WELDING.
     - 4.3. FACINGS: RAISED FACE.
  5. STEEL PIPE NIPPLES: ASTM A733, MADE OF ASTM A53, BLACK STEEL OF SAME TYPE, GRADE, AND SCHEDULE AS PIPE IN WHICH INSTALLED.
- d. JOINING MATERIALS
  1. PIPE-FLANGE GASKET MATERIALS: SUITABLE FOR CHEMICAL AND THERMAL CONDITIONS OF PIPING SYSTEM CONTENTS.
     - 1.1. ASME B16.21, NONMETALLIC, FLAT, ASBESTOS-FREE, 1/16-INCH (3.2-MM) MAXIMUM THICKNESS UNLESS OTHERWISE INDICATED.
       - 1.1.1. FULL-FACE TYPE: FOR FLAT-FACE, CLASS 125, CAST-IRON AND CAST-BRONZE FLANGES.
       - 1.1.2. NARROW-FACE TYPE: FOR RAISED-FACE, CLASS 250, CAST-IRON AND STEEL FLANGES.
  2. FLANGE BOLTS AND NUTS: ASME B18.2.1, CARBON STEEL, UNLESS OTHERWISE INDICATED.
  3. SOLDER FILLER METALS: ASTM B 32, LEAD-FREE ALLOYS. INCLUDE WATER-FLUSHABLE FLUX ACCORDING TO ASTM B 813.
  4. BRAZING FILLER METALS: AWS A5.8/A5.8M, BCUP SERIES, COPPER-PHOSPHORUS ALLOYS FOR JOINING COPPER WITH COPPER; OR BAG-1, SILVER ALLOY FOR JOINING COPPER WITH BRONZE OR STEEL.
  5. WELDING FILLER METALS: COMPLY WITH AWS D10.12M/D10.12 FOR WELDING MATERIALS

G. MANUFACTURER OF VIBRATION ISOLATION EQUIPMENT SHALL HAVE THE FOLLOWING RESPONSIBILITIES:
1. DETERMINE VIBRATION ISOLATOR AND SEISMIC RESTRAINT SIZES AND LOCATIONS.
2. PROVIDE SUITABLE PIPING AND EQUIPMENT VIBRATION ISOLATION AND SEISMIC RESTRAINTS.
3. GUARANTEE SPECIFIED ISOLATION SYSTEM ATTENUATION AND DEFLECTION.
4. STARTERS SHALL BE SELECTED TO SUIT MOTOR RUNNING AND STARTING CHARACTERISTICS.
5. PROVIDE INSTALLATION INSTRUCTIONS, DRAWINGS AND TRAINED FIELD SUPERVISION TO INSURE PROPER INSTALLATION AND PERFORMANCE.

H. ISOLATION AND SEISMIC SYSTEMS SHALL BE MANUFACTURED BY MASON INDUSTRIES OR APPROVED EQUAL BY THE ENGINEER.
1. ALL ISOLATORS AND SEISMIC SYSTEMS SHALL BE OF THE SAME MANUFACTURER AND SHALL BE CERTIFIED BY THE MANUFACTURER.

I. STATIC DEFLECTION OF ISOLATORS SHALL BE A MINIMUM OF 90% EFFICIENT. PROVIDE CORROSION PROTECTION FOR EQUIPMENT MOUNTED OUTDOORS.

J. PROVIDE FLEXIBLE CONNECTIONS BETWEEN ALL FANS AND DUCTWORK (REFER TO DUCTWORK SECTION FOR SPECIFICATIONS.)

K. SEISMIC RESTRAINT OF DUCTWORK
1. SEISMICALLY RESTRAIN ALL DUCTWORK AS LISTED BELOW:
1.1 RESTRAIN RECTANGULAR DUCTS WITH CROSS SECTIONAL AREA OF 6 SQ.FT. OR LARGER.
1.2 RESTRAIN ROUND DUCTS WITH DIAMETERS OF 28" OR LARGER.
1.3 RESTRAIN FLAT OVAL DUCTS THE SAME AS RECTANGULAR DUCTS OF THE SAME NOMINAL SIZE.
2. TRANSVERSE RESTRAINTS SHALL OCCUR AT 30' INTERVALS OR AT BOTH ENDS OF THE DUCT RUN IF LESS THAN THE SPECIFIED INTERVAL. TRANSVERSE RESTRAINTS SHALL BE INSTALLED AT EACH DUCT TURN AND AT EACH END OF A DUCT RUN.
3. LONGITUDINAL RESTRAINTS SHALL OCCUR AT 60' INTERVALS WITH AT LEAST ONE RESTRAINT PER DUCT RUN. TRANSVERSE RESTRAINTS FOR ONE DUCT SECTION MAY ALSO ACT AS A LONGITUDINAL RESTRAINT FOR A DUCT SECTION CONNECTED PERPENDICULAR TO IT IF THE RESTRAINTS ARE INSTALLED WITHIN 4' OF THE INTERSECTION OF THE DUCTS AND IF THE RESTRAINTS ARE SIZED FOR THE LARGER DUCT. DUCT JOINTS SHALL CONFORM TO SMACNA DUCT CONSTRUCTION STANDARDS.
4. THE DUCTWORK MUST BE REINFORCED AT THE RESTRAINT LOCATIONS. REINFORCEMENT SHALL CONSIST OF AN ADDITIONAL ANGLE ON TOP OF THE DUCTWORK THAT IS ATTACHED TO THE SUPPORT HANGER RODS. DUCTWORK IS TO BE ATTACHED TO BOTH UPPER ANGLE AND LOWER TRAPEZE.
5. DUCTWORK EXCLUSIONS
5.1 RECTANGULAR AND SQUARE AND DUCTS THAT ARE LESS THAN 6 SQUARE FEET IN CROSS SECTIONAL AREA.
5.2 OVAL DUCTS THAT ARE LESS THAN 6 SQUARE FEET IN CROSS SECTIONAL AREA BASED ON NOMINAL SIZE.
5.3 ROUND DUCT LESS THAN 28" IN DIAMETER.
5.4 ALL TRAPEZED DUCTWORK WHERE THE DISTANCE FROM THE SUSPENSION POINT TO THE TRAPEZE MEM-BER IS 12" OR LESS.
5.5 DUCTWORK HUNG WITH STRAPS WHERE THE TOP OF THE DUCT IS 12" OR LESS FROM THE SUSPENSION POINT AND THE STRAP HAS 2 #10 SHEET METAL SCREWS WITHIN 2" OF THE TOP OF THE DUCT.
5.6 IF ANY SUSPENSION LOCATION IN THE RUN EXCEEDS THE ABOVE, THE ENTIRE RUN MUST BE BRACED.

L. SEISMIC RESTRAINT OF PIPING
1. SEISMICALLY RESTRAIN ALL PIPING AS LISTED BELOW:
1.1 FUEL OIL PIPING, GAS PIPING, MEDICAL GAS PIPING, AND COMPRESSED AIR PIPING THAT IS 1" I.D. OR LARGER.
1.2 PIPING LOCATED IN BOILER ROOMS, MECHANICAL EQUIPMENT ROOMS, AND REFRIGERATION EQUIPMENT ROOMS THAT IS 11/4" I.D. AND LARGER.
1.3 ALL OTHER PIPING 21/2" (64MM) DIAMETER AND LARGER.
2. TRANSVERSE PIPING RESTRAINTS SHALL BE AT 40' MAXIMUM SPACING FOR ALL PIPE SIZES, EXCEPT WHERE LESSER SPACING IS EQUIRED TO LIMIT ANCHORAGE LOADS.
3. LONGITUDINAL RESTRAINTS SHALL BE AT 80' MAXIMUM SPACING FOR ALL PIPE SIZES, EXCEPT WHERE LESSER SPACING IS REQUIRED TO LIMIT ANCHORAGE LOADS.
4. WHERE THERMAL EXPANSION IS A CONSIDERATION, GUIDES AND ANCHORS MAY BE USED AS TRANSVERSE AND LONGITUDINAL RESTRAINTS PROVIDED THEY HAVE A CAPACITY EQUAL TO OR GREATER THAN THE RESTRAINT LOADS IN ADDITION TO THE LOADS INDUCED BY EXPANSION OR CONTRACTION.
5. PIPE EXCLUSIONS
5.1 GAS PIPING LESS THAN 1" (25MM) INSIDE DIAMETER.
5.2 PIPING IN BOILER AND MECHANICAL ROOMS LESS THAN 11/4" (32MM) INSIDE DIAMETER.
5.3 ALL OTHER PIPING LESS THAN 21/2" (64MM) INSIDE DIAMETER.
5.4 ALL PIPING SUSPENDED BY CLEVIS HANGERS WHERE THE DISTANCE FROM THE TOP OF THE PIPE TO THE SUSPENSION POINT IS 12" OR LESS.
5.5 ALL TRAPEZED PIPING WHERE THE DISTANCE FROM THE SUSPENSION POINT TO THE TRAPEZE MEMBER IS 12" OR LESS.
5.6 IF ANY SUSPENSION LOCATION IN THE RUN EXCEEDS THE ABOVE, THE ENTIRE RUN MUST BE BRACED.

2.07 TESTING AND BALANCING

A. GENERAL
1. TESTING AND BALANCING WORK SHALL BE PERFORMED BY AN INDEPENDENT COMPANY (NOT ASSOCIATED WITH THE HVAC CONTRACTOR), AABC CERTIFIED OR AS APPROVED BY THE ENGINEER BEFORE COMMENCEMENT OF WORK. APPROVED COMPANIES INCLUDE MERENDINO ASSOCIATES, R.H. MCDERMOTT, INTERNATIONAL TESTING AND BALANCING OR AS APPROVED BY THE ENGINEER AND BUILDING MANAGEMENT.
2. AFTER ALL PROJECT HVAC WORK IS COMPLETE, TESTED AND IN FULL WORKING ORDER, THE AGENCY SHALL PERFORM THE BALANCING AND TESTING OF THE PROJECT HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS.
3. UPON THE COMPLETION OF THE AIR CONDITIONING SYSTEM, THE BALANCING AGENCY SHALL PERFORM TESTING AND BALANCING AND COMPILE ALL TEST DATA IN A CERTIFIED REPORT AND SUBMIT FOUR (4) COPIES FOR REVIEW AND APPROVAL TO THE ENGINEER.
4. THE REPORT SHALL INCLUDE DESIGN AND ACTUAL READINGS FOR ALL EQUIPMENT AND LOCATION PLAN INDICATING WHERE ALL WORK HAS BEEN PERFORMED AND METHODS OF BALANCING AND DETAILS OF INSTRUMENTS USED.
5. IF DISCREPANCIES EXIST IN THE REPORT THAT REQUIRE FIELD VERIFICATION, THE TESTING AND BALANCING COMPANY IN THE PRESENCE OF THE ENGINEER SHALL VISIT THE JOB SITE FOR FIELD VERIFICATION OF THE REPORT.
6. AFTER SUBMISSION OF THE FIELD VERIFIED BALANCING REPORT, THE AIR BALANCING COMPANY SHALL RETURN TO THE JOB SITE TO PERFORM TWO (2) OCCUPANT COMFORT BALANCES AS DIRECTED BY THE OWNER OR ENGINEER.
7. THE FINAL REPORT AFTER THE COMFORT BALANCE IS TO BE INCLUDED IN PROJECT OPERATING AND MAINTENANCE MANUAL.
8. THE TESTING AND BALANCING AGENCY SHALL INCLUDE AS PART OF THEIR WORK AN EXTENDED WARRANTY OF 90 DAYS AFTER COMPLETION OF TEST AND BALANCE WORK. THE ENGINEER AT HIS DISCRETION DURING THE WARRANTY PERIOD MAY REQUEST A RECHECK, OR RESETTING OF ANY EQUIPMENT. THE MECHANICAL CONTRACTOR AND THE BALANCING CONTRACTOR SHALL PROVIDE THE NECESSARY TECHNICIANS TO FACILITATE THIS WORK.
9. BALANCING AGENCY SHALL PERMANENTLY MARK ALL ADJUSTMENT DEVICES (VALVES, DAMPERS, ETC.,) TO ENABLE THE SETTING TO BE RESTORED.

2.08 COMMISSIONING FOR HVAC

A. SUMMARY
1. CONTRACTOR IS REQUIRED TO HIRE A THIRD-PARTY COMMISSIONING AGENT TO PERFORM MECHANICAL, ELECTRICAL, AND PLUMBING COMMISSIONING FOR THIS PROJECT. SEE DIV 22 AND 26 SPECIFICATIONS FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
2. COMMISSIONING PROCESS REQUIREMENTS FOR THE FOLLOWING HVAC&R SYSTEMS, ASSEMBLIES, AND EQUIPMENT:
a. COOLING GENERATION SYSTEMS, INCLUDING CHILLED-WATER SYSTEMS AND DIRECT-EXPANSION SYSTEMS.
b. HEAT GENERATION SYSTEMS, INCLUDING FURNACES AND BOILERS.
c. DISTRIBUTION SYSTEMS, INCLUDING AIR DISTRIBUTION (HEATING AND COOLING) SYSTEMS, STEAM DISTRIBUTION SYSTEMS, HOT-WATER DISTRIBUTION SYSTEMS, CHILLED-WATER DISTRIBUTION SYSTEMS, GLYCOL DISTRIBUTION SYSTEMS, EXHAUST SYSTEMS, AND AIR-HANDLING UNITS.
d. TERMINAL AND PACKAGED UNITS, INCLUDING ERVS, UNIT VENTILATORS, UNIT HEATERS, FAN-COIL UNITS, FINNED-TUBE RADIATION, HOT WATER HEATING COILS, STEAM HEATING COILS, ELECTRIC HEATING COILS, AND AIR TERMINAL UNITS, AND PACKAGED UNITS.
e. VIBRATION SYSTEMS, INCLUDING VIBRATION ISOLATION DEVICES AND SEISMIC RESTRAINTS.
f. CONTROLS AND INSTRUMENTATION, INCLUDING BMS.
g. SYSTEMS TESTING AND BALANCING VERIFICATION, INCLUDING HEATING-WATER PIPING SYSTEMS, CHILLED-WATER PIPING SYSTEMS, DOMESTIC HOT-WATER CIRCULATING SYSTEMS, SUPPLY-AIR SYSTEMS, RETURN-AIR SYSTEMS, AND EXHAUST-AIR SYSTEMS.
h. LIFE SAFETY DAMPERS, INCLUDING FIRE DAMPERS, SMOKE DAMPERS, AND COMBINATION FIRE/SMOKE DAMPERS.

B. COMMISSIONING PLAN
1. A COMMISSIONING PLAN SHALL BE DEVELOPED BY THE COMMISSIONING AGENT AND SHALL INCLUDE, AS A MINIMUM, THE FOLLOWING ITEMS:
a. A NARRATIVE DESCRIPTION OF THE ACTIVITIES THAT WILL BE ACCOMPLISHED DURING EACH PHASE OF COMMISSIONING, INCLUDING THE PERSONNEL INTENDED TO ACCOMPLISH EACH OF THE ACTIVITIES.
b. A LISTING OF THE SPECIFIC EQUIPMENT, APPLIANCES, OR SYSTEMS TO BE TESTED AND A DESCRIPTION OF THE TESTS TO BE PERFORMED.
c. FUNCTIONS TO BE TESTED INCLUDING, BUT NOT LIMITED TO, CALIBRATIONS AND ECONOMIZER CONTROLS.
d. CONDITIONS UNDER WHICH THE TEST WILL BE PERFORMED. TESTING SHALL AFFIRM WINTER AND SUMMER DESIGN CONDITIONS AND FULL OUTSIDE AIR CONDITIONS.
e. MEASURABLE CRITERIA FOR PERFORMANCE.

C. BUILDING OPERATIONS AND MAINTENANCE INFORMATION
1. THE BUILDING OPERATIONS AND MAINTENANCE DOCUMENTS SHALL BE PROVIDED TO THE OWNER AND SHALL CONSIST OF MANUFACTURERS' INFORMATION, SPECIFICATIONS, AND RECOMMENDATIONS; PROGRAMMING PROCEDURES AND DATA POINTS; NARRATIVES; AND OTHER MEANS OF ILLUSTRATING TO THE OWNER HOW THE BUILDING, EQUIPMENT, AND SYSTEMS ARE INTENDED TO BE INSTALLED, MAINTAINED, AND OPERATED. REQUIRED REGULAR MAINTENANCE ACTIONS FOR EQUIPMENT AND SYSTEMS SHALL BE CLEARLY STATED ON A READILY VISIBLE LABEL. THE LABEL SHALL INCLUDE THE TITLE OR PUBLICATION NUMBER FOR THE OPERATION AND MAINTENANCE MANUAL FOR THAT PARTICULAR MODEL AND TYPE OF PRODUCT.

D. MECHANICAL SYSTEMS AND SERVICE WATER-HEATING SYSTEMS COMMISSIONING AND COMPLETION REQUIREMENT
1. PRIOR TO THE FINAL MECHANICAL AND PLUMBING INSPECTIONS, THE COMMISSIONING AGENT SHALL PROVIDE EVIDENCE OF MECHANICAL SYSTEMS COMMISSIONING AND COMPLETION IN ACCORDANCE WITH THE PROVISIONS OF THIS SECTION. CONSTRUCTION DOCUMENT NOTES SHALL CLEARLY INDICATE PROVISIONS FOR COMMISSIONING AND COMPLETION REQUIREMENTS IN ACCORDANCE WITH THIS SECTION AND ARE PERMITTED TO REFER TO SPECIFICATIONS FOR FURTHER REQUIREMENTS. COPIES OF ALL DOCUMENTATION SHALL BE GIVEN TO THE OWNER OR OWNER'S AUTHORIZED AGENT AND MADE AVAILABLE TO THE CODE OFFICIAL UPON REQUEST.

E. FUNCTIONAL PERFORMANCE TESTING
1. EQUIPMENT: EQUIPMENT FUNCTIONAL PERFORMANCE TESTING SHALL DEMONSTRATE THE INSTALLATION AND OPERATION OF COMPONENTS, SYSTEMS, AND SYSTEM-TO-SYSTEM INTERFACING RELATIONSHIPS IN ACCORDANCE WITH APPROVED PLANS AND SPECIFICATIONS SUCH THAT OPERATION, FUNCTION, AND MAINTENANCE SERVICEABILITY FOR EACH OF THE COMMISSIONED SYSTEMS IS CONFIRMED. TESTING SHALL INCLUDE ALL MODES AND SEQUENCE OF OPERATION, INCLUDING UNDER FULL-LOAD, PART-LOAD AND THE FOLLOWING EMERGENCY CONDITIONS:
a. ALL MODES AS DESCRIBED IN THE SEQUENCE OF OPERATION.
b. REDUNDANT OR AUTOMATIC BACK-UP MODE.
c. PERFORMANCE OF ALARMS.
d. MODE OF OPERATION UPON A LOSS OF POWER AND RESTORATION OF POWER.
e. EXCEPTION: UNITARY OR PACKAGED HVAC EQUIPMENT THAT DOES NOT REQUIRE SUPPLY AIR ECONOMIZERS.
2. CONTROLS: HVAC AND SERVICE WATER-HEATING CONTROL SYSTEMS SHALL BE TESTED TO DOCUMENT THAT CONTROL DEVICES, COMPONENTS, EQUIPMENT, AND SYSTEMS ARE CALIBRATED AND ADJUSTED AND OPERATE IN ACCORDANCE WITH APPROVED PLANS AND SPECIFICATIONS. SEQUENCES OF OPERATION SHALL BE FUNCTIONALLY TESTED TO DOCUMENT THEY OPERATE IN ACCORDANCE WITH APPROVED PLANS AND SPECIFICATIONS.
3. ECONOMIZERS: AIR ECONOMIZERS SHALL UNDERGO A FUNCTIONAL TEST TO DETERMINE THAT THEY OPERATE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

F. PRELIMINARY COMMISSIONING REPORT
1. A PRELIMINARY REPORT OF COMMISSIONING TEST PROCEDURES AND RESULTS SHALL BE COMPLETED AND CERTIFIED BY THE ENGINEER OR APPROVED AGENCY AND PROVIDED TO THE BUILDING OWNER OR OWNER'S AUTHORIZED AGENT. THE REPORT SHALL BE ORGANIZED WITH MECHANICAL AND SERVICE HOT WATER FINDINGS IN SEPARATE SECTIONS TO ALLOW INDEPENDENT REVIEW. THE REPORT SHALL BE IDENTIFIED AS "PRELIMINARY COMMISSIONING REPORT," SHALL INCLUDE THE COMPLETED COMMISSIONING COMPLIANCE CHECKLISTS, AND SHALL IDENTIFY:
a. ITEMIZATION OF DEFICIENCIES FOUND DURING TESTING REQUIRED BY THIS SECTION THAT HAVE NOT BEEN CORRECTED AT THE TIME OF REPORT PREPARATION.
b. DEFERRED TESTS THAT CANNOT BE PERFORMED AT THE TIME OF REPORT PREPARATION BECAUSE OF CLIMATIC CONDITIONS.
c. CLIMATIC CONDITIONS REQUIRED FOR PERFORMANCE OF THE DEFERRED TESTS.
d. RESULTS OF FUNCTIONAL PERFORMANCE TESTS.
e. FUNCTIONAL PERFORMANCE TEST PROCEDURES USED DURING THE COMMISSIONING PROCESS, INCLUDING MEASURABLE CRITERIA FOR TEST ACCEPTANCE.
2. ACCEPTANCE OF REPORT: BUILDINGS, OR PORTIONS THEREOF, SHALL NOT BE CONSIDERED AS ACCEPTABLE FOR A FINAL INSPECTION UNTIL THE CODE OFFICIAL HAS RECEIVED THE PRELIMINARY COMMISSIONING REPORT FROM THE BUILDING OWNER OR OWNER'S AUTHORIZED AGENT.
3. COPY OF REPORT. THE CODE OFFICIAL SHALL BE PERMITTED TO REQUIRE THAT A COPY OF THE PRELIMINARY COMMISSIONING REPORT BE MADE AVAILABLE FOR REVIEW BY THE CODE OFFICIAL.

G. DOCUMENTATION REQUIREMENTS
1. ALL DOCUMENTS DESCRIBED IN THIS SECTION BE PROVIDED TO THE BUILDING OWNER OR OWNER'S AUTHORIZED AGENT WITHIN 90 DAYS OF THE DATE OF RECEIPT OF THE CERTIFICATE OF OCCUPANCY.
a. SYSTEM BALANCING REPORT: A WRITTEN REPORT DESCRIBING THE ACTIVITIES AND MEASUREMENTS COMPLETED.
b. FINAL COMMISSIONING REPORT: A REPORT OF TEST PROCEDURES AND RESULTS IDENTIFIED AS "FINAL COMMISSIONING REPORT" SHALL BE DELIVERED TO THE BUILDING OWNER OR OWNER'S AUTHORIZED AGENT. THE REPORT SHALL BE ORGANIZED WITH MECHANICAL SYSTEM AND SERVICE HOT WATER SYSTEM FINDINGS IN SEPARATE SECTIONS TO ALLOW INDEPENDENT REVIEW. THE REPORT SHALL INCLUDE THE FOLLOWING:
1. RESULTS OF FUNCTIONAL PERFORMANCE TESTS.
2. DISPOSITION OF DEFICIENCIES FOUND DURING TESTING, INCLUDING DETAILS OF CORRECTIVE MEASURES USED OR PROPOSED.
3. FUNCTIONAL PERFORMANCE TEST PROCEDURES USED DURING THE COMMISSIONING PROCESS INCLUDING MEASURABLE CRITERIA FOR TEST ACCEPTANCE, PROVIDED HEREIN FOR REPEATABILITY.
4. PROJECT SPECIFIC COMMISSIONING CHECKLISTS.
5. EXCEPTION: DEFERRED TESTS THAT CANNOT BE PERFORMED AT THE TIME OF REPORT PREPARATION DUE TO CLIMATIC CONDITIONS.

H. GENERAL TESTING REQUIREMENTS
1. CERTIFY THAT HVAC&R SYSTEMS, SUBSYSTEMS, AND EQUIPMENT HAVE BEEN INSTALLED, CALIBRATED, AND STARTED AND ARE OPERATING ACCORDING TO THE CONTRACT DOCUMENTS AND APPROVED SHOP DRAWINGS AND SUBMITTALS.
2. CERTIFY THAT HVAC&R INSTRUMENTATION AND CONTROL SYSTEMS HAVE BEEN COMPLETED AND CALIBRATED, THAT THEY ARE OPERATING ACCORDING TO THE CONTRACT DOCUMENTS AND APPROVED SHOP DRAWINGS AND SUBMITTALS, AND THAT PRETEST SET POINTS HAVE BEEN RECORDED.
3. CERTIFY THAT TAB PROCEDURES HAVE BEEN COMPLETED AND THAT TAB REPORTS HAVE BEEN SUBMITTED, DISCREPANCIES CORRECTED, AND CORRECTIVE WORK APPROVED.
4. SET SYSTEMS, SUBSYSTEMS, AND EQUIPMENT INTO OPERATING MODE TO BE TESTED ACCORDING TO APPROVED TEST PROCEDURES (E.G., NORMAL SHUTDOWN, NORMAL AUTO POSITION, NORMAL MANUAL POSITION, UNOCCUPIED CYCLE, EMERGENCY POWER, AND ALARM CONDITIONS).
5. MEASURE CAPACITIES AND EFFECTIVENESS OF SYSTEMS, ASSEMBLIES, SUBSYSTEMS, EQUIPMENT, AND COMPONENTS, INCLUDING OPERATIONAL AND CONTROL FUNCTIONS TO VERIFY COMPLIANCE WITH ACCEPTANCE CRITERIA.
6. TEST SYSTEMS, ASSEMBLIES, SUBSYSTEMS, EQUIPMENT, AND COMPONENTS OPERATING MODES, INTERLOCKS, CONTROL RESPONSES, AND RESPONSES TO ABNORMAL OR EMERGENCY CONDITIONS, AND RESPONSE ACCORDING TO ACCEPTANCE CRITERIA.
7. CONSTRUCTION CHECKLISTS: PREPARE AND SUBMIT DETAILED CONSTRUCTION CHECKLISTS FOR HVAC&R SYSTEMS, SUBSYSTEMS, EQUIPMENT, AND COMPONENTS.
a. CONTRIBUTORS TO THE DEVELOPMENT OF CONSTRUCTION CHECKLISTS SHALL INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:
1. HVAC&R SYSTEMS AND EQUIPMENT INSTALLERS.
2. TAB TECHNICIANS.
3. HVAC&R INSTRUMENTATION AND CONTROLS INSTALLERS.
8. PERFORM TESTS USING DESIGN CONDITIONS, WHENEVER POSSIBLE.
a. SIMULATED CONDITIONS MAY, WITH APPROVAL OF ARCHITECT, BE IMPOSED USING AN ARTIFICIAL LOAD WHEN IT IS IMPRACTICAL TO TEST UNDER DESIGN CONDITIONS. BEFORE SIMULATING CONDITIONS, CALIBRATE TESTING INSTRUMENTS. PROVIDE EQUIPMENT TO SIMULATE LOADS. SET SIMULATED CONDITIONS AS DIRECTED BY COMMISSIONING COORDINATOR AND DOCUMENT SIMULATED CONDITIONS AND METHODS OF SIMULATION. AFTER TESTS, RETURN CONFIGURATIONS AND SETTINGS TO NORMAL OPERATING CONDITIONS.
b. COMMISSIONING TEST PROCEDURES MAY DIRECT THAT SET POINTS BE ALTERED WHEN SIMULATING CONDITIONS IS IMPRACTICAL.
c. COMMISSIONING TEST PROCEDURES MAY DIRECT THAT SENSOR VALUES BE ALTERED WITH A SIGNAL GENERATOR WHEN DESIGN OR SIMULATING CONDITIONS AND ALTERING SET POINTS ARE IMPRACTICAL.
9. IF TESTS CANNOT BE COMPLETED BECAUSE OF A DEFICIENCY OUTSIDE THE SCOPE OF THE HVAC&R SYSTEM, DOCUMENT THE DEFICIENCY AND REPORT IT TO OWNER. AFTER DEFICIENCIES ARE RESOLVED, RESCHEDULE TESTS.
10. IF SEASONAL TESTING IS SPECIFIED, COMPLETE APPROPRIATE INITIAL PERFORMANCE TESTS AND DOCUMENTATION AND SCHEDULE SEASONAL TESTS.
11. COORDINATE SCHEDULE WITH, AND PERFORM THE FOLLOWING ACTIVITIES AT THE DIRECTION OF, COMMISSIONING COORDINATOR.
12. COMPLY WITH CONSTRUCTION CHECKLIST REQUIREMENTS, INCLUDING MATERIAL VERIFICATION, INSTALLATION CHECKS, START-UP, AND PERFORMANCE TESTS REQUIREMENTS SPECIFIED IN SECTIONS SPECIFYING HVAC SYSTEMS AND EQUIPMENT.
13. PROVIDE TECHNICIANS, INSTRUMENTATION, TOOLS, AND EQUIPMENT TO COMPLETE AND DOCUMENT THE FOLLOWING:
a. PERFORMANCE TESTS.
b. DEMONSTRATION OF A SAMPLE OF PERFORMANCE TESTS.
c. COMMISSIONING TESTS.
d. COMMISSIONING TEST DEMONSTRATIONS.

2.09 EQUIPMENT

A. PROVIDE ALL EQUIPMENT AND ACCESSORIES OF THE SIZES AND CAPACITIES AS SCHEDULED AND AS INDICATED ON THE DRAWINGS.
B. INSTALL EQUIPMENT IN ACCORDANCE WITH APPROVED SHOP DRAWINGS, MANUFACTURERS RECOMMENDATIONS, INSTRUCTIONS, AND ALL AUTHORITIES HAVING JURISDICTION.
C. PROVIDE EQUIPMENT SUPPORTS AND/OR MOUNTINGS AS INDICATED ON THE DRAWING, IN VIBRATION SPECIFICATION AND AS FOLLOWS:
1. CEILING MOUNTED EQUIPMENT - PROVIDE SUPPORTS WITH APPROVED SUITABLE ANCHORS SUSPENDED DIRECTLY FROM BUILDING STEEL STRUCTURE.
2. PROVIDE SUPPLEMENTAL STEEL AS REQUIRED TO ADEQUATELY SUPPORT THE EQUIPMENT LOAD.
D. EQUIPMENT SHALL BE INSTALLED WITH VIBRATION ISOLATION, REFER TO VIBRATION ISOLATION SECTION.

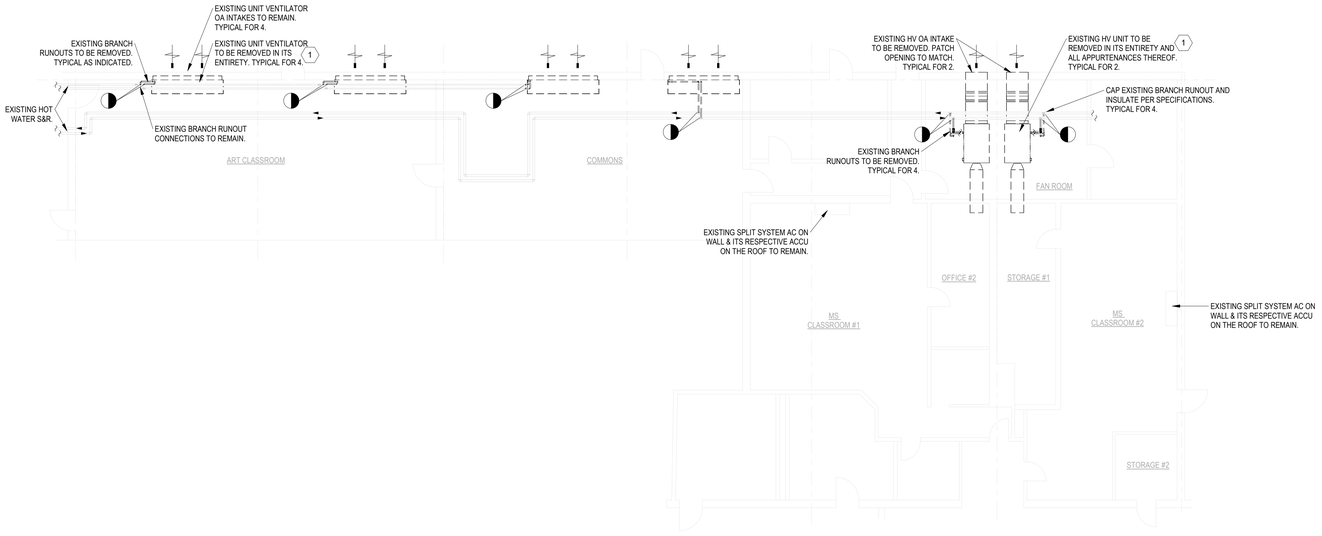
3.01 AUTOMATIC TEMPERATURE CONTROLS

A. OVERVIEW:
1. ALL NEW CONTROLS FOR THIS PROJECT MUST BE COMPATIBLE WITH, AND INTERFACE WITH THE OWNER'S EXISTING BUILDING MANAGEMENT SYSTEM. ATC CONTRACTOR TO PROVIDE ALL HARDWARE AND SOFTWARE REQUIRED FOR FULL MONITORING AND CONTROL OF ALL FUNCTIONS.
2. THE HVAC CONTRACTOR SHALL INCLUDE WITH THE EQUIPMENT PACKAGE A SYSTEM OF CONTROLS INCLUDING CONTROL INTERFACES, ACTUATORS, AND RELAYS REQUIRED TO PROVIDE THE DESIRED SEQUENCE OF OPERATION. THE SUPPLIER SHALL ALSO PROVIDE INTEGRATED WIRING DIAGRAMS SHOWING INTERCONNECTIONS BETWEEN FIELD INSTALLED EQUIPMENT AND PACKAGE WIRING FURNISHED WITH THE HVAC EQUIPMENT.
3. THIS SPECIFICATION DEFINES THE MINIMUM EQUIPMENT AND PERFORMANCE REQUIREMENTS FOR A DIRECT DIGITAL CONTROL (DDC) BUILDING MANAGEMENT CONTROL SYSTEM (BMS). IT SHALL BE UNDERSTOOD THAT THE DRAWINGS AND SPECIFICATIONS DESCRIBE THE APPROXIMATE LOCATIONS OF THE WORK. DO NOT SCALE THE DRAWINGS TO DETERMINE EXACT POSITIONS AND CLEARANCES.
4. DETAILS OF CONSTRUCTION AND OF WORKMANSHIP WHERE NOT SPECIFICALLY DESCRIBED HEREIN OR INDICATED ON THE DRAWINGS SHALL BE SUBJECT TO THE ENGINEER'S OR OWNER'S APPROVAL. IT IS THE INTENT OF THESE SPECIFICATIONS TO PROVIDE COMPLETE SYSTEMS, LEFT IN GOOD WORKING ORDER, READY FOR OPERATION, INCLUDING NECESSARY LABOR AND MATERIALS, WHETHER OR NOT SPECIFICALLY SHOWN ON THE DRAWINGS OR MENTIONED HEREIN.

B. SYSTEM DESCRIPTION:
1. ALL CONTROL PROGRAMS INCLUDING FIELD LEVEL PROGRAMMING, WILL BE ACCESSIBLE, INCLUDING UPLOADING AND DOWNLOADING. NO PROPRIETARY (MANUFACTURER SPECIFIC) SOFTWARE SHALL BE REQUIRED TO CONFIGURE OR PROGRAM THE FIELD LEVEL CONTROLLERS.
2. THE ATC CONTRACTOR SHALL FURNISH AND INSTALL A FULLY INTEGRATED BUILDING AUTOMATION SYSTEM, INCORPORATING DDC FOR ENERGY MANAGEMENT, EQUIPMENT MONITORING AND CONTROL AS HEREIN SPECIFIED. THE SYSTEM SHALL INCLUDE, BUT NOT BE LIMITED TO; ALL REQUIRED COMPUTER SOFTWARE AND HARDWARE, CONTROLLERS, SENSORS, TRANSMISSION EQUIPMENT, SYSTEM WORKSTATIONS, LOCAL PANELS, CONDUIT, WIRE, INSTALLATION, ENGINEERING, DATABASE AND SETUP, SUPERVISION, COMMISSIONING, ACCEPTANCE TEST, TRAINING, WARRANTY SERVICE AND, AT THE OWNER'S OPTION, EXTENDED WARRANTY SERVICE.
3. THE ATC SHALL BE CAPABLE OF TOTAL INTEGRATION OF THE FACILITY INFRASTRUCTURE SYSTEMS WITH USER ACCESS TO ALL SYSTEM DATA EITHER LOCALLY OVER A SECURE INTRANET WITHIN THE BUILDING OR BY REMOTE ACCESS BY A STANDARD WEB BROWSER OVER THE INTERNET. SYSTEMS REQUIRING ADDITIONAL SOFTWARE (TO ENABLE A STANDARD WEB BROWSER TO BE RESIDENT ON A CLIENT MACHINE, OR MANUFACTURE-SPECIFIC BROWSERS SHALL NOT BE ACCEPTABLE.
4. WHERE APPLICABLE, THE ATC SHALL COMMUNICATE WITH THIRD PARTY SYSTEMS SUCH AS CHILLERS, BOILERS, AIR HANDLING SYSTEMS, ENERGY METERING SYSTEMS, OTHER ENERGY MANAGEMENT SYSTEMS, ACCESS CONTROL SYSTEMS, FIRE-LIFE SAFETY SYSTEMS, INDOOR AND OUTDOOR LIGHTING AND OTHER BUILDING MANAGEMENT RELATED DEVICES WITH OPEN, INTEROPERABLE COMMUNICATION CAPABILITIES. COORDINATE WITH THE WORK BY DIVISION 26, 27 & 28 TO PROVIDE NECESSARY ATC COMPONENTS TO SATISFY THE INTEGRATION OF ALL OTHER SYSTEMS.
5. ALL MATERIALS AND EQUIPMENT USED SHALL BE NEW, STANDARD COMPONENTS, REGULARLY MANUFACTURED FOR THIS AND/OR OTHER SYSTEMS AND NOT CUSTOM DESIGNED SPECIALLY FOR THIS PROJECT.
6. THE ATC SHALL POSSESS A MODULAR ARCHITECTURE, PERMITTING EXPANSION THROUGH THE ADDITION OF MORE DIRECT DIGITAL CONTROL PANELS (DDCP'S), TERMINAL EQUIPMENT CONTROLLERS (TEC'S), SENSORS, ACTUATORS, AND/OR OPERATOR TERMINALS.
7. THE CONTROLS SYSTEM SHALL BE DESIGNED AND IMPLEMENTED ENTIRELY FOR USE AND OPERATION ON THE INTERNET AND THE OWNER'S INTRANET. ALL ASPECTS OF THE CONTROLS SYSTEMS OPERATOR INTERFACE SHALL BE PROVIDED TO OPERATE THROUGH AN IT INDUSTRY STANDARD WEB BROWSERS SUCH AS INTERNET EXPLORER OR APPROVED EQUIVALENT. THE WEB BROWSER BASED OPERATOR INTERFACE PROVIDED SHALL NOT REQUIRE THE PROCUREMENT OR LICENSING OF ANY SPECIAL OR PROPRIETARY SOFTWARE FROM THE CONTROLS CONTRACTOR OR ITS SUPPLIERS FOR THE CONTROLS SYSTEMS OWS.
8. WHERE NECESSARY AND AS DICTATED ELSEWHERE IN THESE SPECIFICATIONS, SERVERS SHALL BE USED FOR THE PURPOSE OF PROVIDING A LOCATION FOR EXTENSIVE ARCHIVING OF SYSTEM CONFIGURATION DATA, AND HISTORICAL DATA SUCH AS TREND DATA AND OPERATOR TRANSACTIONS. ALL DATA STORED WILL BE THROUGH THE USE OF A STANDARD DATA BASE PLATFORM: MICROSOFT DATA ENGINE (MSDE) OR MICROSOFT SQL SERVER AS DICTATED ELSEWHERE IN THIS SPECIFICATION.
9. PROVIDE A COMPLETE, NEAT AND WORKMANLIKE INSTALLATION. USE ONLY EMPLOYEES WHO ARE SKILLED, EXPERIENCED, TRAINED, AND FAMILIAR WITH THE SPECIFIC EQUIPMENT, SOFTWARE, STANDARDS AND CONFIGURATIONS TO BE PROVIDED FOR THIS PROJECT.

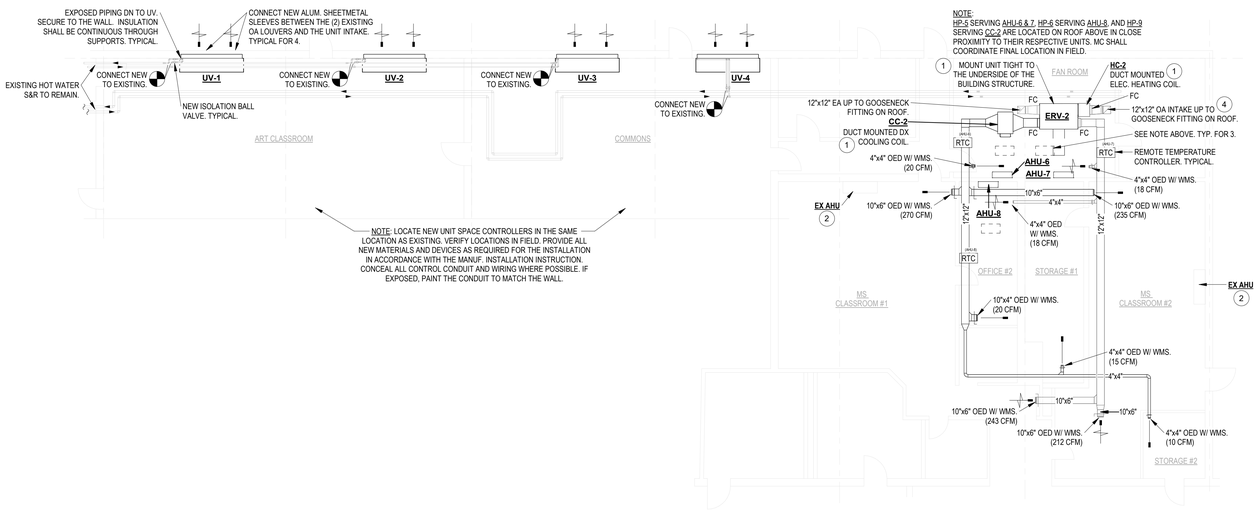
C. WIRING:
1. INSTALLATION OF THE ENTIRE BUILDING MANAGEMENT SYSTEM SHALL BE BY SKILLED ELECTRICIANS AND MECHANICS, ALL OF WHOM ARE PROPERLY LICENSED, TRAINED AND QUALIFIED FOR THIS WORK. ALL WIRING SHALL BE INSTALLED IN ACCORDANCE WITH DIVISION 26 ELECTRICAL SPECIFICATIONS.
2. SUPERVISION AND CHECKOUT OF THE SYSTEM SHALL BE BY LOCAL BRANCH ENGINEERS AND TECHNICIANS DIRECTLY EMPLOYED BY THE CONTROL CONTRACTOR
3. POWER WIRING FOR THE DDCP'S AND TEC'S SHALL BE PROVIDED BY THE ATC CONTRACTOR FROM THE NEAREST POWER PANEL FOR THIS PURPOSE.
4. ELECTRICAL WIRING FOR THE ATC SHALL BE PERFORMED BY QUALIFIED ELECTRICIANS DIRECTLY SUBCONTRACTED BY THE CONTROL CONTRACTOR.

D. SYSTEM TURNOVER AND SERVICE:
1. UPON COMPLETION OF THE INSTALLATION, THE ATC CONTRACTOR SHALL START UP THE SYSTEM AND PERFORM ALL NECESSARY TESTING AND RUN DIAGNOSTICS TO ENSURE PROPER OPERATION. AN ACCEPTANCE TEST IN THE PRESENCE OF THE OWNER REPRESENTATIVE SHALL BE PERFORMED. THE ACCEPTANCE TEST SHALL CONSIST OF A POINT-TO-POINT CHECKOUT WITHIN EACH DDCP TO INSURE PROPER OPERATION OF ALL SYSTEM COMPONENTS.
2. WHEN THE SYSTEM PERFORMANCE IS DEEMED SATISFACTORY IN WHOLE OR IN PART BY THESE OBSERVERS, THE SYSTEM PARTS WILL BE ACCEPTED FOR BENEFICIAL USE AND PLACED UNDER WARRANTY.
3. PROBLEMS WHICH OCCUR WITHIN THE PROVIDED HARDWARE



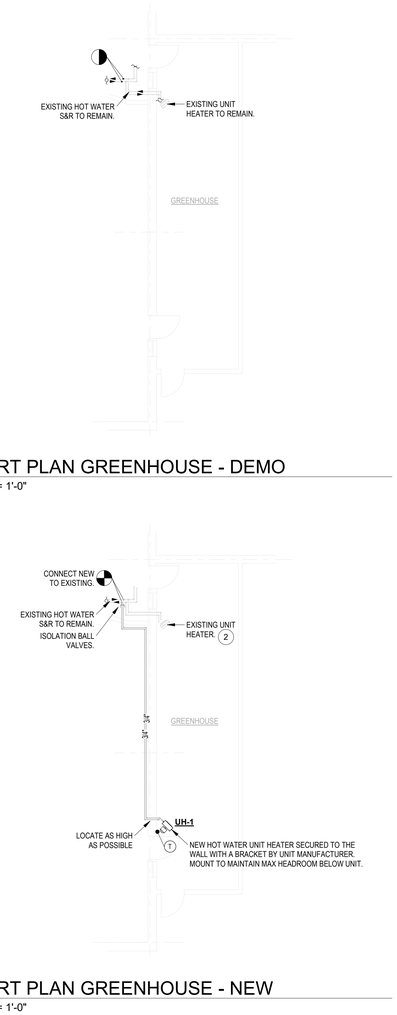
3 PART PLAN ART ROOM, COMMONS AND LOCKROOM CLASSROOM - DEMO
1/8" = 1'-0"

4 PART PLAN ART ROOM, COMMONS AND LOCKROOM CLASSROOM - NEW
1/8" = 1'-0"



1 PART PLAN GREENHOUSE - DEMO
1/8" = 1'-0"

2 PART PLAN GREENHOUSE - NEW
1/8" = 1'-0"



MECHANICAL GENERAL NOTES:

1. ALL COMBINATION FIRE/SMOKE AND FIRE DAMPERS SHALL BE PROVIDED WITH DUCT ACCESS DOORS OF ADEQUATE SIZE TO PROVIDE SERVICE AND MAINTENANCE. WHERE THE DAMPERS ARE IN INACCESSIBLE LOCATIONS, COORDINATE THE LOCATIONS OF THE DAMPERS AND THEIR RESPECTIVE DUCT ACCESS DOORS WITH THE GENERAL CONTRACTOR TO PROVIDE ACCESS DOORS IN FINISHED SURFACES - MIN. 18"x18". WHERE THE CONSTRUCTION ASSEMBLY HAS A FIRE RATING, THE ACCESS DOORS SHALL BE RATED TO MATCH.
2. PROVIDE CABLE OPERATED VOLUME DAMPERS (COD) AT ALL LOCATIONS WHERE THE DAMPER IS LOCATED BEHIND AN INACCESSIBLE ASSEMBLY. THE MECHANICAL CONTRACTOR SHALL COORDINATE THE LOCATION OF THE OPERATORS TO ALLOW FOR CONVENIENT OPERATION, INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS INSTALLATION INSTRUCTIONS.
3. USE OF COMBUSTIBLE MATERIALS IS NOT ALLOWED IN THE RETURN AIR PLENUM. MATERIALS USED IN THE PLENUM SHALL HAVE A FLAME SPREAD RATING NOT TO EXCEED 25, AND A SMOKE DEVELOPED RATING NOT TO EXCEED 50 WHEN TESTED IN ACCORDANCE WITH ASTM E 84. ALL EXPOSED WIRING IN THE PLENUM SHALL BE PLENUM RATED.
4. ALL SIDEWALL VENT TERMINATIONS SHALL BE NO LESS THAN 3 FEET FROM ALL OPERABLE BUILDING OPENINGS. VERIFY DISTANCE IN FIELD. COORDINATE ALL SIDEWALL VENT LOCATIONS WITH ARCHITECT'S ELEVATIONS.
5. PROVIDE NECESSARY LOW VOLTAGE WIRING, POWER SUPPLIES TO CONTROLLER, & TRANSFORMERS TO SUPPLY POWER TO THE REMOTE SENSORS AS REQUIRED BY MANUFACTURER.

MECHANICAL KEY NOTES:

(NOT ALL KEY NOTES MAY APPEAR ON ALL SHEETS)

1. SUSPEND EQUIPMENT ON GALV. THREADED STEEL WITH SPRING TYPE VIBRATION ISOLATORS. LOCATE RODS AT ALL UNIT MOUNTING LOCATIONS IN ACCORDANCE WITH THE MANUF. WRITTEN INSTALLATION INSTRUCTIONS. ALL SUPPORTS SHALL BE SECURELY CONNECTED TO THE BUILDING STRUCTURAL STEEL. PROVIDE ADDITIONAL MISC. GALV. STEEL SUPPORTS TO ACCOMMODATE INSTALLATION AS REQUIRED. REFER TO DETAIL ON THE MS SERIES DWGS.
2. EXISTING UNITS TO REMAIN SHALL OPERATE AND BE CONTROLLED AS ORIGINAL.
3. THE ENERGY RECOVERY VENTILATOR SYSTEM SHALL BE ENERGIZED AND OPERATE CONTINUOUSLY WHENEVER THE BUILDING IS IN OCCUPIED MODE AND SCHEDULED WITH THE OPERATIONS OF THEIR RESPECTIVE HVAC SYSTEMS ASSOCIATED IN THEIR ZONES.
4. THE OUTDOOR AIR INTAKES SHALL BE SEPARATED BY A MIN. OF 10' HORIZONTALLY FROM A BUILDING EXHAUST OR PLUMBING VENT DISCHARGE. COORDINATE EXACT LOCATION IN THE FIELD.

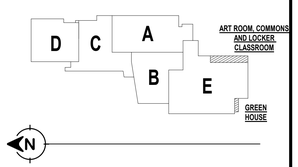
DEMOLITION PLAN GENERAL NOTES:

1. THE CONTRACTOR SHALL VISIT THE SITE AND ADJOINING AREAS, EXAMINE, AND BE FAMILIAR WITH ALL EXISTING CONDITIONS AND DETERMINE THE IMPACT ON THE EXECUTION OF WORK OF THIS CONTRACT. THE CONTRACTOR SHALL PERFORM THIS PRIOR TO THE SUBMISSION OF HIS PROPOSAL. SUBMISSION OF PROPOSAL WILL BE CONSTRUED AS EVIDENCE THAT SUCH AN EXAMINATION HAS BEEN MADE AND LATER CLAIMS WILL NOT BE RECOGNIZED FOR EXTRA LABOR, EQUIPMENT OR MATERIALS REQUIRED BECAUSE OF DIFFICULTIES ENCOUNTERED WHICH COULD HAVE BEEN FORESEEN HAD SUCH AN EXAMINATION BEEN MADE.
2. WHERE THE PROJECT REQUIRES PHASING, IT MAY BE NECESSARY FOR CORRESPONDING PHASED DEMOLITION WORK TO BE PERFORMED. CARE MUST BE TAKEN TO INSURE ACTIVE AREAS OUTSIDE THE CURRENT DEMOLITION PHASE REMAIN UNAFFECTED BY THIS WORK WITH NO/INTERRUPTION OF SERVICE(S). INCLUDE ALL NECESSARY PREMIUM TIME TO PERFORM EACH PHASE OF DEMOLITION. REFER TO THE ARCHITECTURAL DRAWINGS FOR INFORMATION THAT DEFINES THE PROJECT PHASING.
3. CONTRACTORS SHALL TAKE SPECIAL CARE TO DEMOLISH ONLY THAT WORK WHICH IS REQUIRED TO BE DEMOLISHED AND NOT TO DISTURB ANY WORK WHICH IS TO REMAIN. IF IN THE COURSE OF THE DEMOLITION, THE CONTRACTOR DESTROYS OR DISTURBS ANY WORK WHICH IS TO REMAIN, THEN HE SHALL, AT HIS OWN EXPENSE, REPAIR OR REPLACE SUCH WORK AS NECESSARY.
4. THE DEMOLITION WORK SHALL INCLUDE PROVIDING ALL MATERIALS AND LABOR FOR: EXTENSIONS, CONNECTIONS, CUTTING, PATCHING, REPAIRING, ELECTRICAL WORK, AND TEMPORARY CONNECTIONS REQUIRED TO MAINTAIN SERVICE PENDING THE COMPLETION OF THE PERMANENT WORK. NOTES AND GRAPHIC REPRESENTATION SHALL NOT LIMIT THE EXTENT OF DEMOLITION REQUIRED. EXTENT OF THE DEMOLITION WORK SHALL BE COORDINATED WITH THE ARCHITECT.
5. PRIOR TO ANY WORK BEING PREFORMED, THIS CONTRACTOR SHALL COORDINATE WITH ALL APPROPRIATE TRADES AND BUILDING MANAGEMENT TO ENSURE THAT WORK WILL BE IN HARMONY WITH OTHER WORK AND NOT AFFECT ANY EXISTING BUILDING SYSTEMS. THIS WORK MUST BE APPROVED BY BUILDING MANAGEMENT PRIOR TO PROCEEDING.
6. GENERAL CONTRACTOR TO REMOVE ALL CEILING IN AREAS WHERE NEW WORK IS TO BE INSTALLED OR EXISTING IS ALTERED, AS PER ARCHITECT'S INSTRUCTIONS.
7. THE CONTRACTOR SHALL DOCUMENT ALL EXISTING DUCTWORK, PIPING, FEEDERS, LOW VOLTAGE CONTROL WIRING, ETC… , WHICH PASS THROUGH THE DEMOLITION SPACE SERVICING EXISTING OCCUPIED ADJOINING AREAS. ANY EXISTING WORK REQUIRED TO REMAIN BUT INTERFERING WITH NEW WORK SHALL BE RELOCATED AND RECONNECTED USING LIKE MATERIALS AND METHODS OF THE EXISTING SERVICE AND SHALL CONFORM TO STANDARDS OF THIS CONTRACT. THIS WORK MAY NOT BE REPRESENTED IN THE DRAWINGS, BUT SHOULD BE TAKEN INTO ACCOUNT BY THE CONTRACTOR IN HIS PROPOSAL. COORDINATE WITH BUILDING MANAGEMENT PRIOR TO ANY SHUTDOWN OR DISRUPTION OF SERVICES THAT MAY BE REQUIRED TO ACCOMPLISH THIS WORK.
8. EQUIPMENT REQUIRED TO BE TEMPORARILY DISCONNECTED AND RELOCATED SHALL BE CAREFULLY REMOVED, STORED, CLEANED, REINSTALLED, RECONNECTED AND MADE OPERATIONAL.
9. ALL NECESSARY CUTTING AND PATCHING TO ACCOMMODATE THE NEW HVAC WORK SHALL BE PREFORMED BY THIS CONTRACTOR AND COORDINATED WITH BUILDING MANAGEMENT SO AS TO MINIMIZE DISRUPTION OF EXISTING TENANTS AND SERVICES. RESTORE ALL ITEMS TO MATCH EXISTING CONDITIONS.
10. PROVIDE ADDITIONAL SUPPORT FOR ALL EXISTING DUCTWORK, PIPING, CONDUITS, LOW VOLTAGE CABLING AND DEVICES TO REMAIN, WHICH ARE AFFECTED BY DEMOLITION OF EXISTING CEILING AND PARTITIONS.
11. PROTECT THE INTEGRITY OF ALL ITEMS (I.E. EQUIPMENT, DUCTWORK, PIPING, FINTUBE ENCLOSURE, INSULATION, ETC…) THAT ARE INDICATED TO REMAIN. MAINTAIN THE FULL FUNTIONALITY OF ALL ITEMS THAT ARE TO REMAIN. REPLACE AND/OR REPAIR ANY DAMAGE TO THE ABOVE MENTIONED ITEMS RESULTING FROM THEIR WORK. WHERE ITEMS THAT ARE INDICATED TO REMAIN ARE NOT IN PROPER WORKING ORDER PRIOR THE THE START OF THE MC'S WORK, REPORT ANY ISSUES IMMEDIATELY TO THE ENGINEER OF RECORD AND THE OWNER'S REPRESENTATIVE. UNLESS OTHERWISE NOTED, REMOVE CONDUIT AND WIRING TO POINTS OF ORIGIN WITHIN THE DESIGNATED AREA OF CONSTRUCTION FOR ALL EXISTING EQUIPMENT TO BE REMOVED.
12. ANY DEMOLITION MATERIALS, EQUIPMENT, ETC… REQUIRED TO BE TURNED OVER TO THE OWNER SHALL BE PLACED IN A MUTUALLY ACCEPTABLE LOCATION. THE ITEMS TO BE TURNED OVER AND LOCATION FOR THEIR STORAGE SHALL BE COORDINATED WITH THE OWNER'S REP. OTHERWISE, THE DEMOLITION MATERIALS SHALL BE REMOVED FROM THE BUILDING AFTER REGULAR BUSINESS HOURS AND SHALL BE TAKEN OFF-SITE NO LATER THAN THE START OF THE NEXT BUSINESS DAY. NO DEBRIS SHALL BE ALLOWED TO ACCUMULATE ON THE SITE. THE CONSTRUCTION SITE SHALL BE SWEPT CLEAN EACH DAY AND NO DUST OR DEBRIS SHALL BE PERMITTED TO ENTER THE AREA DRAINS SERVING THE BUILDING.
13. ALL MATERIALS AND EQUIPMENT SLATED TO BE REMOVED AND IS NOT DESIGNATED TO BE TURNED OVER TO THE OWNER, SHALL BE TAKEN FROM THE SITE AND DISPOSED OF IN ACCORDANCE WITH APPLICABLE LAWS AND ENVIRONMENTAL REGULATIONS. EQUIPMENT REQUIRED TO BE TURNED OVER TO THE OWNER SHALL BE PLACED IN A MUTUALLY ACCEPTABLE LOCATION (COORDINATE LOCATION AND EQUIPMENT WITH OWNER).
14. WHERE PORTIONS OF ANY EXISTING SERVICE IS TO BE DEMOLISHED, THE CONTRACTOR SHALL PROVIDE A TEMPORARY CAP TO THE EXISTING SERVICE AND MAKE SAFE ANY UNPROTECTED, EXPOSED ELECTRICAL WIRING AT POINT OF DEMOLITION. CAPS SHALL BE AIRTIGHT OR WATERTIGHT DEPENDING ON TYPE OF SERVICE.

DEMOLITION PLAN KEY NOTES:

1. THE EXISTING HVAC AND ITS APPURTENANCES THEREOF SHALL BE REMOVED IN THEIR ENTIRETY INCLUDING BUT NOT LIMITED TO: UNIT, TEMPERATURE CONTROLS, DUCTWORK, RGDs, PIPING, SUPPORTS, LOW AND LINE VOLTAGE WIRING, ETC.... UNLESS OTHERWISE NOTED.
   - WHERE DUCTS AND/OR PIPING PENETRATE THE ROOF, REMOVE ALL ITEMS, (I.E. EQUIPMENT, DUCTS, PIPING, ROOF CURBS, PENETRATIONS, GOOSENECK FITTINGS, ETC...) AND PATCH ROOF OPENINGS WEATHERTIGHT TO MATCH EXISTING MATERIALS.
   - HYDRONIC PIPING RUNOUTS SHALL BE REMOVED AS SHOWN ON PLANS OR BACK TO THEIR RESPECTIVE MAINS. WHERE BRANCH RUNOUT TAPS ARE NOT TO BE REUSED, PROVIDE AN ISOLATION BALL TYPE VALVE W/ CAP FOR FUTURE USE.
   - WIRING SHALL BE REMOVED BACK TO THEIR POINT OF ORIGIN. COORDINATE WITH DIV. 26 FOR ADDITIONAL INFO.
   - WHERE RDGs ARE REMOVED AND/OR CEILING TILES ARE DAMAGED IN THE REMOVAL PROCESS OF ANY DEMO ITEM(S), PROVIDE NEW CEILING TILES TO MATCH EXISTING. COORDINATE WITH THE G.C.

KEY PLAN



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HVAC UPGRADES TO THE EAST GRANBY MIDDLE/HIGH SCHOOL
95 SOUTH MAIN ST., EAST GRANBY, CT

REVISIONS

NO	DATE	DESCRIPTION

Designed:	PMS
Drawn:	PMS
Reviewed:	JV
Project No.:	2301734
Date:	03/11/2024
Issued for:	100% CONSTRUCTION DOCUMENTS

Title: ENLARGED MECHANICAL PLANS

Sheet No.: M401

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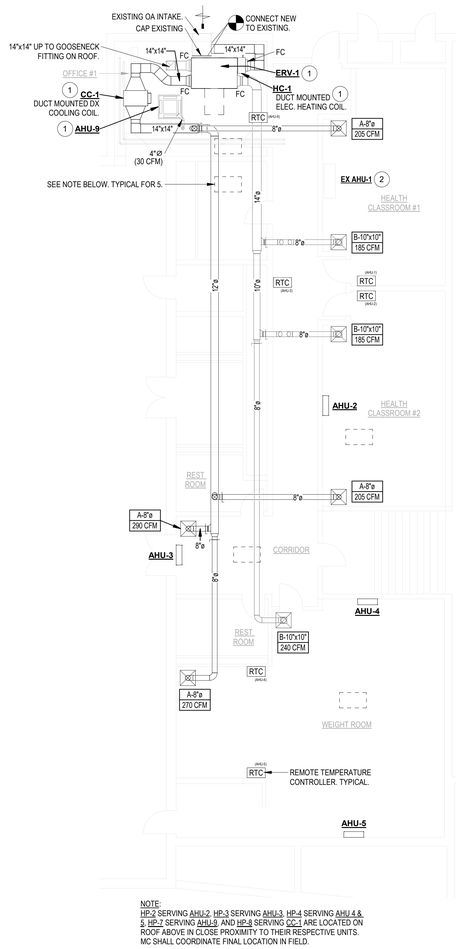
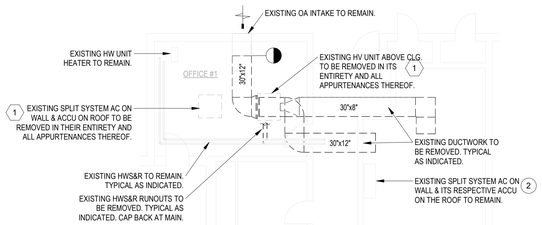


NOTE:
HP-2 SERVING AHU-2, HP-3 SERVING AHU-3, HP-4 SERVING AHU 4 & 5, HP-7 SERVING AHU-9, AND HP-8 SERVING CC-1 ARE LOCATED ON ROOF ABOVE IN CLOSE PROXIMITY TO THEIR RESPECTIVE UNITS. MC SHALL COORDINATE FINAL LOCATION IN FIELD.

2 PART PLAN LOWER LEVEL HEALTH CLASSROOMS & WEIGHT ROOM - NEW
1/8" = 1'-0"



1 PART PLAN LOWER LEVEL HEALTH CLASSROOMS & WEIGHT ROOM - DEMO
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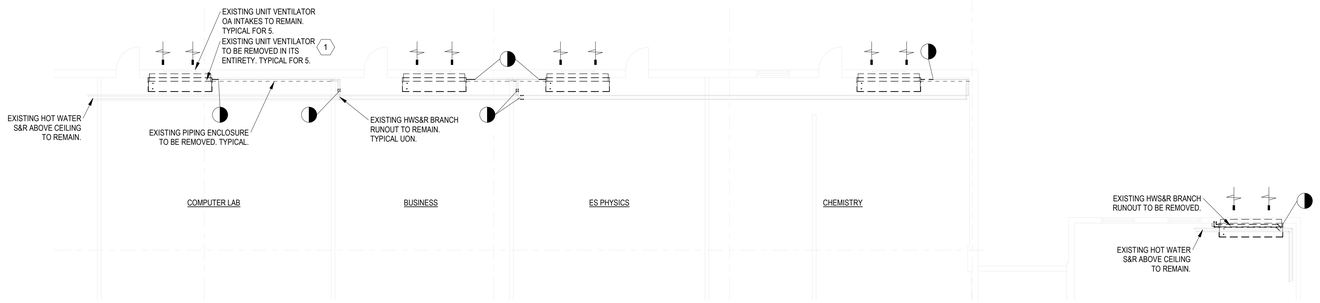

3 PART PLAN LOWER LEVEL CLASSROOMS - DEMO
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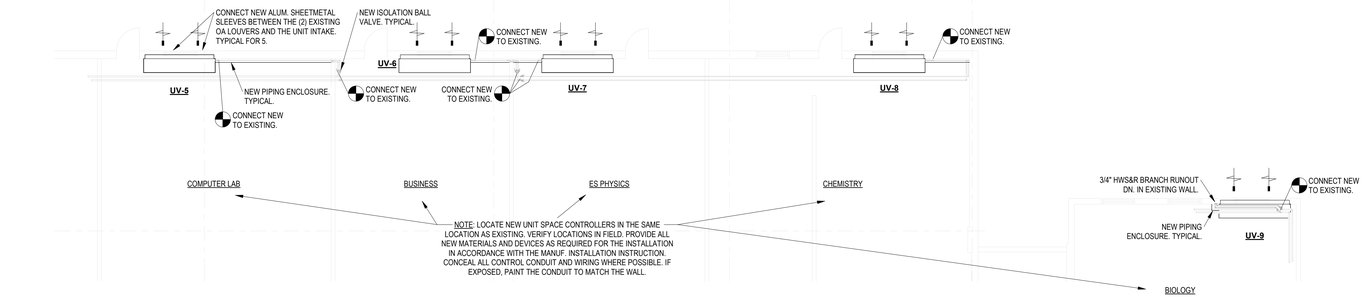

4 PART PLAN LOWER LEVEL CLASSROOMS - NEW
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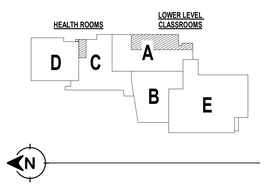
KEY PLAN



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HVAC UPGRADES TO THE EAST GRANBY MIDDLE/HIGH SCHOOL
95 SOUTH MAIN ST., EAST GRANBY, CT

REVISIONS

NO	DATE	DESCRIPTION

Designed:	PMS
Drawn:	PMS
Reviewed:	JV
Project No.:	2301734
Date:	03/11/2024

Issued for:
100% CONSTRUCTION DOCUMENTS

Title:
ENLARGED MECHANICAL PLANS

Sheet No.
M402

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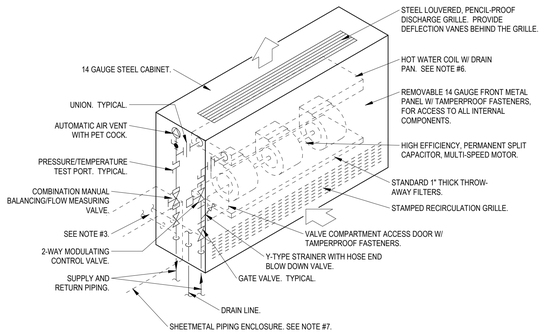
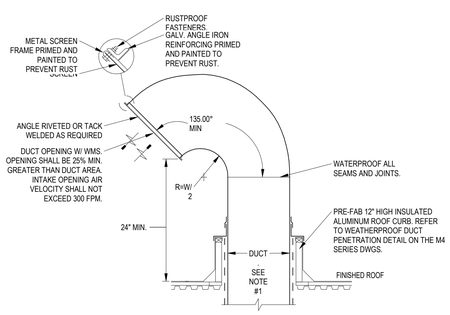


NOTES:
1. ALL PIPE, FITTINGS AND VALVES SHALL BE WITHIN CABINET ENCLOSURE AND SHALL BE PROVIDED WITH INSULATION. REFER TO SPECIFICATION FOR ADDITIONAL INFORMATION.
2. VERTICAL, FLOOR MOUNTED UNIT VENTILATOR IS INDICATED. PIPING ARRANGEMENT IS TYPICAL FOR ALL UNIT VENTILATOR CONFIGURATIONS. REFER TO FLOOR PLANS AND SCHEDULE FOR ALTERNATE UNIT CONFIGURATIONS.
3. ALTERNATE LOCATION OF SUPPLY AND RETURN PIPING, REFER TO FLOOR PLANS. THE MECHANICAL CONTRACTOR SHALL COORDINATE EXACT LOCATION.
4. LOCATE ALL PIPE FITTINGS AND VALVES, IN THE VALVE COMPARTMENT, OVER THE SECONDARY DRAIN PAN.
5. THE UNIT IS PIPED "LEFT HAND" AS INDICATED. THE MECHANICAL CONTRACTOR SHALL COORDINATE PIPING ORIENTATION, EITHER LEFT OR RIGHT HAND, FOR EACH UNIT.
6. PROVIDE A PRIMARY DRAIN PAN FOR THE COIL AND A SECONDARY DRAIN PAN IN THE VALVE COMPARTMENT. THE PANS SHALL BE DOUBLE PITCHED AND INSULATED W/ A VAPOR PROOF INSULATION. THE DRAIN PANS SHALL BE REMOVABLE FOR CLEANING.
7. PROVIDE A FACTORY FABRICATED SHEETMETAL PIPING ENCLOSURE TO CONCEAL EXPOSED HORIZ. PIPING ENTERING THROUGH A UNIT END PANEL. INSTALL IN ACCORDANCE WITH THE UV MANUFACTURER'S INSTRUCTIONS. COORDINATE WITH THE UV MANUFACTURER. ENCLOSURE COLOR TO MATCH THE UNIT VENTILATOR.

10 UNIT VENTILATOR - 2 PIPE
NOT TO SCALE

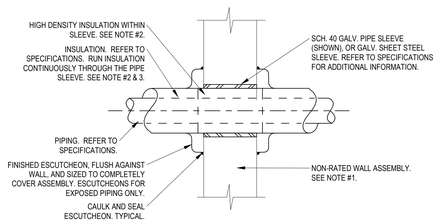
NOTES:
1. WHERE THE UNIT IS LOCATED ABOVE AN INACCESSIBLE CEILING, PROVIDE ACCESS DOORS IN THE FINISHED SURFACE SIZED LARGE ENOUGH TO ALLOW FOR THE PROPER MAINTENANCE PER THE MANUFACTURE'S INSTALLATION AND OPERATING MANUAL (IOM). ACCESS SHALL ALSO BE PROVIDED TO THE UNIT'S APPURTENANCES (I.E. CONDENSATE PUMPS, CONTROL VALVES, ETC.), WHERE APPLICABLE.
2. DO NOT CONNECT OR SECURE THE UNIT SUPPORTS INTO ROOF DECKS OR CONCRETE SLABS. PROVIDE MISC. GALV. STEEL COMPONENTS, AS REQUIRED, DESIGNED TO WITHSTAND THE UNIT'S OPERATING WEIGHTS AND SECURE TO THE BUILDING'S STRUCTURAL STEEL. TYPICAL. REFER TO "TYPICAL METHOD OF SECURING HANGER RODS DETAIL" FOR ATTACHING FAN TO BUILDING STRUCTURE.
3. INSTALL SEISMIC RESTRAINT CABLE PER SMACNA SEISMIC RESTRAINT MANUAL-GUIDELINES FOR MECHANICAL SYSTEMS.

11 SUSPENDED AC UNIT - DUCTED - ABOVE CEILING
NOT TO SCALE



NOTE:
1. REFER TO FLOOR PLANS FOR SIZING AND LOCATIONS. ALL INTAKE AIR DUCTWORK AND ALL APPURTENANCES THEREOF SHALL BE ALUMINUM. ALL EXHAUST AIR DUCTWORK AND ALL APPURTENANCES THEREOF SHALL BE GALVANIZED.

12 GOOSENECK
NOT TO SCALE

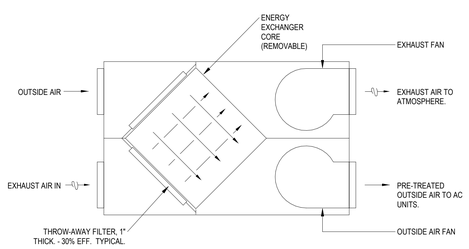


NOTES:
1. REFER TO THE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR WALL ASSEMBLY CONSTRUCTION.
2. WHERE FLUID CONVEYED THROUGH PIPING IS BELOW AMBIENT TEMP. ALL SEAMS AND JOINTS IN THE INSULATION SHALL BE SEALED TO ENSURE A CONTINUOUS VAPOR BARRIER. REFER TO SPECIFICATIONS.
3. WHERE PIPING IS REQUIRED TO BE INSULATED, PROVIDE MAX 2 IN. THICK HOLLOW CYLINDRICAL HEAVY DENSITY (MIN 3.5 PCF) GLASS FIBER UNITS, JACKETED ON THE OUTSIDE WITH AN ALL-SERVICE JACKET. LONGITUDINAL JOINTS SEALED WITH FACTORY APPLIED SELF-SEALING LAP TAPE. TRANSVERSE JOINTS SECURED WITH BUTT TAPE SUPPLIED WITH THE PRODUCT. THE PIPE COVERING SHALL MEET THE ABOVE CRITERIA AND BEAR THE UL CLASSIFICATION MARKING WITH A FLAME SPREAD AND SMOKE DEVELOPED INDEX AS NOTED IN THE SPECIFICATIONS.
4. PIPING SHALL BE SUPPORTED ON EITHER SIDE OF WALL. PIPE SUPPORTS SHALL BE COMPLETELY INDEPENDENT OF WALL.

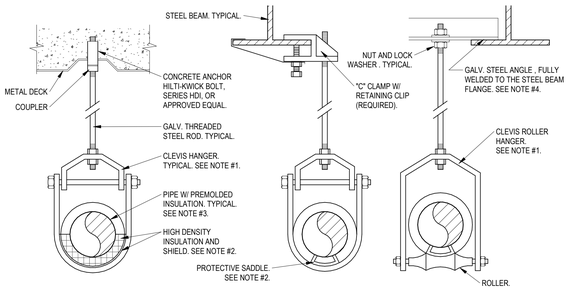
7 PIPING PENETRATIONS AT INTERIOR NON-RATED WALLS
NOT TO SCALE

NOTES:
1. REFER TO THE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR WALL ASSEMBLY CONSTRUCTION.
2. BASED ON THE WALL ASSEMBLY AND ITS RATING, THE MECHANICAL CONTRACTOR SHALL COORDINATE THE FIRE STOP SYSTEM REQUIREMENTS IN STRICT ACCORDANCE WITH THE UL FIRE RESISTANCE DIRECTORY. REFER TO SPECIFICATIONS, DIVISION 7, FOR ADDITIONAL INFORMATION.
3. MIN. 4 PCF MINERAL WOOL BATT INSULATION FIRMLY PACKED INTO OPENING AS A PERMANENT FORM. THICKNESS IS BASED ON ASSEMBLY RATING. REFER TO NOTE #2. PACKING MATERIAL TO BE RECESSED FROM BOTH SURFACES OF WALL AS REQUIRED TO ACCOMMODATE THE REQUIRED THICKNESS OF FILL MATERIAL.
4. MIN 1 IN. THICKNESS OF FILL MATERIAL APPLIED WITHIN THE ANNULUS, FLUSH WITH BOTH ENDS OF STEEL SLEEVE. WHEN SLEEVE PROJECTS BEYOND SURFACE OF WALL, A BEAD OF CAULK SHALL BE APPLIED TO OUTER PERIMETER OF SLEEVE AT INTERFACE WITH WALL SURFACES. COORDINATE THICKNESS OF BEAD TO SUIT THE FIRE STOP SYSTEM REQUIRED FOR THE ASSEMBLY BEING PENETRATED. REFER TO NOTE #2.
5. WHERE FLUID CONVEYED THROUGH PIPING IS BELOW AMBIENT TEMP. ALL SEAMS AND JOINTS IN THE INSULATION SHALL BE SEALED TO ENSURE A CONTINUOUS VAPOR BARRIER. REFER TO SPECIFICATIONS.
6. WHERE PIPING IS REQUIRED TO BE INSULATED, PROVIDE MAX 2 IN. THICK HOLLOW CYLINDRICAL HEAVY DENSITY (MIN 3.5 PCF) GLASS FIBER UNITS, JACKETED ON THE OUTSIDE WITH AN ALL-SERVICE JACKET. LONGITUDINAL JOINTS SEALED WITH FACTORY APPLIED SELF-SEALING LAP TAPE. TRANSVERSE JOINTS SECURED WITH BUTT TAPE SUPPLIED WITH THE PRODUCT. THE ANNULAR SPACE BETWEEN THE PENETRATING ITEM AND THE PERIPHERY OF THE OPENING SHALL BE MIN 1/4 IN. TO MAX 2 IN. THE PIPE COVERING SHALL MEET THE ABOVE CRITERIA AND BEAR THE UL CLASSIFICATION MARKING WITH A FLAME SPREAD AND SMOKE DEVELOPED INDEX AS NOTED IN THE SPECIFICATIONS.
7. PIPING SHALL BE SUPPORTED ON EITHER SIDE OF WALL. PIPE SUPPORTS SHALL BE COMPLETELY INDEPENDENT OF WALL.

8 PIPING PENETRATIONS AT INTERIOR RATED WALLS
NOT TO SCALE



9 ENERGY RECOVERY VENTILATOR ARRANGEMENT
12" = 1'-0"

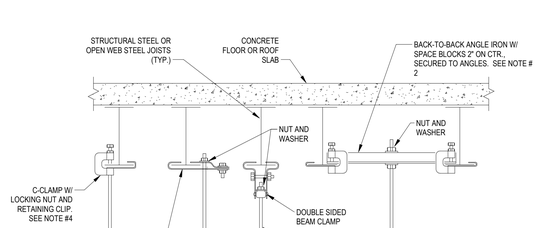


HANGER ROD SPACING (STEEL PIPE)												
PIPE SIZE (IN.)	UP TO 1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	5"	6"	8"	10"	12"
MAX ALLOWABLE SPACING (FT)	7	8	9	10	11	12	14	16	17	19	20	23

HANGER ROD SCHEDULE (STEEL PIPE)			
PIPE SIZE	ROD SIZE	PIPE SIZE	ROD SIZE
UP TO 2"	3/8" DIA.	4" THRU 5"	5/8" DIA.
2-1/2" THRU 3"	1/2" DIA.	6" THRU 12"	7/8" DIA.

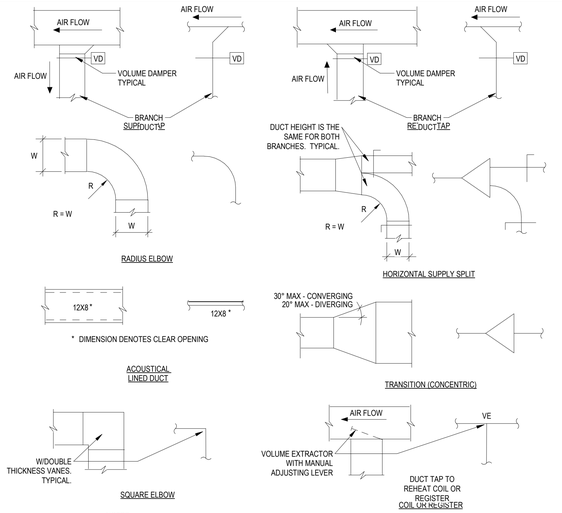
NOTES:
1. CLEVIS HANGERS REQUIRED ON PIPING LARGER THAN 1". GENERAL PURPOSE HANGERS MAY BE USED ON PIPING 1" OR SMALLER.
2. FOR ALL INSULATED PIPING: PROVIDE SEMI-CYLINDRICAL GALVANIZED INSULATION SHIELD AND HIGH DENSITY INSULATION FOR PIPES UP TO 2", OR PROTECTIVE PIPE SADDLE FOR PIPES 2.5" & OVER. SHIELD AND HD INSULATION SHALL BE A MIN. OF 12" LONG, CENTERED ON HANGER.
3. FOR PIPING SYSTEMS CONVEYING FLUIDS BELOW AMBIENT CONDITIONS, PROVIDE A CONTINUOUS A CONTINUOUS VAPOR BARRIER AROUND ALL INSULATION. INSULATE THE CAVITIES OF ALL PROTECTIVE SADDLES AND CAULK AT ALL JOINTS TO ENSURE THE VAPOR BARRIER INTEGRITY. REFER TO SPECIFICATIONS FOR APPROVED VAPOR BARRIER AND CAULKING.
4. THE STEEL ANGLE/CHANNEL SHALL BE SIZED BY A CONTRACTOR DELEGATED DESIGN. THE TOTAL WEIGHT AT EACH HANGER SHALL INCLUDE, BUT NOT LIMITED TO: THE WEIGHT OF THE PIPE WITH LIQUID, INSULATION, SHIELDS, SADDLES, PIPING SUPPORT COMPONENTS, ETC...

5 PIPE HANGER - CLEVIS
NOT TO SCALE



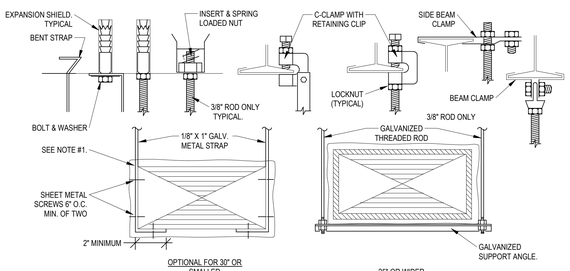
NOTES:
1. FOR CEILING SUSPENDED EQUIPMENT PROVIDE MIN. 3/8" DIA. HANGER ROD (REFER TO MANUFACTURERS INSTALLATION INSTRUCTIONS).
2. FOR PIPES UNDER 2" USE A SINGLE 1-1/2"x1-1/2"x1/4" ANGLE IRON WITH C-CLAMP. FOR PIPES 2-1/2" AND LARGER USE 3"x3"x1/4" ANGLE IRON BACK TO BACK AS SHOWN.
3. REPAIR OF FIREPROOFING IN ORDER TO FACILITATE THE INSTALLATION OF HANGER RODS IN EXISTING CONSTRUCTION SHALL BE BY THE G.C.
4. USE OF C-CLAMPS AND SIDE BEAM CLAMPS IS LIMITED TO PIPING 2-1/2" AND UNDER.

4 TYPICAL METHOD OF SECURING HANGER RODS TO STRUCTURAL STEEL
NOT TO SCALE



NOTES:
1. SPECIFICATIONS EXCEED SMACNA STANDARDS IN SOME INSTANCES.
2. SMACNA SHALL BE CONSIDERED THE MINIMUM STANDARD UNLESS OTHERWISE INDICATED.

1 RECTANGULAR DUCT CONSTRUCTION
NOT TO SCALE

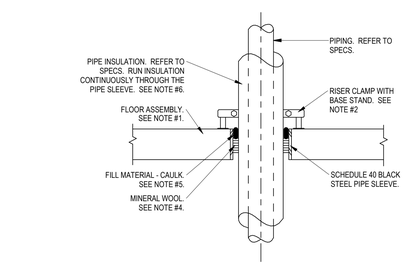


DUCT WIDTH	ROD DIA.	SUPPORT ANGLE OR EQUIV. CHANNEL	MAXIMUM SPACING	MAXIMUM AREA *
UP TO 30"	3/8"	1 1/2" X 1 1/2" X 1/8"	8'-0" O.C.	4 SQ. FT.
31" TO 42"	3/8"	1 1/2" X 1 1/2" X 1/8"	6'-0" O.C.	10 SQ. FT.
43" TO 60"	1/2"	1 1/2" X 1 1/2" X 1/8"	6'-0" O.C.	10 SQ. FT.
61" TO 84"	1/2"	2" X 2" X 1/4"	4'-0" O.C.	--------
85" AND UP	1/2"	2" X 2" X 1/4"	4'-0" O.C.	--------

* REDUCE SPACING TO NEXT SMALLER INTERVAL IF DUCT AREA EXCEEDS MAXIMUM.

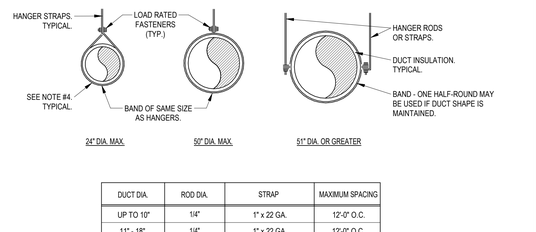
NOTES:
1. HANGERS MUST NOT DEFORM DUCT SHAPE.
2. STRAPS AND RODS SHALL BE GALV. STEEL.
3. WHERE HANGERS ARE INSTALLED UNDER THE INSULATION AND PENETRATE THROUGH THE INSULATION, SEAL ALL PENETRATIONS WITH APPROVED SEALING MASTIC. BUILD-UP MASTIC AT BASE (PENETRATION) AND EXTEND AND TAPER BEYOND PENETRATION TO A MIN. OF 6".

2 RECTANGULAR DUCT SUPPORT
NOT TO SCALE



NOTES:
1. REFER TO THE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR EXACT FLOOR ASSEMBLY CONSTRUCTION.
2. PROVIDE THE APPROPIATE PIPE SUPPORTS TO ALLOW FOR THE SEPARATION OF DISSIMILAR METALS BETWEEN THE PIPE AND PIPING SUPPORTS. SEAL ALL PENTRATIONS THROUGH THE INSULATION TO MAINTAIN INTEGRITY OF THE VAPOR BARRIER.
3. BASED ON THE FLOOR ASSEMBLY AND ITS RATING, THE MECHANICAL CONTRACTOR SHALL COORDINATE THE FIRE STOP SYSTEM REQUIREMENTS IN STRICT ACCORDANCE WITH THE UL FIRE RESISTANCE DIRECTORY. REFER TO SPECIFICATIONS, DIVISION 7, FOR ADDITIONAL INFORMATION.
4. MIN. 4 PCF MINERAL WOOL BATT INSULATION FIRMLY PACKED INTO OPENING AS A PERMANENT FORM. THICKNESS IS BASED ON ASSEMBLY RATING. SEE NOTE #3. PACKING MATERIAL TO BE RECESSED FROM TOP SURFACE OF THE FLOOR AS REQUIRED TO ACCOMMODATE THE REQUIRED THICKNESS OF FILL MATERIAL.
5. MIN 1 IN. THICKNESS OF FILL MATERIAL APPLIED WITHIN THE ANNULUS, FLUSH WITH TOP SURFACE OF THE FLOOR. REFER TO NOTE #3.
6. MAX 2 IN. THICK HOLLOW CYLINDRICAL HEAVY DENSITY (MIN 3.5 PCF) GLASS FIBER UNITS JACKETED ON THE OUTSIDE WITH AN ALL-SERVICE JACKET. LONGITUDINAL JOINTS SEALED WITH FACTORY APPLIED SELF-SEALING LAP TAPE. TRANSVERSE JOINTS SECURED WITH BUTT TAPE SUPPLIED WITH THE PRODUCT. THE ANNULAR SPACE BETWEEN THE INSULATED PENETRATING ITEM AND THE PERIPHERY OF THE OPENING SHALL BE MIN 1/2 IN. TO MAX 1-1/2 IN. THE PIPE COVERING SHALL MEET THE ABOVE CRITERIA AND BEAR THE UL CLASSIFICATION MARKING WITH A FLAME SPREAD AND SMOKE DEVELOPED INDEX AS NOTED IN THE SPECIFICATIONS.

6 PIPING PENETRATIONS AT FLOORS
NOT TO SCALE



DUCT DIA.	ROD DIA.	STRAP	MAXIMUM SPACING
UP TO 10"	1/4"	1" x 22 GA.	12'-0" O.C.
11" - 18"	1/4"	1" x 22 GA.	12'-0" O.C.
19" - 24"	1/4"	1" x 22 GA.	12'-0" O.C.
25" - 36"	3/8"	1" x 20 GA.	12'-0" O.C.
37" - 50"	(2) 3/8"	(2) 1" x 20 GA.	12'-0" O.C.
51" - 60"	(2) 3/8"	(2) 1" x 18 GA.	12'-0" O.C.
61" - 84"	(2) 3/8"	(2) 1" x 16 GA.	12'-0" O.C.

NOTES:
1. HANGERS MUST NOT DEFORM DUCT SHAPE.
2. STRAPS AND RODS SHALL BE GALV. STEEL. REFER TO "RECTANGULAR DUCT SUPPORT DETAIL" FOR ATTACHING DUCTWORK TO THE BUILDING STRUCTURE.
3. WHERE HANGERS ARE INSTALLED UNDER THE INSULATION AND PENETRATE THROUGH THE INSULATION, SEAL ALL PENETRATIONS WITH APPROVED SEALING MASTIC. BUILD-UP MASTIC ON THE HANGER AT BASE (PENETRATION) AND EXTEND AND TAPER UP THE HANGER TO A MIN. OF 6".

3 ROUND DUCT SUPPORT
NOT TO SCALE

Architecture
Engineering
Environmental
Land Surveying
BL Companies
355 Research Parkway
Meriden, CT 06450
(203) 630-1406
(203) 630-2615 Fax

HVAC UPGRADES TO THE EAST GRANBY MIDDLE/HIGH SCHOOL
95 SOUTH MAIN ST., EAST GRANBY, CT

NO	DATE	DESCRIPTION

REVISIONS

Designed: PMS
Drawn: PMS
Reviewed: JV
Project No.: 2301734
Date: 03/11/2024
Issued for: 100% CONSTRUCTION DOCUMENTS

Title: MECHANICAL DETAILS

Sheet No. M501

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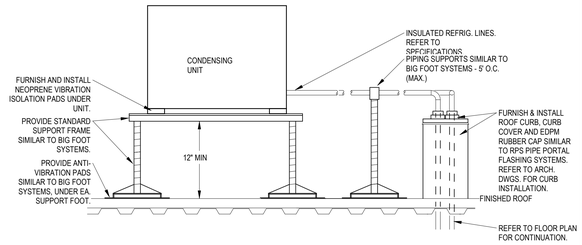
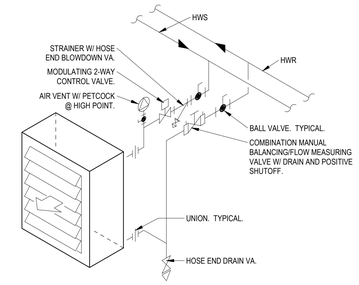


NOTES:
1. CONTRACTOR SHALL PROVIDE MANUFACTURER DESIGNED EQUIPMENT SUPPORT SYSTEM FOR SUBMITTAL REVIEW.
2. FURNISH & INSTALL REFRIGERANT PIPING FROM CONDENSING UNIT TO INDOOR FAN COILS. NOTE THAT CONTRACTOR SHALL PRESSURE TEST THE REFRIGERANT PIPING WITH NITROGEN AT A PRESSURE & TIME RECOMMENDED BY MANUFACTURER & INDUSTRY PRACTICE TO ASSURE ALL PIPING IS FREE OF LEAKS.

1 CONDENSING UNIT ARRANGEMENT - ROOF
NOT TO SCALE



NOTES:
1. ALL BRANCHES ARE 3/4" UNLESS OTHERWISE NOTED ON PLANS.
2. INSTALL UNIT SUSPENDED FROM STRUCTURE ABOVE WITH THREADED STEEL RODS PER MANUFACTURER'S INSTALLATION INSTRUCTIONS AND SEISMICALLY RESTRAIN PER SPECIFICATIONS. ALTERNATE MOUNTING TO WALL WITH WALL BRACKET BY UNIT MANUFACTURER. THE MECHANICAL CONTRACTOR SHALL COORDINATE ALL REQUIREMENTS.

2 HOT WATER UNIT HEATER
NOT TO SCALE

Architecture
Engineering
Environmental
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355 Research Parkway
Meriden, CT 06450
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(203) 630-2615 Fax

HVAC UPGRADES TO THE EAST GRANBY MIDDLE/HIGH SCHOOL
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MECHANICAL DETAILS

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M502

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UNIT VENTILATORS - PACKAGED DX

MARK	MANUFACTURER	MODEL	AREA SERVED	SUPPLY AIRFLOW (CFM)	OUTDOOR AIRFLOW (CFM)	COOLING DATA - DX						HEATING DATA								ELEC DATA				UNIT DATA				REMARKS
						CAPACITY (BTUH)		EAT (DB/WB) (°F)	LAT (DB/WB) (°F)	REFRIG. TYPE	EER	CAPACITY (BTUH)	EAT (DB) (°F)	LAT (DB) (°F)	FLUID DATA					VOLTS	PHASE	MCA	MOP	LENGTH (IN)	WIDTH (IN)	HEIGHT (IN)	WEIGHT (LBS)	
						TOTAL	SENSIBLE								TYPE	GPM	EWT (°F)	LWT (°F)	WPD (FT)									
UV-1	DAIKIN	UAZQ9036	ART CLASSROOM	1250	495	38100	24800	80	67	R410A	10.57	30906	70	92.8	PG	2	200	180	0.63	460	3	12.4	15	98	28	30	975	ALL
UV-2	DAIKIN	UAZQ9036	ART CLASSROOM	1250	495	38100	24800	80	67	R410A	10.57	30906	70	92.8	PG	2	200	180	0.63	460	3	12.4	15	98	28	30	975	ALL
UV-3	DAIKIN	UAZQ9036	COMMONS	1250	495	38100	24800	80	67	R410A	10.57	30906	70	92.8	PG	2	200	180	0.63	460	3	12.4	15	98	28	30	975	ALL
UV-4	DAIKIN	UAZQ9036	COMMONS	1250	495	38100	24800	80	67	R410A	10.57	30906	70	92.8	PG	2	200	180	0.63	460	3	12.4	15	98	28	30	975	ALL
UV-5	DAIKIN	UAZQ9054	COMPUTER LAB	1500	470	53500	33900	80	67	R410A	10.43	38392	70	93.6	PG	2	200	180	0.72	460	3	14.4	20	110	28	30	1075	ALL
UV-6	DAIKIN	UAZQ9054	BUSINESS	1500	515	53500	33900	80	67	R410A	10.43	38392	70	93.6	PG	2	200	180	0.72	460	3	14.4	20	110	28	30	1075	ALL
UV-7	DAIKIN	UAZQ9054	ES PHYSICS	1500	610	53500	33900	80	67	R410A	10.43	38392	70	93.6	PG	2	200	180	0.72	460	3	14.4	20	110	28	30	1075	ALL
UV-8	DAIKIN	UAZQ9054	CHEMISTRY	1500	850	53500	33900	80	67	R410A	10.43	38392	70	93.6	PG	2	200	180	0.72	460	3	14.4	20	110	28	30	1075	ALL
UV-9	DAIKIN	UAZQ9054	BIOLOGY	1500	770	53500	33900	80	67	R410A	10.43	38392	70	93.6	PG	2	200	180	0.72	460	3	14.4	20	110	28	30	1075	ALL

REMARKS:
1. INSTALL IN ACCORDANCE WITH MANUF. INSTALLATION INSTRUCTIONS.
2. INSTALL ALL SHIPPED LOOSE ITEMS IN ACCORDANCE WITH MANUF. INSTALLATION INSTRUCTIONS.
3. NAMEPLATE SHALL INCLUDE UNIT DESIGNATION AND AREA SERVED BY THE UNIT.
4. MOTORS SHALL MEET THE MOTOR EFFICIENCY REQUIREMENTS SET FORTH IN ANSI/ASHRAE/IES STANDARD 90.1
5. COORDINATE SERVICE ACCESS PER MFG'S REQUIRED CLEARANCES.
6. PROVIDE THE FOLLOWING: VERTICAL - FLOOR MTD - BOTTOM FRONT RETURN & REAR OA INTAKE. PACKAGED - SELF-CONTAINED - FACE & BYPASS CONFIGURATION W/ HOT WATER COIL, MULTI-STAGE COMPRESSOR(S), SINGLE POINT POWER W/ A NON-FUSED DISCONNECT, 2-WAY MODULATING HW EOC CVs, SS DRAIN PANS, TAMPER RESISTANT FASTENERS ON THE ACCESS DOORS, END PANELS, MERV13 FILTERS, MICROTECH DIGITAL CONTROLS W/ CO2 SENSOR, ECONOMIZER OPERATION, PART-LOAD VARIABLE AIR CONTROL, ACTIVE DEHUMIDIFICATION CONTROL W/ ELECTRIC REHEAT COIL, DEMAND CONTROL VENTILATION, ASHRAE CONTROL CYCLE II, NIGHT SETBACK, MORNING WARM-UP/COOL DOWN, FACE & BYPASS DAMPER CONTROL, FREEZE PROTECTION, LOW AIR TEMP FREEZESTAT, FACTORY MOUNTED & WIRED - UNIT VENT CONTROLLERS, SENSORS AND ACTUATORS, LOCAL USER INTERFACE, DIG. ADJ. DISPLAY SENSOR W/ DIGITAL DISPLAY FOR TEMPERATURE, OCCUPANCY, ALARM, SETPOINT AND STATUS INDICATION. CONTROLS INCLUDE FOUR BUTTONS FOR SETPOINT, OCCUPIED/UNOCCUPIED REQUEST, AND OVERRIDE RESET.
7. MC SHALL PROVIDE ANY WALL SLEEVE EXTENTIONS AND/OR AIR SPLITTERS AS REQUIRED TO MATCH UP WITH THE EXISTING WALL SLEEVES AND LOUVERS. ALL CONNECTIONS SHALL BE AIRTIGHT AND WEATHERPROOF.
8. THE NEW UNITS ARE PROVIDED WITH PACKAGED CONTROLS FOR COMPLETE OPERATION OF THE SYSTEM TO MAINTAIN CONDITIONING AND VENTILATION FOR THEIR RESPECTIVES SPACES. PROVIDE A BACNET PROTOCOL CONTROL INTERFACE FOR FULL MONITORING & CONTROL BY THE CENTRAL BMS.
9. EQUIPMENT SELECTIONS BASED ON PRODUCTS BY DAIKIN, EQUAL PRODUCTS SUBJECT TO COMPLIANCE WITH ALL CRITERIA.

HEAT PUMP INDOOR AIR-HANDLING UNITS

MARK	ASSOCIATED UNIT	MANUFACTURER	MODEL	AREA SERVED	ARRANGEMENT	REFRIG. TYPE	NOMINAL TONS	AIRFLOW DATA			DX COOLING DATA		COOLING EFFICIENCY (SEER/EER)	DX HEATING DATA		HEATING EFFICIENCY (COP/HSPF)	ELEC DATA					WEIGHT (LBS)	REMARKS
								SUPPLY (CFM)	OUTSIDE (CFM)	ESP (IN WC)	DESIGN OUTDOOR TEMP. (DB F)	CAPACITY (BTUH)		DESIGN OUTDOOR TEMP. (DB F)	CAPACITY (BTUH)		HP	VOLTS	PHASE	MCA	MOP		
AHU-2	HP-2	DAIKIN	FAQ18TAJU	HEALTH CLASSROOM #2	WALL SURFACE	R410A	1.5	500	0	-	95	18000	11.9 / 16.9	3	20000	- / 7.6	-	208	1	0.5	15	35	1,2,3,4,5,6,7,8,10,11
AHU-3	HP-3	DAIKIN	FTXB12BXVJU	CORRIDOR	WALL SURFACE	R410A	1	661	0	-	95	13300	8.5 / 18	3	16400	3.3 / 9.0	-	208	1	0.0	0	30	ALL
AHU-4	HP-4	DAIKIN	FTXS24WVJU9	WEIGHT ROOM	WALL SURFACE	R410A	2	640	0	-	95	23500	10.5 / 20.6	3	24250	3.9 / 9.3	-	208	1	0.0	0	35	ALL
AHU-5	HP-4	DAIKIN	FTXS24WVJU9	WEIGHT ROOM	WALL SURFACE	R410A	2	640	0	-	95	23500	10.5 / 20.6	3	24250	3.9 / 9.3	-	208	1	0.0	0	35	ALL
AHU-6	HP-5	DAIKIN	FTXS24WVJU9	FAN ROOM	WALL SURFACE	R410A	2	640	0	-	95	23500	10.5 / 20.6	3	24250	3.9 / 9.3	-	208	1	0.0	0	35	ALL
AHU-7	HP-5	DAIKIN	FTXS24WVJU9	FAN ROOM	WALL SURFACE	R410A	2	640	0	-	95	23500	10.5 / 20.6	3	24250	3.9 / 9.3	-	208	1	0.0	0	35	ALL
AHU-8	HP-6	DAIKIN	FTXB12BXVJU	OFFICE #2	WALL SURFACE	R410A	1	661	0	-	95	13300	8.5 / 18	3	16400	3.3 / 9.0	-	208	1	0.0	0	30	ALL
AHU-9	HP-7	DAIKIN	FFQ18WZVJU9	OFFICE #1	CEILING CASSETTE - 4 WAY	R410A	1.5	445	0	-	95	17400	11.5 / 18.2	3	21600	3 / 8.4	-	208	1	0.0	0	40	ALL
EX.AHU-1	EX.HP-1	-	-	HEALTH CLASSROOM #1	WALL SURFACE	-	-	0	0	-	-	-	-	-	-	-	-	0	0	0.0	0	-	EXISTING TO REMAIN

REMARKS:
1. INSTALL IN ACCORDANCE WITH MANUF. INSTALLATION INSTRUCTIONS.
2. INSTALL ALL SHIPPED LOOSE ITEMS IN ACCORDANCE WITH MANUF. INSTALLATION INSTRUCTIONS.
3. NAMEPLATE SHALL INCLUDE UNIT DESIGNATION AND AREA SERVED BY THE UNIT.
4. MOTORS SHALL MEET THE MOTOR EFFICIENCY REQUIREMENTS SET FORTH IN ANSI/ASHRAE/IES STANDARD 90.1
5. COORDINATE SERVICE ACCESS PER MFG'S REQUIRED CLEARANCES.
6. THE TOTAL RUNS OF REFRIGERANT PIPING WILL BE BASED ON MANUFACTURERS APPLICATION DATA AND SHALL NOT COMPROMISE WARRANTY PERIOD. PROVIDE REFRIGERANT SIDE ACCESSORIES AS RECOMMENDED BY THE MANUFACTURER. INSULATE REFRIG. LINES, RL & RS, IN ACCORDANCE WITH UNIT MANUF. INSTALLATION INSTRUCTIONS. INSTALLING CONTRACTOR MUST VERIFY ACTUAL PIPING LENGTHS AND UPDATE SELECTION FILE AS NECESSARY TO CHECK FOR ERRORS AND CALCULATE CORRECT ADDITIONAL REFRIGERANT CHARGE.
7. PROVIDE FULL HEATING CAPACITY AT DESIGN HEATING AMBIENT TEMP.
8. PROVIDE AN INTELLIGENT COMMUNICATIONS AND MONITORING CONTROL SYSTEM INDEPENDENT OF THE MAIN BUILDING BMS THAT INCORPORATES THE FOLLOWING: 7-DAY PROGRAMMABLE CONTROLLER WITH AUTO CHANGEOVER, LEAD/LAG FUNCTION, UNIT TO UNIT COMMUNICATION, A WALL MOUNTED GRAPHICAL DISPLAY CONTROL PANEL AND A BACNET INTERFACE TO THE OWNER'S EXISTING CENTRAL BMS SYSTEM.
9. INDOOR UNITS (AHUs) ARE POWERED FROM THEIR RESPECTIVE OUTDOOR UNITS (HPs). PROVIDE ALL WIRING, LINE & LOW VOLTAGE BETWEEN UNITS AS REQUIRED PER MANUF. INSTALLATION INSTRUCTIONS.
10. PROVIDE WITH MATCHING MINI CONDENSATE PUMP.
11. EQUIPMENT SELECTIONS BASED ON PRODUCTS BY DAIKIN, EQUAL PRODUCTS SUBJECT TO COMPLIANCE WITH ALL CRITERIA.

AIR-TO-AIR FIXED PLATE ENERGY RECOVERY VENTILATOR

MARK	MANUFACTURER	MODEL	SUPPLY FAN		EXHAUST FAN		WINTER PERFORMANCE					SUMMER PERFORMANCE					ELEC DATA				WEIGHT (LBS)	REMARKS
			AIRFLOW (CFM)	ESP (IN WC)	AIRFLOW (CFM)	ESP (IN WC)	OA IN (DB/WB)	SA. OUT (DB/WB)	RA. IN (DB/WB)	TOTAL HEAT RECOVERED (BTUH)	TOTAL RECOVERY EFFECTIVENESS (%)	OA IN (DB/WB)	SA. OUT (DB/WB)	RA. IN (DB/WB)	TOTAL HEAT RECOVERED (BTUH)	TOTAL RECOVERY EFFECTIVENESS (%)	VOLTS	PHASE	MCA	MOP		
ERV-1	OXYGEN 8	NOVA B20	1000	0.5	610	0.75	10 / 8.5	39.6 / 32.9	70 / 52.9	39,234	47.2	88.5 / 72	81.8 / 68.2	75 / 63	14,322	44.2	460	3	9	15	425	ALL
ERV-2	OXYGEN 8	NOVA A16	570	0.5	490	0.75	10 / 8.5	22.4 / 22.2	70 / 52.9	25,093	53.7	88.5 / 72	80.9 / 67.8	75 / 63	9,155	49.6	208	1	6	15	320	ALL

REMARKS:
1. INSTALL IN ACCORDANCE WITH MANUF. INSTALLATION INSTRUCTIONS.
2. INSTALL ALL SHIPPED LOOSE ITEMS IN ACCORDANCE WITH MANUF. INSTALLATION INSTRUCTIONS.
3. NAMEPLATE SHALL INCLUDE UNIT DESIGNATION AND AREA SERVED BY THE UNIT.
4. MOTORS SHALL MEET THE MOTOR EFFICIENCY REQUIREMENTS SET FORTH IN ANSI/ASHRAE/IES STANDARD 90.1
5. COORDINATE SERVICE ACCESS PER MFG'S REQUIRED CLEARANCES.
6. PROVIDE ALL LINE & LOW VOLTAGE WIRING FOR FIELD CONNECTIONS BETWEEN THE ERV, HP, CONTROLLERS, ETC.. FOR POWER & CONTROLS PER MANUFACTURER'S INSTALLATION INSTRUCTIONS. THE MC SHALL COORDINATE ALL REQUIREMENTS WITH THE WORK OF ALL TRADES.
7. UNIT SHALL BE SCHEDULED TO OPERATE VIA THE BLDG'S OCCUPIED/UN-OCCUPIED MODE. DURING OCCUPIED MODE, THE SYSTEM SHALL START AND RUN CONTINUOUSLY. SYSTEM SHALL BE DE-ENERGIZED IN UN-OCCUPIED MODE. SUPPLY AND EXH. FANS SHALL RUN AT CONSTANT VOLUME. BACNET INTEGRATION FOR REMOTE, FULL MONITORING AND CONTROL. PROVIDE MEANS TO INTERFACE WITH THE OWNER'S EXISTING CENTRAL BMS, INCLUDING BUT NOT LIMITED TO: HARDWARE, SOFTWARE, WIRING, ETC..
8. EQUIPMENT SELECTIONS BASED ON PRODUCTS BY OXYGEN 8, EQUAL PRODUCTS SUBJECT TO COMPLIANCE WITH ALL CRITERIA.
9. PROVIDE THE FOLLOWING: INDOOR - HORIZONTAL CONFIGURATION, SINGLE POINT POWER FOR ERV, W-CONTROLLER & ELEC PREHEAT COIL W/ A NON-FUSED DISCONNECT FOR EACH DEVICE. DUCT MTD DX COOLING/HEATING COIL, FILTERS: MERV13 - OA & MERV8 - RA, HINGED ACCESS DOORS FOR FILTERS & FANS, START/STOP RELAY FOR LINKING WITH ITS RESPECTIVE HP, FACTORY MOUNTED & WIRED - BACNET PROTOCOL CONTROLS W/ INTERFACE FOR FULL MONITORING & CONTROL BY THE OWNER'S EXISTING CENTRAL BMS.
   A. ERV: SEE SCHEDULE.
   B. W-CONTROLLER: FOR ERV-1 & 2 - 208V / 1PH, MCA 0.3, MOP 15.
   C. ELEC PREHEAT COIL:
      1. ERV-1: EHC-1 - 460V / 3PH, 3 KW, MCA 4.73, MOP 15, 95 LBS.
      2. ERV-2: EHC-2 - 460V / 3PH, 3 KW, MCA 3.15, MOP 15, 90 LBS.
   D. DX COOLING/HEATING COILS: HEATING AND COOLING THROUGH THEIR RESPECTIVE OUTDOOR HPS. PROVIDE DAIKIN VRV INTEGRATION VALVE KIT FOR EACH SYSTEM.
      1. ERV-1: CC-1 / HP-8 - COOLING CAPACITY: 45600 BTUH, HEATING CAPACITY: 49500 BTUH
      2. ERV-2: CC-2 / HP-9 - COOLING CAPACITY: 34200 BTUH, HEATING CAPACITY: 37000 BTUH

VENTILATION AIR REQUIREMENT

HVAC UNIT	AREA SERVED	OCCUPANT LOAD / AREA	REQUIRED VENTILATION	OA/EA REQUIRED (CFM)	OA/EA DESIGN (CFM)	REMARKS
ERV-1	OFFICE #1	2 PEOPLE (300) SQFT)	5 CFM/PERSON (0.06 CFM/SQFT)	28	30	
			SYSTEM TOTAL (CFM)		30	
ERV-1	HEALTH CLASSROOM #1	15 PEOPLE (450 SQFT)	10 CFM/PERSON (0.12 CFM/SQFT)	204	205	
			SYSTEM TOTAL (CFM)		205	
ERV-1	HEALTH CLASSROOM #2	15 PEOPLE (450 SQFT)	10 CFM/PERSON (0.12 CFM/SQFT)	204	205	
			SYSTEM TOTAL (CFM)		205	
UV-1 & 2	ART CLASSROOM	52 PEOPLE (2,600 SQFT)	10 CFM/PERSON (0.18 CFM/SQFT)	988	990	
			SYSTEM TOTAL (CFM)		990	
UV-3 & 4	COMMONS	73 PEOPLE (2,100 SQFT)	10 CFM/PERSON (0.12 CFM/SQFT)	982	990	
			SYSTEM TOTAL (CFM)		990	
UV-5	COMPUTER LAB	35 PEOPLE (1,000 SQFT)	10 CFM/PERSON (0.12 CFM/SQFT)	470	470	
			SYSTEM TOTAL (CFM)		470	
UV-6	BUSINESS	38 PEOPLE (1,100 SQFT)	10 CFM/PERSON (0.12 CFM/SQFT)	512	515	
			SYSTEM TOTAL (CFM)		515	
UV-7	ES PHYSICS	45 PEOPLE (1,300 SQFT)	10 CFM/PERSON (0.12 CFM/SQFT)	606	610	
			SYSTEM TOTAL (CFM)		610	
UV-8	CHEMISTRY	63 PEOPLE (1,800 SQFT)	10 CFM/PERSON (0.12 CFM/SQFT)	846	850	
			SYSTEM TOTAL (CFM)		850	
UV-9	BIOLOGY	49 PEOPLE (1,400 SQFT)	10 CFM/PERSON (0.06 CFM/SQFT)	658	660	
			SYSTEM TOTAL (CFM)		660	
ERV-1	CORRIDOR	0 PEOPLE (600 SQFT)	0 CFM/PERSON (0.06 CFM/SQFT)	36	40	
			SYSTEM TOTAL (CFM)		40	
ERV-1	WEIGHT ROOM	10 PEOPLE (970) SQFT)	20 CFM/PERSON (0.06 CFM/SQFT)	259	260	
			SYSTEM TOTAL (CFM)		260	
ERV-2	MS CLASSROOM #1	23 PEOPLE (650) SQFT)	10 CFM/PERSON (0.06 CFM/SQFT)	269	270	
			SYSTEM TOTAL (CFM)		270	
ERV-2	MS CLASSROOM #2	20 PEOPLE (565 SQFT)	10 CFM/PERSON (0.06 CFM/SQFT)	234	235	
			SYSTEM TOTAL (CFM)		235	
ERV-2	OFFICE #2	2 PEOPLE (145) SQFT)	5 CFM/PERSON (0.06 CFM/SQFT)	18.7	20	
			SYSTEM TOTAL (CFM)		20	
ERV-2	FAN ROOM	0 PEOPLE (330) SQFT)	0 CFM/PERSON (0.06 CFM/SQFT)	19.8	20	
			SYSTEM TOTAL (CFM)		20	
ERV-2	STORAGE #1	0 PEOPLE (190 SQFT)	0 CFM/PERSON (0.06 CFM/SQFT)	12	15	
			SYSTEM TOTAL (CFM)			
ERV-2	STORAGE #2	0 PEOPLE (70) SQFT)	0 CFM/PERSON (0.06 CFM/SQFT)	5	10	
			SYSTEM TOTAL (CFM)			

UNIT HEATERS - HOT WATER

MARK	MANUFACTURER	MODEL	LOCATION	MOUNTING TYPE	AIRFLOW (CFM)	HEATING DATA						ELEC DATA				WEIGHT (LBS)	REMARKS
						CAPACITY (MBH)	FLUID	FLOW (GPM)	EWT (°F)	LWT (°F)	WPD (FT)	VOLTS	PHASE	AMPS	MCA		
UH-1	STERLING	HS-125A	GREENHOUSE	WALL BRACKET	580	24800	PG	2.5	200	180	2.2	115	1	1.2	1.5	30	ALL

REMARKS:
1. INSTALL IN ACCORDANCE WITH MANUF. INSTALLATION INSTRUCTIONS.
2. INSTALL ALL SHIPPED LOOSE ITEMS IN ACCORDANCE WITH MANUF. INSTALLATION INSTRUCTIONS.
3. NAMEPLATE SHALL INCLUDE UNIT DESIGNATION AND AREA SERVED BY THE UNIT.
4. MOTORS SHALL MEET THE MOTOR EFFICIENCY REQUIREMENTS SET FORTH IN ANSI/ASHRAE/IES STANDARD 90.1
5. COORDINATE SERVICE ACCESS PER MFG'S REQUIRED CLEARANCES.
6. PROVIDE OSHA FAN GUARD, VERTICAL LOUVERS, MAGNETIC STARTER W/ THERMOSTAT - "AUTO-OFF-FAN" W/ TAMPERPROOF GUARD, STRAP-ON WATER CONTROL, NEMA 1- TOGGLE TYPE MOTOR STARTER, AND CONTRACTOR DESIGNED FIELD FABRICATED WALL MOUNTING BRACKET.
7. FAN SHALL RUN AS FOLLOWS:
   A. "AUTO": UPON SENSING HOT WATER VIA THE STRAP-ON WATER CONTROL, THE FAN SHALL BE ENERGIZED AND RUN CONTINUOUSLY VIA THERMOSTAT TO MAINTAIN SPACE TEMPERATURE.
   B. "OFF": FAN SHALL BE OFF.
   C. "FAN": FAN SHALL BE ENERGIZED AND RUN CONTINUOUSLY.
8. EQUIPMENT SELECTIONS BASED ON PRODUCTS BY STERLING, EQUAL PRODUCTS SUBJECT TO COMPLIANCE WITH ALL CRITERIA.

HEAT PUMP OUTDOOR AIR-COOLED CONDENSING UNITS

MARK	ASSOCIATED UNIT	MANUFACTURER	MODEL	REFRIG. TYPE	NOMINAL COOLING CAPACITY (TONS)	COOLING EFFICIENCY (EER / SEER)	HEATING EFFICIENCY (COP / HSPF)	ELEC DATA				WEIGHT (LBS)	REMARKS
								VOLTS	PHASE	MCA	MOP		
EX.HP-1	EX.AHU-1	-	-	-	-	-	-	0	0	0.0	0	-	EXISTING TO REMAIN
HP-2	AHU-2	DAIKIN	RZQ18TBVJUA	R410A	1.5	11.9 / 16.9	- / 7.6	208	1	16.5	20	175	1,2,3,4,5,7,8
HP-3	AHU-3	DAIKIN	RXB12BXVJU	R410A	1	8.5 / 18	3.3 / 9.0	208	1	12.4	15	65	ALL
HP-4	AHU-4 & 5	DAIKIN	5MXS48MVJU9	R410A	4	10.5 / 20.6	3.9 / 9.3	208	1	30.8	35	220	ALL
HP-5	AHU-6 & 7	DAIKIN	5MXS48MVJU9	R410A	4	10.5 / 20.6	3.9 / 9.3	208	1	30.8	35	220	ALL
HP-6	AHU-8	DAIKIN	RXB12BXVJU	R410A	1	8.5 / 18	3.3 / 9.0	208	1	12.4	15	65	ALL
HP-7	AHU-9	DAIKIN	RX18MWVJU9	R410A	1.5	11.5 / 18.2	3 / 8.4	208	1	11.6	15	100	ALL
HP-8	CC-1	DAIKIN	RXTQ48TBVJUA	R410A	4	7.9 / 14.6	3.3 / 8.3	208	1	29.1	35	180	ALL
HP-9	CC-2	DAIKIN	RXTQ36TBVJUA	R410A	3	9.2 / 15.3	3.3 / 8.5	208	1	16.5	20	175	ALL

REMARKS:
1. INSTALL IN ACCORDANCE WITH MANUF. INSTALLATION INSTRUCTIONS.
2. INSTALL ALL SHIPPED LOOSE ITEMS IN ACCORDANCE WITH MANUF. INSTALLATION INSTRUCTIONS.
3. NAMEPLATE SHALL INCLUDE UNIT DESIGNATION AND AREA SERVED BY THE UNIT.
4. MOTORS SHALL MEET THE MOTOR EFFICIENCY REQUIREMENTS SET FORTH IN ANSI/ASHRAE/IES STANDARD 90.1
5. COORDINATE SERVICE ACCESS PER MFG'S REQUIRED CLEARANCES.
6. UNIT PROVIDES POWER TO ITS PERSPECTIVE INDOOR UNIT(S). PROVIDE ALL INTERCONNECTING REFRIG. PIPING AND LOW/LINE VOLTAGE WIRING PER MANUFACTURERS INSTALLATION INSTRUCTIONS. COORDINATE WITH DIV 26.
7. BACNET INTEGRATION FOR REMOTE, FULL MONITORING AND CONTROL. PROVIDE MEANS TO INTERFACE WITH THE OWNER'S EXISTING CENTRAL BMS, INCLUDING BUT NOT LIMITED TO: HARDWARE, SOFTWARE, WIRING, ETC..
8. EQUIPMENT SELECTIONS BASED ON PRODUCTS BY DAIKIN, EQUAL PRODUCTS SUBJECT TO COMPLIANCE WITH ALL CRITERIA.

AIR DEVICE

MARK	MANUFACTURER	MODEL	SERVICE	MATERIAL	MOUNTING TYPE	MAX NC LEVEL	COLOR	SIZE		DAMPER	REMARKS
								FACE	NECK		
A	TITUS	TMS-AA	SUPPLY	ALUMINUM	LAY IN / FULL FACE	30	WHITE	24X24	SEE TAG	OBD	1,2,6,9
B	TITUS	350FL	RETURN	ALUMINUM	LAY IN / PANEL	30	WHITE	-	SEE TAG	OBD	3,9

REMARKS:
1. SEE DIFFUSER CONNECTION DETAIL.
2. TYPE #3, FULL FACE, (GRID MOUNTING).
3. TYPE #3, PANEL MOUNTED, (GRID MOUNTING).
4. TYPE #3, PANEL MOUNTED, PROVIDE #TRM MOUNTING FRAME FOR SURFACE MOUNTING.
5. TYPE #1, WHERE APPLICABLE - CONCEALED FASTENERS, (SURFACE MOUNTING).
6. PROVIDE MOLDED INSULATION BLANKET (R-6) FOR THE CEILING DIFFUSER.
7. PROVIDE WITH AIR SCOOP & FULL PERIMETER GASKET.
8. NO CEILINGS. RGDS TO BE RIGIDLY SECURED TO DUCT RUNOUTS. NO FLEX DUCTWORK TO DIFFUSERS. SUSPEND RGDS AT A HEIGHT TO BE COORDINATED WITH THE FACE OF SUSPENDED LIGHTING.
9. SELECTIONS SCHEDULED ARE BASIS OF DESIGN. APPROVED EQUAL PRODUCTS BY METALAIRE OR PRICE, PROVIDED THEY MEET OR EXCEED THE BASIS OF DESIGN PERFORMANCE AND SPECIFICATIONS.

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REVISIONS

NO	DATE	DESCRIPTION

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POWER/LIGHTING SYMBOL LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	DUPLEX RECEPTACLE. (18" A.F.F. UNLESS NOTED OTHERWISE).	MD	MOTORIZED DAMPER, PROVIDED BY DIV. 15, WIRED BY DIV. 16
	QUAD RECEPTACLE. (18" A.F.F. UNLESS NOTED OTHERWISE).	S_T	THERMAL OVERLOAD SWITCH. (240V OR 120V AS REQUIRED).
GFI	DUPLEX RECEPTACLE EQUIPPED WITH INTEGRAL GROUND FAULT INTERRUPTER. (18" A.F.F. UNLESS NOTED OTHERWISE).	S_M	MOTOR RATED SWITCH.
WP	WEATHER PROOF DUPLEX RECEPTACLE. (18" A.F.F. UNLESS NOTED OTHERWISE).	TS	SPRING WOUND TIMER SWITCH
CTR	DUPLEX RECEPTACLE. (10" ABOVE COUNTER UNLESS NOTED OTHERWISE).	FCP FC	FAN CONTROL PANEL/ FAN CONTROLLER (COORDINATE EXACT REQUIREMENTS WITH MECHANICAL DRAWINGS).
MW	DUPLEX RECEPTACLE. (CENTERED BEHIND MICROWAVE. REFER TO ARCHITECTURAL ELEVATIONS FOR EXACT DEVICE MOUNTING LOCATIONS).	T	TRANSFORMER.
REF	DUPLEX RECEPTACLE. (REFRIGERATOR MOUNT AT 42" UNLESS NOTED OTHERWISE).		SURFACE MOUNTED PANEL BOARD
VM	DUPLEX RECEPTACLE. (VENDING MACHINE , MOUNT AT 42" UNLESS NOTED OTHERWISE, COORDINATE EXACT RECEPTACLE CONFIGURATION WITH SUPPLIED VENDING EQUIPMENT). PROVIDE GFCI TYPE CIRCUIT BREAKER.		RECESSED MOUNTED PANEL BOARD
WC	DUPLEX RECEPTACLE. (WATER COOLER GFI RECEPTACLE).		POWER WIRING.
	208 VOLT, 2 POLE, RECEPTACLE AMP RATING AS SHOWN ON PLAN. (18" A.F.F. UNLESS NOTED OTHERWISE)		EMERGENCY CONTROLLED BRANCH CIRCUIT, WIRING INSTALLED PER NEC 700.
	208 VOLT, 3 POLE, RECEPTACLE AMP RATING AS SHOWN ON PLAN. (18" A.F.F. UNLESS NOTED OTHERWISE)		BRANCH CIRCUIT WIRING.
	DUPLEX RECEPTACLE. (FLOOR MOUNTED).		EMERGENCY BRANCH CIRCUIT, WIRING INSTALLED PER NEC 700.
	QUAD RECEPTACLE. (FLOOR MOUNTED).		HOME RUN.
	208 VOLT, 2 POLE, RECEPTACLE AMP RATING AS SHOWN ON PLAN. (FLOOR MOUNTED)		EMERGENCY BRANCH CIRCUIT HOME RUN, WIRING INSTALLED PER NEC 700.
	208 VOLT, 3 POLE, RECEPTACLE AMP RATING AS SHOWN ON PLAN. (FLOOR MOUNTED)		WALL/ CEILING MOUNTED SELF CONTAINED DOUBLE HEAD EMERGENCY LIGHT UNIT
	QUAD RECEPTACLE AND DATA FLOOR BOX. (COORDINATE DATA REQUIREMENTS WITH TELECOMMUNICATION DRAWINGS).	S	SINGLE POLE TOGGLE SWITCH. (48" A.F.F. UNLESS NOTED OTHERWISE)
	SURFACE RACEWAY.	S_{OC}	OCCUPANCY SWITCH, SENSOR SWITCH WSD SERIES. (48" A.F.F. UNLESS NOTED OTHERWISE).
J Z	JUNCTION BOX	J CLG	JUNCTION BOX IN CEILING.
J	JUNCTION BOX WITH FLEXIBLE CONNECTION TO EQUIPMENT	S	SMOKE DETECTOR.
	ELECTRICAL CONNECTION POINT	H	HEAT DETECTOR.
	HEAVY DUTY DISCONNECT SWITCH (NON-FUSED)	CO	CARBON MONOXIDE DETECTOR.
	WEATHER PROOF HEAVY DUTY FUSED DISCONNECT SWITCH	EPO	EMERGENCY POWER OFF.
	MAGNETIC MOTOR STARTER		
M	MOTOR		

NOTE:

NOT ALL SYMBOLS MAY APPEAR ON THE DRAWINGS.

ELECTRICAL DRAWING LIST

SHEET NUMBER	SHEET NAME
E001	ELECTRICAL NOTES, SYMBOL LEGEND, & ABBREVIATIONS
E002	ELECTRICAL SPECIFICATIONS
E401	ENLARGED ELECTRICAL POWER PLANS
E402	ENLARGED ELECTRICAL POWER PLANS
E501	ELECTRICAL DETAILS
E603	ELECTRICAL PANELBOARD SCHEDULES
E604	ELECTRICAL RISER DIAGRAM

ELECTRICAL GENERAL NOTES

1. ALL ELECTRICAL WORK SHALL BE PERFORMED IN ACCORDANCE WITH AND SHALL CONFORM IN ALL ASPECTS TO THE NATIONAL ELECTRICAL CODE (NFPA CODES & LOCAL BUILDING CODES).
2. ALL PERMITS, LICENSES AND CERTIFICATES COVERING THE COMPLETE INSTALLATION OF THE ELECTRICAL WORK SHALL BE OBTAINED AND PAID FOR BY THE CONTRACTOR
3. ALL CORE-BORING, BACKFILLING AND RESURFACING REQUIRED FOR THE ELECTRICAL WORK SHALL BE PROVIDED BY THE GENERAL CONTRACTOR (G.C.).
4. ALL CUTTING PATCHING AND REFINISHING OF WALLS, FLOORS & CEILINGS REQUIRED FOR THE ELECTRICAL WORK SHALL BE PROVIDED FOR BY THE GENERAL CONTRACTOR.
5. THESE DRAWINGS ARE DIAGRAMMATIC ONLY; EXACT LOCATIONS OF ALL CONDUIT, ETC. MUST BE FIELD DETERMINED AND RUN TO AVOID OBSTRUCTIONS AND MECHANICAL EQUIPMENT.
6. UNLESS OTHERWISE NOTED, MINIMUM WIRE SIZE SHALL BE #12 AWG, THWN OR THHN COPPER; MINIMUM CONDUIT SIZE SHALL BE 3/4"C. UNLESS OTHERWISE SPECIFIED 20A, 120V BRANCH CIRCUIT WIRING SHALL BE 2#12, #12G.
7. ALL WIRING SHALL BE CONCEALED AND RUN IN WALLS OR ABOVE CEILINGS. WIRE MOLDING AND EXPOSED CONDUIT IS NOT PERMITTED IN AREAS OTHER THAN THE OPEN WAREHOUSE.
8. WORK NOT INCLUDED IN CONTRACT (N.I.C.); ANY WIRING OR EQUIPMENT NOT TO BE FURNISHED BY CONTRACTOR SHALL BE INDICATED ON PLANS AS N.I.C.
9. SITE VISITATION - PRIOR TO SUBMITTING A BID FOR HIS WORK, THE CONTRACTOR SHALL VISIT THE SITE TO INSPECT THE NATURE AND EXTENT OF THE EXISTING CONDITIONS AND EQUIPMENT, AND DETERMINE HOW THEY WILL AFFECT THE INSTALLATION OF ELECTRICAL WORK. NO ADDITIONAL PAYMENT IN EXCESS OF THE CONTRACT PRICE WILL BE AUTHORIZED FOR "EXTRA" WORK PERFORMED DUE TO EXISTING CONDITIONS WHICH ARE OBVIOUS UPON INSPECTION.
10. METAL CLAD CABLE, "MC CABLE" IS ACCEPTABLE ON THIS PROJECT AND MAY BE USED AS APPROVED BY NEC SPEC SECTION 26 05 19,SECTION 2.4. WHERE RUN CONCEALED IN WALLS, ABOVE CEILINGS, OR IN BASEMENTS. MC CABLE SHALL HAVE A STEEL JACKET. MC CABLING IS NOT ALLOWED IN THE OPEN WAREHOUSE.
11. ALL UNUSED CONDUIT AND WIRING SHALL BE DROPPED TO THE FLOOR BY THE ELECTRICIAN FOR REMOVAL FROM THE BUILDING BY THE CONTRACTOR.
12. ALL EQUIPMENT AND DEVICES SHALL BE NEW & BEAR U.L. LABEL. ALL DEVICES SHALL BE "SPECIFICATION" GRADE.
13. WORKMANSHIP: ONLY THE BEST IN WORKMANSHIP IN ACCORDANCE WITH PRESENT STANDARDS WILL BE ACCEPTABLE. ANY WORK INSTALLED AND ADJUDGED BY THE ENGINEER TO BE BELOW STANDARDS SHALL BE TAKEN OUT AND REPLACED WITH PROPERLY DONE WORK AT CONTRACTOR'S EXPENSE.
14. GUARANTEE: CONTRACTOR SHALL GUARANTEE ALL EQUIPMENT AND WIRING TO BE FREE FROM INHERENT MECHANICAL AND ELECTRICAL DEFECTS FOR A PERIOD OF ONE YEAR FROM DATE OF SUBSTANTIAL COMPLETION OF PROJECT. ALL DEFECTS SHALL BE REPAIRED, DURING THIS PERIOD, AT NO CHARGE TO OWNER (MISUSE OR ABUSE CAUSED PROBLEMS EXCEPTED).
15. SUBSTITUTIONS OF EQUIPMENT: SPECIFIED PRODUCTS SHALL BE USED AS THE BASIS OF BID AND SHALL BE PROVIDED; WHERE 2 OR MORE MANUFACTURERS ARE LISTED, THE CHOICE IS AT THE CONTRACTOR'S OPTION. AN APPROVED EQUAL SHALL BE DETERMINED BY ENGINEER.
16. ALL 15A/20A, 120V HOMERUNS GREATER THAN 75' SHALL BE #10AWG MINIMUM; GREATER THEN 120' SHALL BE #8AWG MINIMUM. ALL 15A/20A 277V HOMERUNS GREATER THAN 175' SHALL BE #10AWG MINIMUM; GREATER THAN 280' SHALL BE #8AWG MINIMUM. ALL 15/20A, 480V, SINGLE PHASE HOMERUNS GREATER THAN 300' SHALL BE #10AWG MINIMUM; GREATER THAN 450' SHALL BE #8AWG MINIMUM. EC SHALL PERFORM VOLTAGE DROP CALCULATIONS FOR BRANCH CIRCUITS LONGER THAN SPECIFIED ABOVE AS PER NEC.
17. CONTRACTOR SHALL FIELD VERIFY NAMEPLATE LOADS OF ALL EQUIPMENT (MECHANICAL AND OWNER SUPPLIED) TO INSURE PROPER WIRE SIZING AND OVERCURRENT PROTECTION AND SHALL NOTIFY ENGINEER OF DISCREPANCIES.
18. CONTRACTOR SHALL SEAL ALL ELECTRICAL PENETRATIONS THRU FIRE RATED PARTITIONS WITH FIRE RATED MATERIAL EQUAL TO DOW CORNING SILICONE RTV FOAM AS A MINIMUM. MATERIAL SELECTION SHALL BE BASED ON RATING OF PARTITION PENETRATED. REFER TO SPEC SECTION 26 05 30.
19. ALL SUPPLEMENTARY STEEL REQUIRED FOR ELECTRICAL WORK SHALL BE PROVIDED BY THE CONTRACTOR.
20. WHERE NOTED ON DRAWINGS OR WHERE CONTRACTOR ELECTS TO GROUP CIRCUITS PER ONE NEUTRAL THEY SHALL SIZE NEUTRAL AS FOLLOWS:

    a. #10 NEUTRAL PER TWO CIRCUITS
    b. #8 NEUTRAL PER THREE CIRCUITS
21. PROVIDE INSULATED GROUNDING CONDUCTOR IN ALL CONDUITS AND CABLE ASSEMBLIES AS NECESSARY TO COMPLY WITH NEC.
22. BRANCH CIRCUITS SHOWN WITH TWO GROUND CONDUCTORS SHALL HAVE ONE EQUIPMENT GROUND CONDUCTOR (GREEN) AND ONE ISOLATED GROUND CONDUCTOR (GREEN W/YELLOW STRIPE) INSTALLED IN RACEWAY.
23. ALL EMPTY CONDUITS FOR FUTURE WORK SHALL BE PROVIDED WITH A PULL WIRE.
24. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN AND DETAILS FOR THE EXACT LOCATION OF ALL LIGHTING FIXTURES AND ANY OTHER EQUIPMENT INSTALLED TO THE CEILING SYSTEM. VERIFY EXACT MOUNTING HEIGHTS AND FINISHES WITH ARCHITECT PRIOR TO ROUGH-IN.
25. CONTRACTOR SHALL COORDINATE INSTALLATION OF ELECTRICAL WORK ABOVE THE CEILING TO PROVIDE THE GREATEST POSSIBLE CLEARANCE FOR INSTALLATION OF PLUMBING AND MECHANICAL INSTALLATION. CONDUIT RUNS TO BE THROUGH OR ABOVE TRUSSES WHERE POSSIBLE.
26. ELECTRICAL CONTRACTOR TO COORDINATE EXACT PLACEMENT OF ALL DEVICES SHOWN ON THE ELECTRICAL CONSTRUCTION DOCUMENTS WITH ARCHITECTURAL, MECHANICAL AND PLUMBING DRAWINGS PRIOR TO FINAL PLACEMENT.
27. ALL WIRE IN CEILING MUST BE PLENUM RATED.
28. NO TELEPHONE WIRE SHALL BE RUN EXPOSED ON BASEBOARDS OR WALLS.
29. WIRING FOR LOW VOLTAGE SYSTEMS SHALL BE RUN CONCEALED WITHIN WALLS AND ABOVE CEILINGS.
30. PANEL DIRECTORIES SHALL BE COMPLETELY FILLED IN AT COMPLETION OF JOB PER NEC 408.4. (TYPED).
31. CONTRACTOR MUST PRODUCE A LETTER ATTESTING THAT WORK HAS BEEN COMPLETED TO THE SATISFACTION OF THE BUILDING MANAGER WHO WILL CONFIRM HIS ACCEPTANCE BY AFFIXING HIS SIGNATURE TO THE LETTER IN A SPACE PROVIDED FOR THIS PURPOSE. WORK WILL NOT BE CONSIDERED AS BEING COMPLETE WITHOUT THIS LETTER.
32. HANGING OF LIGHT FIXTURES IS TO BE DONE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, STATE AND LOCAL BUILDING CODES AND SEISMIC REQUIREMENTS.
33. AT THE COMPLETION OF THE JOB, IT WILL BE THE ELECTRICAL CONTRACTOR'S RESPONSIBILITY TO TURN OVER TO THE BUILDING MANAGER AN AS-BUILT-DRAWING IN REPRODUCIBLE FORM. THIS DRAWING DOES NOT HAVE TO BE MADE FROM SCRATCH; THE CONTRACT REFLECTED CEILING AND POWER PLANS MAY BE USED AS BACKGROUNDS WITH THE ACTUAL CIRCUITING CHANGES ADDED.
34. PRIOR TO THE CONTRACTOR BEING RELEASED FROM ALL OBLIGATIONS, HE WILL OBTAIN AND TURN OVER TO THE BUILDING MANAGER THE ORIGINAL COPY OF THE "CERTIFICATE OF ELECTRICAL INSPECTION".
35. COORDINATE EXACT LOCATIONS AND MOUNTING HEIGHTS OF EQUIPMENT AND DEVICES WITH ARCHITECT.
36. WIRING SHALL BE WITH COPPER CONDUCTORS UNLESS OTHERWISE NOTED.
37. LOCATIONS AND QUANTITIES OF EQUIPMENT HAVE BEEN BASED ON THE LATEST COMPOSITE PROVIDED BY THE CLIENT.
38. SHOULD CONFLICTING ISSUES BE FOUND WITHIN THE CONTRACT DOCUMENTS, IT IS INCUMBENT UPON THE CONTRACTOR TO REQUEST FOR CLARIFICATION PRIOR TO PROCEEDING WITH WORK. FOR BUDGETING PURPOSES, THE CONTRACTOR SHALL CARRY THE COST OF THE HIGHER QUALITY/QUANTITY OF WORK UNTIL SUCH TIME THAT A CLARIFICATION IS RENDERED.

A. VOLTAGE DROP: THE CONTRACTOR SHALL BE RESPONSIBLE TO ADJUST SPECIFIED FEEDER AND BRANCH CIRCUIT REQUIREMENTS BASED ON THE FOLLOWING:

1. FEEDERS SHALL BE SIZED FOR 2% VOLTAGE DROP, AND BRANCH CIRCUITS SHALL BE SIZED FOR 3% VOLTAGE DROP.
2. THE CONTRACTOR SHALL UTILIZE THE AS-BUILT LENGTHS FOR THE FEEDERS AND BRANCH CIRCUITS WHEN CALCULATING ASSOCIATED VOLTAGE DROP.
3. THE FEEDER AMPERES SHALL BE BASED ON THE FULL LOAD AMPERES OF THE UTILIZATION EQUIPMENT SERVED.
4. THE FEEDER AMPERES FOR PANELBOARDS SHALL BE BASED ON 80% OF THE TRIP SETTING FOR THAT PANELBOARD.
5. WIRING FOR LIGHTING AND RECEPTACLE BRANCH CIRCUITS SHALL BE SIZED IN ACCORDANCE WITH ELECTRICAL GENERAL NOTE 16 ON E0.01.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INCREASING THE SIZE OF THE FEEDER AND/OR BRANCH CIRCUIT WIRING, AND ASSOCIATED CONDUIT AS REQUIRED TO MEET THE ABOVE VOLTAGE DROP REQUIREMENTS.
7. THE CONTRACTOR SHALL BE RESPONSIBLE TO INCREASE THE SIZE OF THE EQUIPMENT GROUND CONDUCTOR, FOR FEEDERS AND/OR BRANCH CIRCUITS INCREASED IN SIZE DUE TO VOLTAGE DROP (AND/OR OTHER ADJUSTMENT REASONS), IN ACCORDANCE WITH NEC 250.122(B).
8. THE CONTRACTOR SHALL SUBMIT A SHOP DRAWING FOR THE FEEDERS INCREASED IN SIZE DUE TO VOLTAGE DROP FOR REVIEW AND APPROVAL. THE SHOP DRAWING SHALL INDICATE THE FEEDER AMPERES, THE FEEDER SIZE, THE CONDUIT SIZE, AND THE CALCULATED PERCENT VOLTAGE DROP.

B. LOAD BALANCING: AFTER SUBSTANTIAL COMPLETION, BUT NOT MORE THAN 60 DAYS AFTER FINAL ACCEPTANCE, MEASURE LOAD BALANCING AND MAKE CIRCUIT CHANGES. PRIOR TO MAKING CIRCUIT CHANGES TO ACHIEVE LOAD BALANCING, INFORM ARCHITECT OF EFFECT ON PHASE COLOR CODING.

1. MEASURE LOADS DURING PERIOD OF NORMAL FACILITY OPERATIONS.
2. PERFORM CIRCUIT CHANGES TO ACHIEVE LOAD BALANCING OUTSIDE NORMAL FACILITY OPERATION SCHEDULE OR AT TIMES DIRECTED BY THE ARCHITECT. AVOID DISRUPTING SERVICES SUCH AS FAX MACHINES AND ON-LINE DATA PROCESSING, COMPUTING, TRANSMITTING, AND RECEIVING EQUIPMENT.
3. AFTER CHANGING CIRCUITS TO ACHIEVE LOAD BALANCING, RECHECK LOADS DURING NORMAL FACILITY OPERATIONS. RECORD LOAD READINGS BEFORE AND AFTER CHANGING CIRCUITS TO ACHIEVE LOAD BALANCING.
4. TOLERANCE: MAXIMUM DIFFERENCE BETWEEN PHASE LOADS, WITHIN A PANELBOARD, SHALL NOT EXCEED 20 PERCENT.

ELECTRICAL ABBREVIATIONS

A OR AMP	AMPERES	IG	ISOLATED GROUND	REF	REFRIGERATOR
AAC	ABOVE ACCESSIBLE CEILING	IMC	INTERMEDIATE METALLIC CONDUIT	RGS	RIGID GALVANIZED STEEL
AC	ALTERNATING CURRENT			RMC	RIGID METALLIC CONDUIT
ACT	ABOVE COUNTER TOP	JB	JUNCTION BOX	RTU	ROOFTOP UNIT
AFF	ABOVE FINISHED FLOOR				
AFG	ABOVE FINISHED GRADE	KCMIL	1000 CIRCULAR MILS	SW	SWITCH
AHJ	AUTHORITY HAVING JURISDICTION	KV	KILOVOLTS (1000 VOLTS)	SWBD	SWITCHBOARD
AHU	AIR HANDLING UNIT.	KVA	KILOVOLT AMPERES (1000 VOLT-AMPERES)		
AIC	INTERRUPTING CAPACITY(RMS SYMMETRICAL AMPERES)	KW	KILOWATTS (1000 WATTS)	TC	TIME CLOCK
ATS	AUTOMATIC TRANSFER SWITCH			TEL	TELEPHONE
		LCP	LIGHTING CONTROL PANEL	TL	TWIST LOCK
BFG	BELOW FINISHED GRADE	LRA	LOCKED ROTOR AMPS	TYP	TYPICAL
BKBD	BACKBOARD			TV	TELEVISION
BOS	BOTTOM OF SHAFT	MCA	MINIMUM CIRCUIT AMPS	TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
		MCB	MAIN CIRCUIT BREAKER		
C OR COND	CONDUIT	MCC	MOTOR CONTROL CENTER	UF	UNDERFLOOR
CIT	CURRENT TRANSFORMER	MCM	THOUSAND CIRCULAR MILS	UG	UNDERGROUND
CTR	COUNTER	MD	MOTORIZED DAMPER	UL	UNDERWRITERS LABORATORIES
CB, C/B	CIRCUIT BREAKER	MDP	MAIN DISTRIBUTION PANEL	UP	UP
CFA	CALL FOR ASSISTANCE	MFR, MFTR	MANUFACTURER	UTP	UNSHIELDED TWISTED PAIR
CLG	CEILING	MH	MECHANICALLY HELD		
CPT	CURRENT POTENTIAL TRANS.	MIC	MICROPHONE	V	VOLTS
CU	CONDENSING UNIT	MLO	MAIN LUGS ONLY	VP	VAPORPROOF
DC	DIRECT CURRENT	MO	MOTOR OPERATED	VSD	VARIABLE SPEED DRIVE
DISC. SW	DISCONNECT SWITCH	MTD	MOUNTED	VFD	VARIABLE FREQUENCY DRIVE
DN	DOWN	MUA, MAU	MAKE-UP AIR UNIT	VM	VENDING MACHINE
		MW	MICROWAVE		
EO	ELECTRICALLY OPERATED			W/	WITH
EDH	ELECTRIC DUCT HEATER	NC	NORMALLY CLOSED	WC	WATER COOLER
EF	EXHAUST FAN	NEC	NATIONAL ELECTRIC CODE	WP	WEATHERPROOF
EM	EMERGENCY	NF	NOT FUSED	XFMR, TXFMR	TRANSFORMER
EP	ELECTRIC PNEUMATIC SWITCH	NFPA	NATIONAL FIRE PROTECTION ASSOCIATION		
ETR, E	EXISTING TO REMAIN.	NIC	NOT IN CONTRACT		
EUH	ELECTRIC UNIT HEATER	NL	NIGHT LIGHT		
EWC	ELECTRIC WATER COOLER				
EWH	ELECTRIC WALL HEATER	NO	NORMALLY OPEN		
		NTS	NOT TO SCALE		
FA	FIRE ALARM				
FACP	FIRE ALARM CONTROL PANEL	OC	OCCUPANCY SENSOR		
FCU	FAN COIL UNIT.				
FLA	FULL LOAD AMPS	P	POLE		
		PB	PULL BOX	EXISTING ELECTRICAL EQUIPMENT ABBREVIATIONS	
GFI, GFCI	GROUND FAULT CIRCUIT INTERRUPTER	PC	PULL CHAIN		
G, GND	GROUND	PE	PNEUMATIC ELECTRIC SWITCH	EX	EXISTING TO REMAIN.
		PM	PROJECT MANAGER	RE	REMOVE EXISTING.
HOA	HANDS-OFF AUTOMATIC SWITCH	PH	PHASE	RL	RELOCATE EXISTING.
HP	HORSEPOWER	P/T	POTENTIAL TRANSFORMER	NL	NEW LOCATION OF EXISTING RELOCATED.
HVAC	HEATING, VENTILATING AND AIR CONDITIONING	PVC	POLYVINYL CHLORIDE	NR	NEW TO REPLACE EXISTING.
HD	HAND DRYER	PWU	PURCHASED WITH UNIT	RR	REMOVE AND REPLACE ON NEW SURFACE.

NOTE:
NOT ALL ABBREVIATIONS MAY APPEAR ON THE DRAWINGS.

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ELECTRICAL SPECIFICATIONS

DIVISION 26 - ELECTRICAL

1. GENERAL PROVISIONS
   - A. GENERAL CONDITIONS, CODES & STANDARDS
     1. GENERAL CONDITIONS OF THE CONTRACT FOUND IN THE ARCHITECTURAL DRAWINGS, GENERAL AND SPECIAL CONDITIONS OF THE AMERICAN INSTITUTE OF ARCHITECTS (AIA) AND ANY OF THE OWNER'S GENERAL REQUIREMENTS SHALL APPLY UNLESS NOTED OTHERWISE.
     2. REFER TO THE GENERAL CONDITIONS ON THE ARCHITECTURAL DOCUMENTS AND THE GENERAL AND SPECIAL CONDITIONS OF THE AIA FOR ADDITIONAL REQUIREMENTS REGARDING; SAFETY, COORDINATION & COOPERATION, WORKMANSHIP, PROTECTION, CUTTING AND PATCHING, DAMAGE TO OTHER WORK, PRELIMINARY OPERATIONS,STORAGE, ADJUSTMENTS, CLEANING, ETC.
     3. ALL WORK SHALL BE IN CONFORMANCE WITH ALL LOCALLY ENFORCED, FEDERAL, STATE, AND LOCAL CODES AND ORDINANCES INCLUDING ANY SPECIAL OWNER REQUIREMENTS IN ADDITION TO THOSE SPECIFIED.
     4. CONTRACTOR SHALL PAY FOR AND OBTAIN ALL NECESSARY LICENSES, PERMITS AND INSPECTIONS REQUIRED TO PROCEED WITH THE WORK. THIS SHALL INCLUDE ALL REQUIRED COORDINATION WITH THE LOCAL UTILITY COMPANIES AND THEIR ASSOCIATED FEES OR COSTS.
     5. ALL EQUIPMENT AND MATERIALS USED SHALL BE NEW AND UL LISTED FOR THE APPLICATION, AND SHALL BEAR AN APPROPRIATE UL LABEL.
   - B. SCOPE OF WORK
     1. THIS CONTRACT SHALL INCLUDE THE FURNISHING, INSTALLING, CONNECTING, AND OPERATION OF ALL EQUIPMENT WHICH IS A PART OF THE ELECTRICAL SYSTEMS AS SHOWN ON THE DRAWINGS AND AS REQUIRED BY SIMILAR INSTALLATIONS. ANY MATERIAL OR LABOR WHICH IS NEITHER SHOWN ON THE DRAWINGS NOR CALLED FOR IN THE SPECIFICATIONS, BUT WHICH IS OBVIOUSLY NECESSARY TO COMPLETE THE WORK AND WHICH IS USUALLY INCLUDED IN WORK OF A SIMILAR CHARACTER SHALL BE FURNISHED AND INSTALLED UNDER THIS CONTRACT AT NO ADDITIONAL COST TO THE OWNER. CONTRACTOR SHALL PROVIDE ALL LABOR AND MATERIALS REQUIRED TO PROVIDE THE OWNER A COMPLETE, CODE APPROVED AND OPERATIONAL ELECTRICAL SYSTEM.
     2. CAREFULLY READ SPECIFICATION FOR ALL PARTS OF THE WORK SO AS TO BECOME FAMILIAR WITH ALL TRADES' WORK SCOPE. CONSULT WITH OTHER TRADES TO INSURE PROPER LOCATIONS AND AVOID INTERFERENCES. ANY CONFLICT SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER BEFORE WORK IS COMMENCED.
     3. CONTRACTORS SHALL BE REQUIRED TO HAVE EXAMINED THE PREMISES AND SITE SO AS TO COMPARE THEM WITH THE DRAWINGS AND SPECIFICATIONS, NOTE THE EXISTING CONDITIONS AND OTHER WORK THAT WILL BE REQUIRED, AND THE NATURE OF THE CONDITIONS UNDER WHICH THE WORK IS TO BE PERFORMED. NO ALLOWANCE SHALL BE MADE TO THE CONTRACTOR BY REASON OF THIS FAILURE TO HAVE MADE SUCH EXAMINATION OR OF ANY ERROR ON HIS PART.
     4. ALL EXISTING UTILITY AND ELECTRICAL SERVICES SHALL BE FIELD VERIFIED. CORRECTIONS TO THE DESIGN AND INSTALLATION SHALL BE MADE WITHOUT ADDITIONAL COST TO THE OWNER.
     5. PROVIDE ALL CUTTING AND PATCHING REQUIRED FOR INSTALLATION OF ELECTRICAL WORK. ALL CORE DRILLING OR CUTTING OF FIRE RATED FLOORS, SHAFTS, AND WALLS SHALL BE FIRESTOPPED PRIOR TO FINISH PATCHING. ALL PENETRATIONS SHALL BE FIRE SEALED TO MATCH THE FIRE RATING OF THE FLOORS, SHAFTS, AND WALLS PENETRATED.
     6. TEMPORARY ELECTRICAL SERVICE, LIGHTING, AND RELATED WIRING SHALL BE PROVIDED TO OSHA REQUIREMENTS FOR THE USE OF ALL TRADES DURING CONSTRUCTION.
     7. TEMPERATURE AND INTERLOCK CONTROL COMPONENTS AND ALL RELATED WIRING AND CONDUIT SHALL BE PROVIDED BY THE MECHANICAL CONTRACTOR UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
     8. THIS CONTRACT SHALL ALSO INCLUDE ALL LABOR, MATERIALS AND MISCELLANEOUS EXPENSES REQUIRED FOR ALL REQUIRED ELECTRICAL DEMOLITION OF THE EXISTING AREAS BEING RENOVATED.
        - a. THE DEMOLITION SHALL CONSIST OF THE COMPLETE REMOVAL (PROPERLY DISPOSED OFF SITE UNLESS OTHERWISE NOTED) OF ALL ELECTRICAL EQUIPMENT, WIRING, CONDUIT, MATERIALS, ETC. NOT REQUIRED IN THE FINAL DESIGN AND INSTALLATION OF THE ELECTRICAL SYSTEMS FOR THE NEW RENOVATED AREAS.
        - b. ALL UNDERGROUND SERVICES NOT BEING REUSED SHALL BE CAPPED BELOW THE FLOOR, WIRING REMOVED, AND FLOOR PENETRATIONS REPAIRED TO MATCH ADJACENT SURFACES.
        - c. ALL ABOVE GROUND CIRCUITS SHALL BE REMOVED BACK TO THE SOURCE UNLESS INDICATED OTHERWISE.
        - d. COORDINATE ALL DEMOLITION WITH THE ARCHITECTURAL DOCUMENTS, THE ARCHITECT, AND THE OWNER'S GENERAL REQUIREMENTS.
     9. ALL WORK INCLUDING, BUT NOT LIMITED TO PARTS, MATERIAL, EQUIPMENT AND LABOR SHALL BE GUARANTEED FOR ONE YEAR AFTER ACCEPTANCE BY THE ENGINEER AND OWNER. WHERE AN EQUIPMENT MANUFACTURER HAS A WARRANTY THAT EXCEEDS ONE YEAR, THAT WARRANTY PERIOD SHALL APPLY TO THIS PROJECT.
   - C. DOCUMENTS
     1. THE DRAWINGS ARE DIAGRAMMATIC; ALL WORK SHALL BE PERFORMED AS INDICATED ON THE DRAWINGS UNLESS EXISTING CONDITIONS OR COORDINATION ISSUES REQUIRE CHANGES. THESE CHANGES SHALL BE MADE WITH NO ADDITIONAL COST TO THE OWNER.
     2. ANY INCIDENTAL ITEMS OR LABOR, ETC. NOT INCLUDED IN THE SPECIFICATIONS OR THE DRAWINGS BUT REASONABLY IMPLIED AS NECESSARY FOR THE COMPLETE INSTALLATION OF ALL APPARATUS SHALL BE INCLUDING IN BID.
     3. THE DRAWINGS AND SPECIFICATIONS ARE INTENDED TO SUPPLEMENT EACH OTHER AND ANY MATERIAL OR LABOR CALLED FOR IN ONE SHALL BE FURNISHED EVEN THOUGH NOT MENTIONED IN BOTH.
     4. IF ERRORS ARE FOUND IN THE DRAWINGS OR SPECIFICATIONS, OR DISCREPANCIES OCCUR BETWEEN THE SAME, OR BETWEEN THE FIGURES ON THE DRAWINGS AND THE SCALE OF SAME, OR BETWEEN THE LARGER AND SMALLER DRAWINGS, OR IN THE DESCRIPTIVE MATTER ON THE DRAWINGS, SUCH ERRORS SHALL BE REFERRED TO THE OWNER FOR REVIEW AND FINAL DECISION PRIOR TO THE BID DUE DATE.
     5. THE BIDDING OF THIS WORK WILL CONTEMPLATE THE USE OF EQUIPMENT AND MATERIALS EXACTLY AS SPECIFIED HEREIN. WHERE MORE THAN ONE MANUFACTURER IS MENTIONED ANY ONE MAY BE UTILIZED. SUBSTITUTE MANUFACTURERS MAY BE OFFERED ONLY AS AN ALTERNATE TO THE SPECIFIED EQUIPMENT AND MATERIAL AND MUST BE SUBMITTED AS SPECIFIED IN THE ARCHITECTURAL DOCUMENTS.
     6. MISCELLANEOUS ITEMS NECESSARY TO COMPLETE THE SYSTEMS CAN BE OF ANY RECOGNIZED MANUFACTURE PROVIDED THESE ITEMS MEET MINIMUM STANDARDS AS SET IN THESE SPECIFICATIONS. REFER TO EACH SECTION FOR ANY SPECIFIC REQUIREMENTS.
   - D. COORDINATION
     1. CONTRACTOR SHALL LOCATE, IDENTIFY AND PROTECT ANY EXISTING SERVICES WHICH ARE REQUIRED TO BE MAINTAINED OPERATIONAL AND SHALL EXERCISE EXTRA CAUTION IN THE PERFORMANCE OF ALL WORK TO AVOID DISTURBING SUCH FACILITIES. ALL COSTS FOR REPAIR OF DAMAGES TO SUCH SERVICES SHALL BE PAID BY THE CONTRACTOR CAUSING THE DAMAGE.
     2. EACH CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ALL DAMAGE TO OTHER WORK CAUSED BY HIS WORK OR THROUGH THE NEGLECT OF HIS, OR HIS SUB-TRADE'S PERSONNEL. ALL PATCHING, REPAIRING, REPLACEMENT AND PAINTING, ETC. SHALL BE DONE AS DIRECTED BY THE OWNER BY THE CRAFTSMEN OF THE TRADES INVOLVED. THE COSTS OF SUCH WORK SHALL BE PAID BY THE CONTRACTOR CAUSING THE DAMAGE.
     3. IT IS ESSENTIAL THAT ALL WORK AT THE PROJECT BE DONE AT SUCH TIME AND IN SUCH MANNER AS NOT TO INTERFERE WITH THE OPERATIONS OF THE SPACE, ADJACENT SPACES, OR FACILITY. A WORK SCHEDULE SHALL BE ARRANGED WITH THE OWNER, INCLUDING PREMIUM TIME WORK TO FACILITATE WORK WITH A MINIMUM OF INTERFERENCE TO THE OWNER'S OPERATIONS.
     4. ELECTRICAL CONTRACTOR TO REVIEW SUBMITTALS PROVIDED BY OTHER DISCIPLINES & TRADES FOR ALL ELECTRICAL CONNECTION REQUIREMENTS.
   - E. METHODS
     1. EXCAVATIONS SHALL BE MADE IN OPEN TRENCHES. FLOORS SHALL BE SAW CUT. CONDUIT SHALL BE LAID ON AN APPROPRIATELY GRADED 6" BED OF CLEAN AND DRY SAND. ENGINEERED FILL SHALL BE USED TO BACKFILL TO 6" ABOVE THE CONDUIT. BACKFILL THE REMAINDER OF THE TRENCH UTILIZING THE EXCAVATED MATERIAL IF APPROVED BY THE ARCHITECT OR THE OWNER. IF THE EXCAVATED MATERIALS ARE NOT ACCEPTABLE, ENGINEERED FILL ACCEPTABLE TO THE ARCHITECT SHALL BE UTILIZED TO BACKFILL THE REMAINDER OF THE TRENCH. BACKFILL SHALL BE ACCOMPLISHED IN 9" LIFTS WITH ALL LIFTS COMPACTED TO 95% PROCTOR. PATCH FLOOR TO MATCH EXISTING.
     2. EQUIPMENT, CONDUIT, ETC. SHALL NOT BE SUPPORTED FROM ANY CEILINGS, OTHER PIPING, OTHER CONDUIT OR DUCTWORK, ROOF DECK, OR JOIST BRIDGING. ITEMS SHALL BE SUPPORTED FROM ACCEPTABLE STRUCTURAL BUILDING COMPONENTS AS DETERMINED BY THE ARCHITECT AND STRUCTURAL ENGINEER.
     3. ALL ROOF PENETRATIONS, FLASHINGS AND COUNTER FLASHINGS SHALL BE PERFORMED BY THE OWNER'S ROOFING CONTRACTOR AT THE REQUESTING CONTRACTORS COST.
   - F. SUBMITTALS
     1. SHOP DRAWINGS SHALL BE PROVIDED TO THE ARCHITECT OF ALL EQUIPMENT AND ACCESSORIES PROVIDED FOR THE PROJECT WHETHER SPECIFIED HERE-IN OR ON THE DRAWINGS. REVIEW OF THE SHOP DRAWINGS SHALL BE FOR GENERAL DESIGN CONCEPT AND ADHERENCE WITH THE SPECIFICATIONS. QUANTITY OF SHOP DRAWINGS SUBMITTED SHALL BE AS SPECIFIED BY THE ARCHITECT. SHOP DRAWINGS SHALL BE PREPARED BY THE CONTRACTOR SHOWING LOCATIONS AND MEASUREMENTS FROM COLUMNS OF ALL CONCEALED AND EXPOSED PIPING, DUCTWORK, CONDUIT, EQUIPMENT, ACCESSORIES, ETC., AND SUBMITTED PRIOR TO INSTALLATION. THE OWNER MAY MAKE REPRODUCIBLE COPIES OF THEIR DRAWINGS AVAILABLE FOR USE IN PREPARATION OF SHOP DRAWINGS, HOWEVER THE OWNERS SHALL NOT BE HELD RESPONSIBLE FOR NOT CONFIRMING ALL INFORMATION ON THE DRAWINGS PRIOR TO FABRICATION AND/OR INSTALLATION.
     2. PROJECT RECORD DOCUMENTS - MAINTAIN AT THE JOBSITE ONE COPY OF ALL CONTRACT DOCUMENTS CLEARLY MARKED AS PROJECT RECORD COPY. THESE DRAWINGS ARE TO BE MAINTAINED IN GOOD CONDITION, UPDATED DAILY FOR CHANGES ENCOUNTERED AND AVAILABLE AT ALL TIMES FOR INSPECTION BY THE OWNER. DO NOT USE FOR FIELD CONSTRUCTION. PROJECT RECORD DOCUMENTS ARE TO BE KEPT CURRENT WITH THE CONDITIONS OF ALL WORK, EQUIPMENT, DISTRIBUTION CONDUIT, CIRCUITS, ETC. MARK ALL INFORMATION IN RED LINES AND NOTES SO AS TO BE EASILY IDENTIFIED FROM THE BASE DRAWING. UPON COMPLETION OF THE WORK, ONE SET OF THESE DOCUMENTS SHALL BE TURNED OVER TO THE OWNER AS ONE QUALIFICATION FOR FINAL PAYMENT.
     3. THREE COMPLETE SETS OF AS-BUILT DOCUMENTATION SHALL BE PROVIDED. IT SHALL INCLUDE, BUT NOT BE LIMITED TO ACCURATE PLAN DRAWINGS, WIRING DIAGRAMS AND OPERATION AND MAINTENANCE MANUALS.

2. PRODUCTS
   - A. CONDUIT
     1. CONDUIT SHALL BE HEAVY WALL RIGID GALVANIZED STEEL WHERE EXPOSED AND SUBJECT TO DAMAGE, 8'-0" AFF AND BELOW, AND IN WET LOCATIONS WHERE INDICATED ON THE DRAWINGS. UNDERGROUND CONDUIT SHALL BE SCHEDULE 40 PVC AND SHALL BE CONCRETE ENCASED (3" MINIMUM) WHERE INDICATED ON THE DRAWINGS. A TRANSITION SHALL BE MADE TO HEAVY WALL RIGID GALVANIZED STEEL BEFORE PVC CONDUITS PENETRATE THE FLOOR SLAB. INTERIOR CONDUITS SHALL BE ELECTRICAL METALLIC TUBING (EMT), METALLIC CLAD (MC) CABLE MAY BE USED IF APPROVED BY THE OWNER, AND INSTALLED IN LOCATIONS PERMITTED BY CODE.
     2. FLEXIBLE METAL CONDUIT SHALL BE USED FROM OUTLET BOX TO INDIVIDUAL RECESSED LIGHT FIXTURES, AND FOR FINAL CONNECTIONS TO MOTORS, TRANSFORMERS AND OTHER DEVICES SUBJECT TO VIBRATION.
   - B. CONDUIT FITTINGS AND BOXES
     1. INTERIOR OUTLET BOXES SHALL BE STANDARD GALVANIZED SHEET STEEL TYPE, NOT LESS THAN 14 GAUGE IN THICKNESS, WITH KNOCKOUT OPENINGS, EXTENSIONS, PLASTER RINGS AND COVER PLATES TO ACCOMMODATE THE DEVICES INSTALLED. COVER PLATES SHALL BE SMOOTH PLASTIC TO MATCH DEVICE COLOR. USE STEEL PLATES WITH ROUNDED CORNERS FOR SURFACE BOXES. OUTDOOR (WET LOCATION) OUTLET BOXES SHALL BE CAST ALUMINUM TYPE WITH DEVICE COVERS TO SUIT.
     2. OUTLET BOXES SHALL NOT BE LESS THAN 4 INCHES SQUARE, 1-1/2 INCHES DEEP.
     3. COUPLINGS AND CONNECTORS FOR EMT SHALL BE DIE CAST ZINC OR STEEL. BUSHING SHALL BE GROUNDING TYPE WITH INSULATING PLASTIC INSERT.
     4. FLOOR BOXES SHALL BE FLUSH SERVICE TYPE., RECTANGULAR CAST METAL CONSTRUCTION GANGABLE ADJUSTABLE WITH BRASS (ALUMINUM) COVER AND TRIM/FLANGE AS REQUIRED. COVER TYPE SHALL BE AS INDICATED ON LEGEND.
   - C. WIRE AND CABLE
     1. CONDUCTORS FOR POWER AND LIGHTING SHALL BE NEW 600-VOLT, 90°C, TYPE XHHW, THHW, THHN, OR THWN INSULATION. MINIMUM SIZE #12-AWG, EXCEPT FOR CONTROL WIRING WHICH MAY BE #14-AWG. OTHER SIZES SHALL BE AS NOTED ON THE DRAWINGS. CONDUCTORS SHALL BE COPPER, UNLESS OTHERWISE APPROVED BY THE OWNER. CONDUCTORS SHALL BE UTILIZED WHERE SUITABLE AND REQUIRED BY NEC.
     2. BRANCH CIRCUIT RUNS EXCEEDING 100 FEET IN TOTAL LENGTH FROM THE PANELBOARD TO THE LAST DEVICE, SHALL BE #10-AWG CONDUCTORS UNLESS OTHERWISE NOTED.
     3. COMPRESSION TYPE LUGS AND CONNECTORS SHALL BE USED FOR ALL TERMINATIONS AND SPLICES.
     4. CONDUCTORS ROUTED ON ROOFTOP, EXPOSED TO DIRECT SUNLIGHT SHALL BE 90°C TYPE XHHW-2 PER NEC 310.15(B)(3)(C). 5. ALL LOW VOLTAGE COMMUNICATIONS, FIRE ALARM, DATA, SECURITY, TELEPHONE AND ALL OTHER MISCELLANEOUS LOW VOLTAGE WIRING INSTALLED IN CEILING SHALL BE PLENUM RATED.
   - D. WIRING DEVICES
     1. DUPLEX RECEPTACLES SHALL BE GROUNDING TYPE, NEMA 5-20R, RATED FOR 20 AMPS, 125 VOLTS, WITH PROVISIONS FOR BACK AND SIDE WIRING.
     2. GFI TYPE RECEPTACLES SHALL BE READILY ACCESSIBLE AS REQUIRED PER NEC. COORDINATE INSTALLATION WITH FIELD CONDITIONS.
     3. CONTROLLED RECEPTACLES SHALL BE PROVIDED WITH IDENTIFIABLE MARKINGS.
     4. ISOLATED GROUND RECEPTACLES SHALL BE IDENTIFIED BY AN ORANGE TRIANGLE ON THE FACE OF THE RECEPTACLE.
     5. SWITCHES SHALL BE TOGGLE OPERATED, QUIET TYPE, RATED FOR 20 AMPS, 120/277 VOLTS, WITH PROVISIONS FOR BACK AND SIDE WIRING. THREE WAY AND FOUR WAY SWITCHES SHALL BE PROVIDED WHERE INDICATED.
     6. DIMMERS SHALL BE LUTRON "NOVA T-STAR" SERIES, OF A RATING, VOLTAGE AND WATTAGE SUITABLE FOR LOAD SERVED, OR APPROVED EQUAL.
     7. COLORS OF DEVICES SHALL BE SELECTED BY ARCHITECT.
     8. WIRING DEVICES SHALL BE SPECIFICATION GRADE, AS MANUFACTURED BY HUBBELL, PASS & SEYMOUR, ARROW HART, LEVITON AND GENERAL ELECTRIC.
   - E. LIGHTING AND RECEPTACLE PANELBOARDS
     1. BRANCH CIRCUIT PANELBOARDS SHALL BE DEAD FRONT TYPE, WITH MAIN LUGS OR MAIN OVERCURRENT DEVICE AS INDICATED, BRANCH OVERCURRENT DEVICES AS NOTED AND AN EQUIPMENT GROUND BAR, ALL IN A SURFACE OR FLUSH MOUNTED SHEET STEEL ENCLOSURE. PANELBOARDS SHALL BE FULLY RATED, MINIMUM SHORT CIRCUIT CAPACITY SHALL BE 10,000 AMPS SYMMETRICAL FOR 120/208V, AND 18,000 AMPS SYMMETRICAL FOR 277/480V APPLICATION UNLESS NOTED OTHERWISE.
     2. ELECTRICAL PANELS MOUNTED ON INTERIOR OF BUILDING SHALL BE NEMA 1 UNLESS OTHERWISE INDICATED ON THE DRAWINGS. ELECTRICAL PANELS MOUNTED ON EXTERIOR OF BUILDING SHALL BE NEMA 3R UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
     3. CIRCUIT BREAKERS SHALL BE BOLT ON TYPE, WITH MOLDED PLASTIC CASE; 1, 2, OR 3 POLE AS INDICATED; QUICK-MAKE, QUICK-BREAK; AND THERMAL-MAGNETIC TRIP DEVICE.
     4. ALL BREAKERS FEEDING HVAC EQUIPMENT SHALL BE HACR RATED, UNLESS OTHERWISE NOTED.
     5. ALL EQUIPMENT RATED 100A OR LESS SHALL HAVE 60 DEGREE C MINIMUM TERMINATIONS. ALL EQUIPMENT RATED OVER 100A SHALL HAVE 75 DEGREE MINIMUM TERMINATIONS.
     6. INDIVIDUAL SINGLE POLE CIRCUIT BREAKERS, WITH IDENTIFIED TIES, OR 2/3 POLE BREAKERS SHALL BE PROVIDED FOR EACH UNGROUNDED CONDUCTOR IN ALL MULTI-WIRE BRANCH CIRCUITS.
     7. CONTRACTOR SHALL CONFIRM AVAILABLE UTILITY FAULT CURRENT WITH UTILITY ENGINEER PRIOR TO COMMENCING WORK.
     8. PANELBOARDS SHALL BE AS MANUFACTURED BY SQUARE D, GENERAL ELECTRIC, SIEMENS, AND EATON.
   - F. DISTRIBUTION TRANSFORMERS
     1. TRANSFORMERS SHALL BE ENERGY SAVING TYPE, DRY TYPE, 220 DEGREE C INSULATION, 115 DEGREE C RISE WITH 2 TAPS ABOVE AND 4 TAPS BELOW NORMAL VOLTAGE. TRANSFORMERS SHALL BE AS MANUFACTURED BY SQUARE D, GENERAL ELECTRIC, SIEMENS, EATON, AND ACME. TRANSFORMERS SHALL MEET DOE 2016 STANDARDS.
     2. REFER TO NEC 240.21(B)(3) AND 450.14 FOR TRANSFORMER DISCONNECTING MEANS REQUIREMENTS. WHEN TRANSFORMERS ARE NOT WITHIN LINE OF SITE, OR EXCEED 25' OF COMBINED DISTANCE OF SECONDARY AND PRIMARY FEEDERS, A DISCONNECTING MEANS SHALL BE LOCATED WITHIN REQUIRED NEC DISTANCES. CONTRACTOR SHALL VERIFY LENGTHS OF PRIMARY AND SECONDARY FEEDERS IN THE FIELD AND ARE RESPONSIBLE FOR MEETING THE REQUIREMENTS OF THE NEC CODE SECTIONS LISTED ABOVE.
   - G. SAFETY SWITCHES AND MOTOR STARTERS
     1. SAFETY SWITCHES SHALL BE FUSIBLE OR NON-FUSIBLE AS INDICATED ON THE DRAWINGS. SWITCHES SHALL BE QUICK-MAKE, QUICK-BREAK, HEAVY DUTY VISIBLE BLADE TYPE. ENCLOSURES SHALL BE RATED FOR INSTALLATION IN DESIGNATED AREA AS INDICATED ON PLANS. INTERIOR ENCLOSURES SHALL BE NEMA 1 UNLESS OTHERWISE INDICATED ON THE DRAWINGS. EXTERIOR ENCLOSURES SHALL BE NEMA 3R. UNLESS OTHERWISE INDICATED ON THE DRAWINGS. FUSES SHALL BE DUAL ELEMENT - TIME DELAY TYPE.
     2. MAGNETIC MOTOR STARTERS SHALL BE COMBINATION TYPE WITH THERMAL OVERLOAD, INTEGRAL FUSED SAFETY SWITCH, H-O-A SELECTOR SWITCH, CONTROL TRANSFORMER, RUNNING PILOT LIGHT, NEMA TYPE 1 ENCLOSURE, AND (2) NORMALLY OPEN AND (2) NORMALLY CLOSED AUXILIARY CONTACTS.
     3. ALL MOTORS OVER 1/8 HP SHALL BE PROVIDED WITH THERMAL OVERLOAD PROTECTION. OVERLOAD PROTECTION SHALL BE PROVIDED INTEGRAL WITH THE MOTOR WINDINGS AND/OR MOTOR CONTROLLER (PROVIDED BY OTHERS) UNLESS OTHERWISE INDICATED ON DRAWINGS.
     4. ALL EQUIPMENT RATED 100A OR LESS SHALL HAVE 60 DEGREE C MINIMUM TERMINATIONS. ALL EQUIPMENT RATED OVER 100A SHALL HAVE 75 DEGREE MINIMUM TERMINATIONS.
     5. SWITCHES SHALL BE RATED TO WITHSTAND INCOMING KAIC VALUES. COORDINATE INCOMING KAIC VALUES WITH UTILITY ENGINEER AS REQUIRED.

3. EXECUTION
   - A. GENERAL MISCELLANEOUS
     1. ALL CONDUIT RUN IN FINISHED AREAS SHALL BE CONCEALED. CONDUIT SMALLER THAN 3/4" SHALL NOT BE USED FOR ANY CIRCUIT HOMERUNS.
     2. RACEWAYS EXPOSED TO DIFFERENT TEMPERATURES SHALL BE FILLED WITH AN APPROVED MATERIAL IN ACCORDANCE WITH ARTICLE 300.7 OF THE NATIONAL ELECTRICAL CODE.
     3. HANGERS, SUPPORTS, OR FASTENINGS SHALL BE PROVIDED AT EACH ELBOW, AT THE ENDS OF STRAIGHT RUNS TERMINATING AT BOXES OR CABINETS, AND AT INTERMEDIATE POINTS AS REQUIRED BY CODE. CONDUITS OR BOXES SHALL NOT BE SUPPORTED BY CEILING SUPPORT WIRES OR OTHER CEILING SUPPORTING HARDWARE.
     4. ACCESS PANELS SHALL BE PROVIDED FOR ALL JUNCTION BOXES AND PULL BOXES INSTALLED ABOVE DRYWALL CEILINGS, COORDINATE SIZE AND LOCATION WITH ARCHITECT.
     5. FIXTURE SUPPORTS SHALL BE IN ACCORDANCE WITH ARTICLE 410-30 OF THE NATIONAL ELECTRICAL CODE, OR ANY LOCAL CODES WHICH MY APPLY.
     6. PROVIDE PERMANENT NAMEPLATES WITH DESIGNATIONS FOR PANELBOARDS, FEEDER DEVICES, DISTRIBUTION EQUIPMENT AND STARTERS.
     7. PROVIDE TYPEWRITTEN DIRECTORY CARDS WITH BRANCH CIRCUIT IDENTIFICATION FOR BRANCH CIRCUIT PANELBOARDS. PANELBOARDS, FEEDER DEVICES, DISTRIBUTION EQUIPMENT AND STARTERS SHALL BE FIELD MARKED TO WARN QUALIFIED PERSONS OF POTENTIAL ELECTRIC ARC FLASH HAZARDS IN ACCORDANCE WITH NEC 110.16.
     8. INSTALL HANDLE GUARDS ON ALL BREAKERS FOR NIGHT LIGHTING, EMERGENCY AND SIMILAR CIRCUITS.
     9. THE ELECTRICAL CONTRACTOR SHALL BALANCE PANELBOARD LOADING TO WITHIN 10% ON EACH PHASE BASED ON INSTALLED CONDITIONS. LOAD BALANCING CIRCUIT CHANGES SHALL BE PERFORMED OUTSIDE THE NORMAL OCCUPANCY WORKING SCHEDULE AND AT A TIME DIRECTED BY LANDLORD.
     10. WHERE TRANSFORMERS HAVE A DISCONNECTING MEANS IN A REMOTE LOCATION, THE DISCONNECTING MEANS SHALL BE LOCKABLE AND THE LOCATION FIELD MARKED ON THE TRANSFORMER IN ACCORDANCE WITH ARTICLE 450.14 OF NEC.
     11. ALL FLUSH MOUNTED PANELBOARDS SHALL HAVE (3) 3/4" EMPTY CONDUITS INSTALLED TO ABOVE ACCESSIBLE CEILING FOR FUTURE USE.
     12. THE FINAL LOCATIONS OF ALL EQUIPMENT, OUTLETS, ETC. SHALL BE SUBJECT TO REASONABLE CHANGES IN LOCATION UP TO THE TIME OF ROUGHING-IN, AT NO ADDITIONAL COST TO THE OWNER.
     13. CONTACT ELECTRIC POWER COMPANY AND MAKE NECESSARY ARRANGEMENTS FOR ELECTRIC SERVICE.
     14. CONTACT ELECTRIC POWER COMPANY TO CONFIRM AVAILABLE FAULT CURRENT. MODIFY EQUIPMENT AS REQUIRED TO MEET WITHSTAND RATINGS PER NEC
     15. CONTACT TELEPHONE COMPANY AND MAKE NECESSARY ARRANGEMENTS FOR TELEPHONE SERVICE.
     16. AT ALL TIMES KEEP PREMISES AND BUILDING IN A NEAT AND ORDERLY CONDITION, FOLLOWING OWNER'S INSTRUCTION IN REGARD TO STORING OF MATERIALS, PROTECTIVE MEASURES AND DISPOSING OF DEBRIS.
     17. ALL SERVICE EQUIPMENT SHALL BE IDENTIFIED AS BEING SUITABLE FOR USE AS SERVICE EQUIPMENT. SERVICE EQUIPMENT SHALL BE FIELD MARKED WITH THE MAXIMUM AVAILABLE FAULT CURRENT AND THE DATE THE CALCULATION WAS PERFORMED. FIELD MARKING SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE INSTALLATION ENVIRONMENT.
     18. REFER TO NEC TABLE 300.5 FOR CONDUIT BURIAL DEPTH REQUIREMENTS. COORDINATE BURIAL DEPTH AND CONDUIT COVER WITH CIVIL PLANS AND FIELD CONDITIONS, MODIFY AND ADJUST COVER BASED ON NEC REQUIREMENTS.
     19. THE ELECTRICAL CONTRACTOR SHALL COORDINATE ELECTRICAL CONNECTION REQUIREMENTS WITH ALL EQUIPMENT PROVIDED BY OTHERS PRIOR TO ROUGH-IN.
     20. RACEWAYS BELOW DRIVEWAYS, PARKING LOTS, AND ANY RACEWAYS INSTALLED BELOW GRADE SHALL BE INSTALLED A MINIMUM OF 24" BELOW FINISHED GRADE PER NEC 300.5.
     21. CONTRACTOR SHALL PROVIDE PROGRAMMING AND TRAINING OF ALL LIGHTING CONTROL SYSTEMS AND COMPONENTS TO OWNER/TENANT PRIOR TO PROJECT TURNOVER. PROVIDE TWO(2) WEEK NOTICE TO TENANT/OWNER/GC FOR TRAINING SCHEDULING, COORDINATE WITH ALL REQUIRED PARTIES.
     22. MAXIMUM VOLTAGE DROP ACROSS ELECTRICAL SYSTEM SHALL BE NO GREATER THAN 5% FROM UTILITY SERVICE POINT. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING INCREASED WIRE SIZES DUE TO FIELD CONDITIONS RESULTING IN EXTENDING CONDUIT PATHS. GROUND WIRE SIZES ARE REQUIRED TO BE ADJUSTED PER ARTICLE 250 OF THE NEC WHEN WIRES ARE INCREASED FOR VOLTAGE DROP. REFER TO NEC ARTICLE 215.2 INFORMATIONAL NOTES REGARDING ACCEPTABLE ALLOWANCES FOR INDIVIDUAL LOAD CLASSIFICATIONS/TYPES.
   - B. GROUNDING
     1. GROUND ALL CONDUITS, CABINETS, MOTORS, PANELS, AND OTHER EXPOSED NON-CURRENT CARRYING PARTS OF ELECTRICAL EQUIPMENT IN ACCORDANCE WITH NEC ARTICLE 250.
     2. BOND METAL WATER PIPING AND OTHER METAL PIPING (INCLUDING GAS PIPING) AND EXPOSED STRUCTURAL METAL IN ACCORDANCE WITH NEC ARTICLE 250.
     3. GROUNDING OF THE ELECTRICAL SYSTEM SHALL BE BY MEANS OF AN INSULATED GROUNDING CONDUCTOR INSTALLED WITH ALL FEEDERS AND BRANCH CIRCUIT CONDUCTORS IN ALL CONDUITS.

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REVISIONS

NO	DATE	DESCRIPTION

Designed: HP
Drawn: DH
Reviewed: JC
Project No.: 2301734
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Title: ELECTRICAL SPECIFICATIONS

Sheet No.: E002

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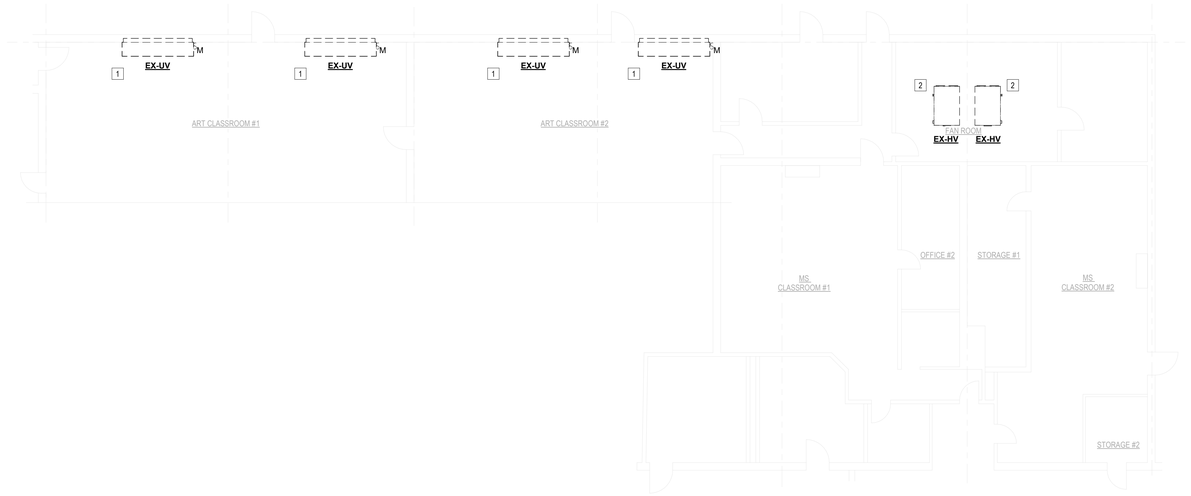
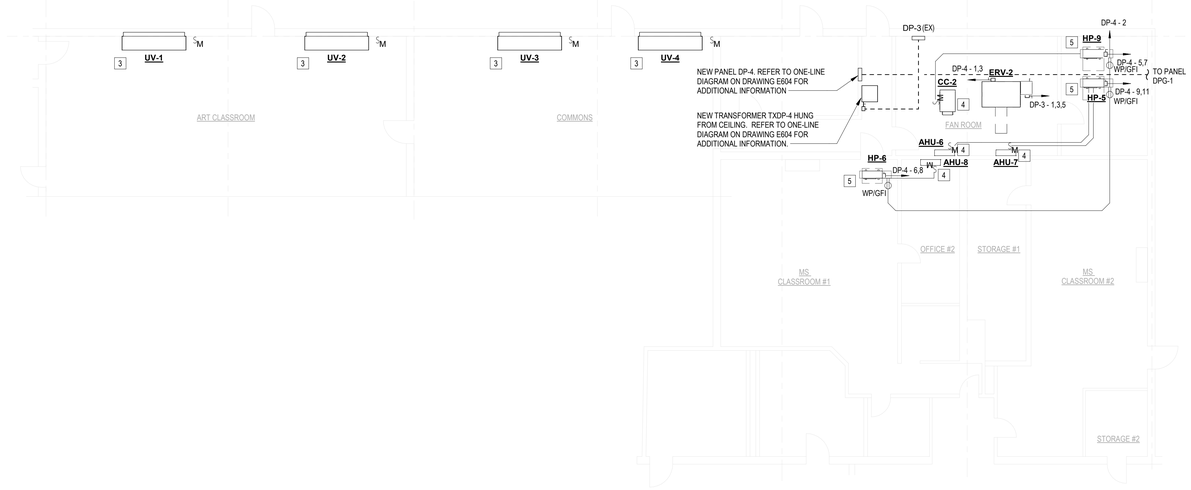
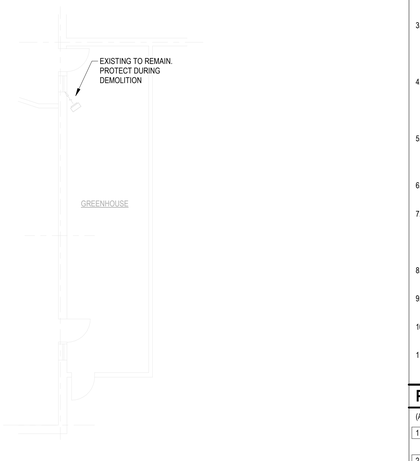


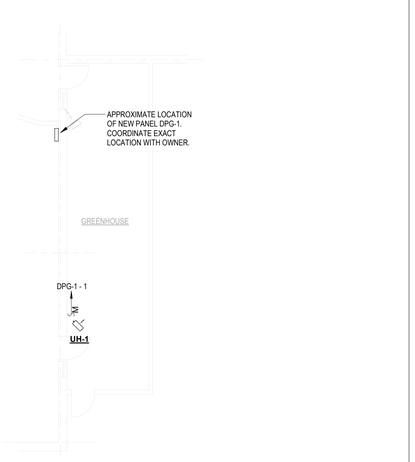
3 PARTIAL POWER PLAN - ART ROOMS AND LOCKERROOM CLASSROOM - DEMO
1/8" = 1'-0"



4 PARTIAL POWER PLAN - ART ROOMS AND LOCKERROOM CLASSROOM - NEW
1/8" = 1'-0"



1 PARTIAL POWER PLAN - GREENHOUSE - DEMO
1/8" = 1'-0"



2 PARTIAL POWER PLAN - GREENHOUSE - NEW
1/8" = 1'-0"

POWER PLAN GENERAL NOTES

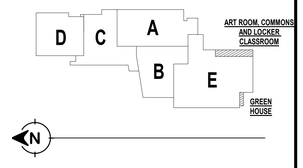
1. ALL INSTALLATIONS SHALL CONFORM TO THE LATEST ADOPTED EDITION OF THE NATIONAL ELECTRICAL CODE AS WELL AS ALL APPLICABLE STATE AND LOCAL CODES.
2. ALL ELECTRICAL EQUIPMENT AND DEVICES SHALL BE SUITABLE FOR ITS APPLICATION PER THE LISTING INSTRUCTIONS OF A NATIONALLY RECOGNIZED AND APPROVED TESTING LABORATORY.
3. ACCESS TO & CLEARANCES AROUND ELECTRICAL EQUIPMENT SHALL CONFORM TO NEC ARTICLE 110. CONSULT ENGINEER WHERE SPACE APPEARS INADEQUATE DUE TO ARCHITECTURAL CHANGES, EQUIPMENT LAYOUT CHANGES, OR FIELD CONDITIONS. DO NOT COVER, OBSCURE OR BLOCK ACCESS TO EQUIPMENT, DATA PLATES, ACCESS PANELS OR MAINTENANCE AREAS WITH THE ELECTRICAL WORK.
4. THIS DRAWING SHOWS EQUIPMENT LOCATIONS ONLY. WIRING SHOWN IS SCHEMATIC IN NATURE. REFER TO RISERS, & DETAILS FOR ALL REQUIRED POWER & CONTROL WIRING. COORDINATE CONDUIT ROUTE IN FIELD WITH OTHER TRADES, EQUIPMENT & OWNER. VERIFY ALL MOUNTING HEIGHTS WITH OWNER & ARCHITECTURAL PLANS PRIOR TO INSTALLATION.
5. UNLESS NOTED OTHERWISE, MINIMUM POWER WIRING SHALL BE 2-#12 & 1-#12 GND IN 3/4"C TO 20A-1P CIRCUIT BREAKER IN PANEL LISTED. MINIMUM CONTROL WIRING SHALL BE 2-#14 IN 3/4"C. ALL POWER WINIG OF CIRCUIT SHALL MATCH HOMERUN WIRING OF CIRCUIT.
6. REFER TO MECHANICAL EQUIPMENT FEEDER SCHEDULE FOR BRANCH CIRCUIT INFORMATION OF MECHANICAL AND PLUMBING EQUIPMENT.
7. REVIEW DRAWINGS TO COORDINATE POWER REQUIREMENTS AND LOCATIONS FOR ALL EQUIPMENT SPECIFIED BY OTHER TRADES INVOLVED IN THE PROJECT. PROVIDE ALL THE ELECTRICAL POWER CIRCUITS, INTERCONNECTING POWER WIRING AND CONDUIT, CONTROL WIRING, NECESSARY TO PROVIDE A COMPLETE INSTALLATION.
8. COORDINATE ELECTRICAL REQUIREMENTS OF ALL OWNER PROVIDED EQUIPMENT WITH ACTUAL EQUIPMENT PRIOR TO INSTALLATION.
9. CONTRACTOR SHALL COORDINATE WITH SITE SPECIFIC LOCAL REQUIREMENTS FOR SEISMIC BRACING OF ELECTRICAL EQUIPMENT AND CONDUITS.
10. CONTRACTOR SHALL CLEARLY LABEL ALL ELECTRICAL EQUIPMENT AND DEVICES WITH ASSOCIATED PANEL NAME AND CIRCUIT BREAKER.
11. UNLESS OTHERWISE NOTED, ALL 15A AND 20A, 120V AND 250V NONLOCKING-TYPE RECEPTACLES SHALL BE LISTED TAMPER-RESISTANT RECEPTACLES TO MEET NEC 406.12.

POWER PLAN KEY NOTES

(ALL KEY NOTES MAY NOT BE INDICATED ON FLOOR PLAN)

1. DISCONNECT EXISTING HVAC EQUIPMENT FOR REMOVAL BY MECHANICAL CONTRACTOR. ELECTRICAL CIRCUIT TO REMAIN FOR FUTURE USE.
2. DISCONNECT EXISTING HVAC EQUIPMENT FOR REMOVAL BY MECHANICAL CONTRACTOR. REMOVE ASSOCIATED CONDUIT AND WIRING BACK TO SOURCE.
3. CONNECT NEW HVAC UNIT TO EXISTING CIRCUIT MADE AVAILABLE DURING DEMOLITION. PROVIDE NEW THERMAL DISCONNECT. EXTEND WIRING AND CONDUIT AS REQUIRED.
4. AHU/CC TO BE ENERGIZED FROM ASSOCIATED HP UNIT. SEE MECHANICAL FEEDER SCHEDULE FOR ADDITIONAL INFORMATION.
5. APPROXIMATE LOCATION OF ROOFTOP HP UNIT. SEE MECHANICAL DRAWINGS FOR MORE INFORMATION.

KEY PLAN



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REVISIONS

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Reviewed:	JC
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Title:
ENLARGED ELECTRICAL POWER PLANS

Sheet No.
E401

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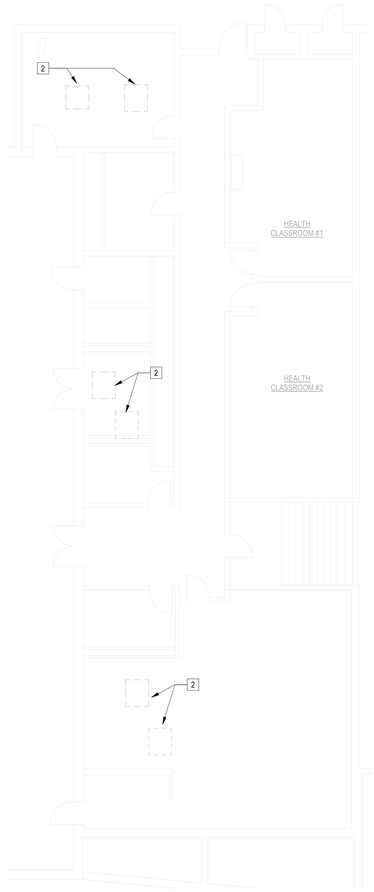
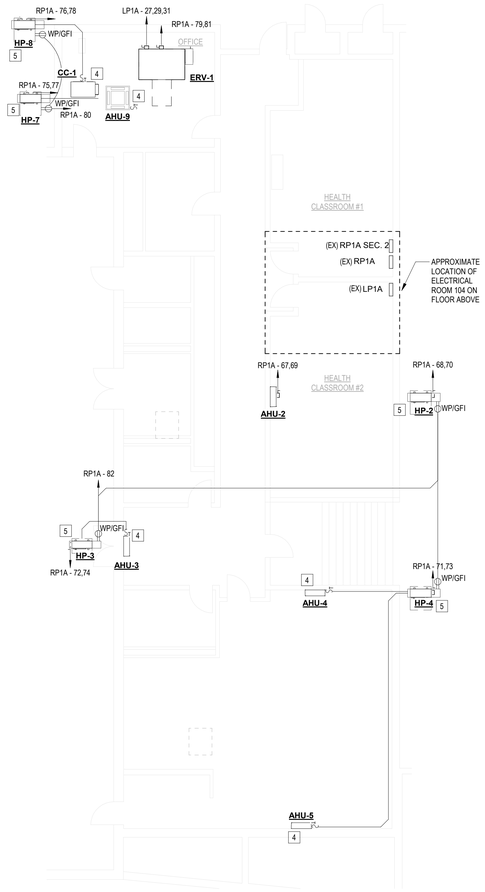
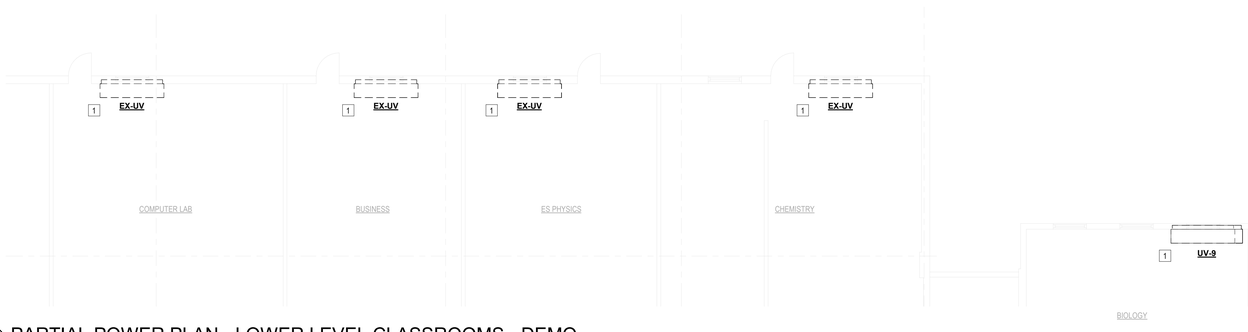


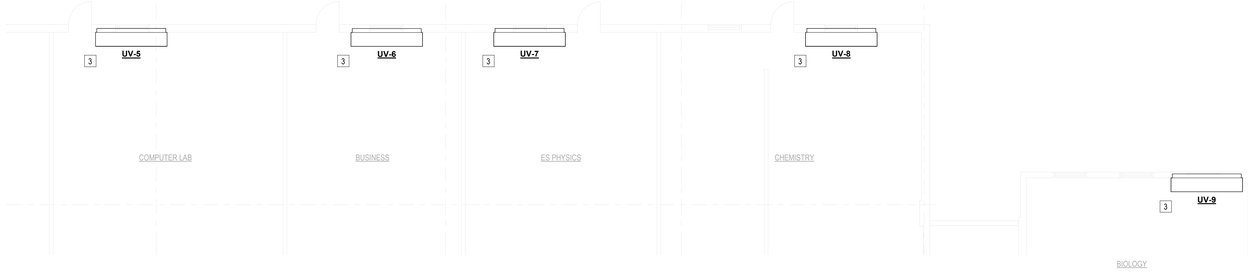
1 PARTIAL POWER PLAN - LOWER LEVEL HEALTH CLASSROOMS - DEMO
1/8" = 1'-0"



2 PARTIAL POWER PLAN - LOWER LEVEL HEALTH CLASSROOMS - NEW
1/8" = 1'-0"



3 PARTIAL POWER PLAN - LOWER LEVEL CLASSROOMS - DEMO
1/8" = 1'-0"



4 PARTIAL POWER PLAN - LOWER LEVEL CLASSROOMS - NEW
1/8" = 1'-0"

POWER PLAN GENERAL NOTES

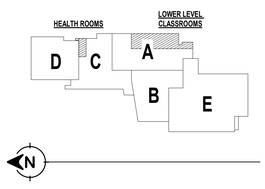
1. ALL INSTALLATIONS SHALL CONFORM TO THE LATEST ADOPTED EDITION OF THE NATIONAL ELECTRICAL CODE AS WELL AS ALL APPLICABLE STATE AND LOCAL CODES.
2. ALL ELECTRICAL EQUIPMENT AND DEVICES SHALL BE SUITABLE FOR ITS APPLICATION PER THE LISTING INSTRUCTIONS OF A NATIONALLY RECOGNIZED AND APPROVED TESTING LABORATORY.
3. ACCESS TO & CLEARANCES AROUND ELECTRICAL EQUIPMENT SHALL CONFORM TO NEC ARTICLE 110. CONSULT ENGINEER WHERE SPACE APPEARS INADEQUATE DUE TO ARCHITECTURAL CHANGES, EQUIPMENT LAYOUT CHANGES, OR FIELD CONDITIONS. DO NOT COVER, OBSCURE OR BLOCK ACCESS TO EQUIPMENT, DATA PLATES, ACCESS PANELS OR MAINTENANCE AREAS WITH THE ELECTRICAL WORK.
4. THIS DRAWING SHOWS EQUIPMENT LOCATIONS ONLY. WIRING SHOWN IS SCHEMATIC IN NATURE. REFER TO RISERS, & DETAILS FOR ALL REQUIRED POWER & CONTROL WIRING. COORDINATE CONDUIT ROUTE IN FIELD WITH OTHER TRADES, EQUIPMENT & OWNER. VERIFY ALL MOUNTING HEIGHTS WITH OWNER & ARCHITECTURAL PLANS PRIOR TO INSTALLATION.
5. UNLESS NOTED OTHERWISE, MINIMUM POWER WIRING SHALL BE 2-#12 & 1-#12 GND IN 3/4"C TO 20A-1P CIRCUIT BREAKER IN PANEL LISTED. MINIMUM CONTROL WIRING SHALL BE 2-#14 IN 3/4"C. ALL POWER WINIG OF CIRCUIT SHALL MATCH HOMERUN WIRING OF CIRCUIT.
6. REFER TO MECHANICAL EQUIPMENT FEEDER SCHEDULE FOR BRANCH CIRCUIT INFORMATION OF MECHANICAL AND PLUMBING EQUIPMENT.
7. REVIEW DRAWINGS TO COORDINATE POWER REQUIREMENTS AND LOCATIONS FOR ALL EQUIPMENT SPECIFIED BY OTHER TRADES INVOLVED IN THE PROJECT. PROVIDE ALL THE ELECTRICAL POWER CIRCUITS, INTERCONNECTING POWER WIRING AND CONDUIT, CONTROL WIRING, NECESSARY TO PROVIDE A COMPLETE INSTALLATION.
8. COORDINATE ELECTRICAL REQUIREMENTS OF ALL OWNER PROVIDED EQUIPMENT WITH ACTUAL EQUIPMENT PRIOR TO INSTALLATION.
9. CONTRACTOR SHALL COORDINATE WITH SITE SPECIFIC LOCAL REQUIREMENTS FOR SEISMIC BRACING OF ELECTRICAL EQUIPMENT AND CONDUITS.
10. CONTRACTOR SHALL CLEARLY LABEL ALL ELECTRICAL EQUIPMENT AND DEVICES WITH ASSOCIATED PANEL NAME AND CIRCUIT BREAKER.
11. UNLESS OTHERWISE NOTED, ALL 15A AND 20A, 120V AND 250V NONLOCKING-TYPE RECEPTACLES SHALL BE LISTED TAMPER-RESISTANT RECEPTACLES TO MEET NEC 406.12.

POWER PLAN KEY NOTES

(ALL KEY NOTES MAY NOT BE INDICATED ON FLOOR PLAN)

1. DISCONNECT EXISTING HVAC EQUIPMENT FOR REMOVAL BY MECHANICAL CONTRACTOR. ELECTRICAL CIRCUIT TO REMAIN FOR FUTURE USE.
2. DISCONNECT EXISTING HVAC EQUIPMENT FOR REMOVAL BY MECHANICAL CONTRACTOR. REMOVE ASSOCIATED CONDUIT AND WIRING BACK TO SOURCE.
3. CONNECT NEW HVAC UNIT TO EXISTING CIRCUIT MADE AVAILABLE DURING DEMOLITION. PROVIDE NEW THERMAL DISCONNECT. EXTEND WIRING AND CONDUIT AS REQUIRED.
4. AHU/CC TO BE ENERGIZED FROM ASSOCIATED HP UNIT. SEE MECHANICAL FEEDER SCHEDULE FOR ADDITIONAL INFORMATION.
5. APPROXIMATE LOCATION OF ROOFTOP HP UNIT. SEE MECHANICAL DRAWINGS FOR MORE INFORMATION.

KEY PLAN



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HVAC UPGRADES TO THE EAST GRANBY MIDDLE/HIGH SCHOOL
95 SOUTH MAIN ST., EAST GRANBY, CT

REVISIONS

NO	DATE	DESCRIPTION

Designed:	HP
Drawn:	DH
Reviewed:	JC
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Title:
ENLARGED ELECTRICAL POWER PLANS

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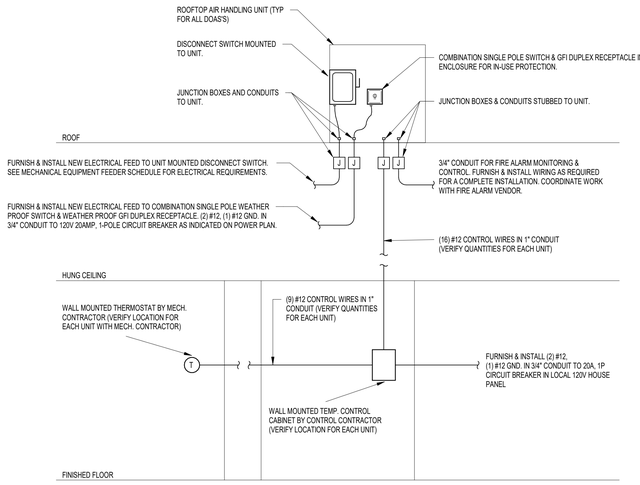
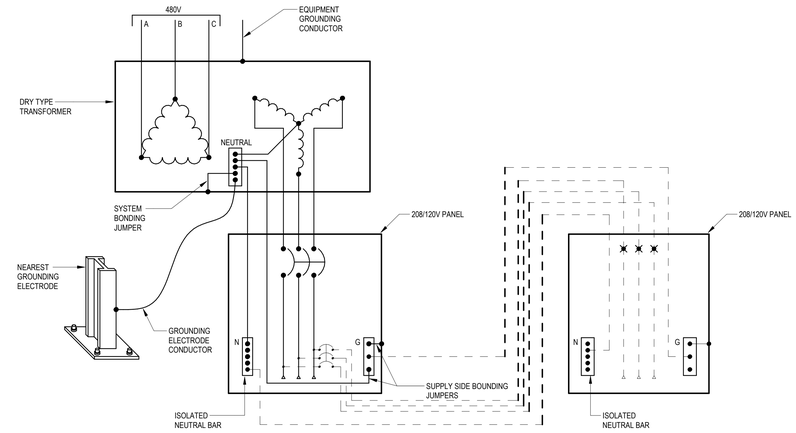


NOTES:

1. TYPICAL FOR ALL NEW DEDICATED OUTSIDE AIR UNITS (DOAS'S).
2. ELECTRICAL CONTRACTOR SHALL FURNISH & INSTALL CONTROL WIRING FOR UNITS. FINAL CONNECTIONS BY CONTROL CONTRACTOR. COORDINATE QUANTITY & COLOR CODING OF CONTROL WIRING WITH CONTROL CONTRACTOR FOR EACH UNIT. FURNISH & INSTALL (4) SPARE CONTROL WIRES IN EACH RUN OF CONTROL CONDUIT & LABEL EACH END 'SPARE'.
3. ELECTRICAL CONTRACTOR SHALL FURNISH & WIRE (2) DUCT MOUNTED SMOKE DETECTORS, (1) EACH FOR SUPPLY & RETURN. WIRE DETECTORS TO SHUT DOWN UNIT UPON DETECTION OF SMOKE. REFER TO ELECTRICAL GENERAL NOTES & SYMBOLS LEGEND FOR FURTHER INFORMATION OF DUCT SMOKE DETECTORS. COORDINATE WORK WITH FIRE ALARM VENDOR.
4. ELECTRICAL CONTRACTOR SHALL FURNISH & INSTALL A RELAY WITH (2) CONVERTIBLE CONTACTS USED TO TIE EACH MAGNETIC STARTER INTO THE FIRE ALARM PANEL.

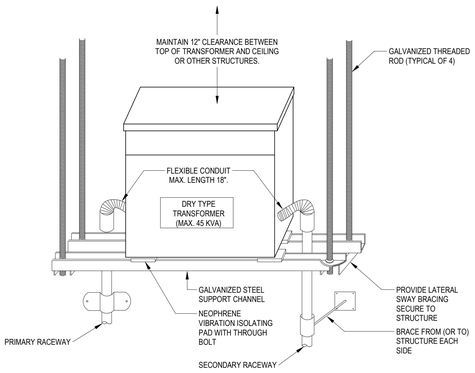
1 ROOF TOP HVAC EQUIPMENT ELECTRICAL INSTALLATION DETAIL

12" = 1'-0"



2 TYPICAL DISTRIBUTION TRANSFORMER GROUNDING DETAIL

12" = 1'-0"



3 SUSPENDED TRANSFORMER SUPPORT DETAIL

12" = 1'-0"

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HVAC UPGRADES TO THE EAST GRANBY MIDDLE/HIGH SCHOOL
95 SOUTH MAIN ST., EAST GRANBY, CT

REVISIONS

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ELECTRICAL DETAILS

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PANEL: LP1A (EX)

LOCATION: EXISTING | **VOLTAGE:** 480/277V | **A.I.C. RATING:** EXISTING
SUPPLY FROM: EXISTING | **PHASES:** 3 | **MAINS TYPE:** MLO
MOUNTING: SURFACE | **WIRES:** 4 | **MAINS RATING:** 225 A
ENCLOSURE: TYPE 1 | **MCB RATING:** 225 A

CKT	CIRCUIT DESCRIPTION	TRIP	POLES	A		B		C		POLES	TRIP	CIRCUIT DESCRIPTION	CKT
1				3.00	3.00								2
3	EXISTING CIRCUIT	20 A	3			3.00	3.00			3	20 A	EXISTING CIRCUIT	4
5								3.00	3.00				6
7				3.00	3.00					1	20 A	EXISTING CIRCUIT	8
9	EXISTING CIRCUIT	20 A	3			3.00	3.00			1	20 A	EXISTING CIRCUIT	10
11								3.00	3.00	1	20 A	EXISTING CIRCUIT	12
13	EXISTING CIRCUIT	20 A	1	0.50	0.50					1	20 A	EXISTING CIRCUIT	14
15	EXISTING CIRCUIT	20 A	1			0.50	0.50			1	20 A	EXISTING CIRCUIT	16
17	EXISTING CIRCUIT	20 A	1					0.50	0.50	1	20 A	EXISTING CIRCUIT	18
19	EXISTING CIRCUIT	20 A	1	0.50	0.50					1	20 A	EXISTING CIRCUIT	20
21	EXISTING CIRCUIT	20 A	1			0.50	0.50			1	20 A	EXISTING CIRCUIT	22
23	EXISTING CIRCUIT	20 A	1					0.50	0.50	1	20 A	EXISTING CIRCUIT	24
25	EXISTING CIRCUIT	20 A	1	0.50	0.50					1	20 A	EXISTING CIRCUIT	26
27						3.85	--			1	--	SPACE	28
NEW → 29	ERV-1, HC-1	15 A	3					3.85	--	1	--	SPACE	30
31				3.85	--					1	--	SPACE	32
33	SPACE	--	1			--	--			1	--	SPACE	34
35	SPACE	--	1					--	--	1	--	SPACE	36
37	SPACE	--	1	--	--					1	--	SPACE	38
39	SPACE	--	1			--	--			1	--	SPACE	40
41	SPACE	--	1					--	--	1	--	SPACE	42
		TOTAL LOAD:		18.85 kVA		17.85 kVA		17.85 kVA					
		TOTAL AMPS:		68 A		64 A		64 A					

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
Spare	43 kVA	100.00%	43 kVA		
Power	12 kVA	100.00%	12 kVA	**TOTAL CONNECTED LOAD:**	55 kVA
				TOTAL EST. DEMAND LOAD:	55 kVA
				TOTAL CONNECTED AMPS:	66 A
				TOTAL EST. DEMAND AMPS:	66 A

NOTES:
1. CIRCUIT BREAKERS FEEDING F.A. DEVICES SHALL BE RED WITH LOCK-ON DEVICE
2. PROVIDE CLASS A GFI CIRCUIT BREAKER
3. PROVIDE SHUNT-TRIP BREAKER
4. MATCH BREAKER AND WIRE SIZE TO SPD
5. PROVIDE HANDLE TIE BETWEEN 3-P AND 1-P CUBICLE BREAKERS FOR MULTIWIRE BRANCH...

PANEL: DP-4

LOCATION: HALLWAY | **VOLTAGE:** 120/208V | **A.I.C. RATING:** 22 KAIC
SUPPLY FROM: TX DP-4 | **PHASES:** 3 | **MAINS TYPE:** MCB
MOUNTING: SURFACE | **WIRES:** 4 | **MAINS RATING:** 100 A
ENCLOSURE: TYPE 1 | **MCB RATING:** 100 A

CKT	CIRCUIT DESCRIPTION	TRIP	POLES	A		B		C		POLES	TRIP	CIRCUIT DESCRIPTION	CKT
1	ERV-2, ERV-2 CONTROLLER	15 A	2	0.65	0.54					1	20 A	REC. - ROOF GFI	2
3						0.65							4
5	HP-9	20 A	2					1.72	1.29	2	20 A	HP-6	6
7				1.72	1.29								8
9	HP-5	35 A	2			3.21	1.40						10
11								3.21	0.00	3	50 A	DPG-1	12
13	SPARE	20 A	1	0.00	0.00								14
15	SPARE	20 A	1			0.00	0.00			1	20 A	SPARE	16
17	SPARE	20 A	1					0.00	0.00	1	20 A	SPARE	18
19	SPARE	20 A	1	0.00	0.00					1	20 A	SPARE	20
21	SPARE	20 A	1			0.00	0.00			1	20 A	SPARE	22
23	SPACE	--	1					--	--	1	--	SPACE	24
25	SPACE	--	1	--	--					1	--	SPACE	26
27	SPACE	--	1			--	--			1	--	SPACE	28
29	SPACE	--	1					--	--	1	--	SPACE	30
		TOTAL LOAD:		4.19 kVA		5.25 kVA		6.21 kVA					
		TOTAL AMPS:		35 A		45 A		53 A					

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
Other	1 kVA	100.00%	1 kVA		
RECEPTACLES	1 kVA	100.00%	1 kVA	**TOTAL CONNECTED LOAD:**	16 kVA
Power	14 kVA	100.00%	14 kVA	**TOTAL EST. DEMAND LOAD:**	16 kVA
				TOTAL CONNECTED AMPS:	43 A
				TOTAL EST. DEMAND AMPS:	43 A

NOTES:
1. CIRCUIT BREAKERS FEEDING F.A. DEVICES SHALL BE RED WITH LOCK-ON DEVICE
2. PROVIDE CLASS A GFI CIRCUIT BREAKER
3. PROVIDE SHUNT-TRIP BREAKER
4. MATCH BREAKER AND WIRE SIZE TO SPD
5. PROVIDE HANDLE TIE BETWEEN 3-P AND 1-P CUBICLE BREAKERS FOR MULTIWIRE BRANCH...

PANEL: RP1A (EX)

LOCATION: EXISTING | **VOLTAGE:** 120/208V | **A.I.C. RATING:** EXISTING
SUPPLY FROM: EXISTING | **PHASES:** 3 | **MAINS TYPE:** MCB
MOUNTING: SURFACE | **WIRES:** 4 | **MAINS RATING:** 150 A
ENCLOSURE: TYPE 1 | **MCB RATING:** 150 A

CKT	CIRCUIT DESCRIPTION	TRIP	POLES	A		B		C		POLES	TRIP	CIRCUIT DESCRIPTION	CKT
1	EXISTING CIRCUIT	20 A	1	0.20	0.50					1	20 A	EXISTING CIRCUIT	2
3	EXISTING CIRCUIT	20 A	1			0.20	0.50			1	20 A	EXISTING CIRCUIT	4
5	EXISTING CIRCUIT	20 A	1					0.50	0.20	1	20 A	EXISTING CIRCUIT	6
7	EXISTING CIRCUIT	20 A	1	0.50	0.20					1	20 A	EXISTING CIRCUIT	8
9	EXISTING CIRCUIT	20 A	1			0.50	0.20			1	20 A	EXISTING CIRCUIT	10
11	EXISTING CIRCUIT	20 A	1					0.20	0.50	1	20 A	EXISTING CIRCUIT	12
13	EXISTING CIRCUIT	20 A	1	0.50	0.20					1	20 A	EXISTING CIRCUIT	14
15	EXISTING CIRCUIT	20 A	1			0.50	0.50			1	20 A	EXISTING CIRCUIT	16
17	EXISTING CIRCUIT	20 A	1					0.20	0.50	1	20 A	EXISTING CIRCUIT	18
19	EXISTING CIRCUIT	20 A	1	0.50	0.50					1	20 A	EXISTING CIRCUIT	20
21	EXISTING CIRCUIT	20 A	1			0.50	0.20			1	20 A	EXISTING CIRCUIT	22
23	EXISTING CIRCUIT	20 A	1					0.50	0.50	1	20 A	EXISTING CIRCUIT	24
25	EXISTING CIRCUIT	20 A	1	0.20	0.20					1	20 A	EXISTING CIRCUIT	26
27	EXISTING CIRCUIT	20 A	1			0.20	0.20			1	20 A	EXISTING CIRCUIT	28
29	EXISTING CIRCUIT	20 A	1					0.50	0.50	1	20 A	EXISTING CIRCUIT	30
31	EXISTING CIRCUIT	20 A	1	0.50	0.50					1	20 A	EXISTING CIRCUIT	32
33	EXISTING CIRCUIT	20 A	1			0.50	0.20			1	20 A	EXISTING CIRCUIT	34
35	EXISTING CIRCUIT	20 A	1					0.50	0.50	1	20 A	EXISTING CIRCUIT	36
37	EXISTING CIRCUIT	20 A	1	0.50	0.20					1	20 A	EXISTING CIRCUIT	38
39	EXISTING CIRCUIT	20 A	1			0.50	0.50			1	20 A	EXISTING CIRCUIT	40
41	EXISTING CIRCUIT	20 A	1					0.20	0.50	1	20 A	EXISTING CIRCUIT	42
43	EXISTING CIRCUIT	20 A	1	0.50	0.50					1	20 A	EXISTING CIRCUIT	44
45	EXISTING CIRCUIT	20 A	1			0.20	0.20			1	20 A	EXISTING CIRCUIT	46
47	EXISTING CIRCUIT	20 A	1					0.20	0.20	1	20 A	EXISTING CIRCUIT	48
49	EXISTING CIRCUIT	20 A	1	0.50	0.50					1	20 A	EXISTING CIRCUIT	50
51	EXISTING CIRCUIT	20 A	1			0.50	0.20			1	20 A	EXISTING CIRCUIT	52
53	EXISTING CIRCUIT	20 A	1					0.50	0.50	1	20 A	EXISTING CIRCUIT	54
55	EXISTING CIRCUIT	20 A	1	0.50	0.20					1	20 A	EXISTING CIRCUIT	56
57	EXISTING CIRCUIT	20 A	1			0.50	0.50			1	20 A	EXISTING CIRCUIT	58
59	EXISTING CIRCUIT	20 A	1					0.20	0.50	1	20 A	EXISTING CIRCUIT	60
61	EXISTING CIRCUIT	20 A	1	0.50	0.20					1	20 A	EXISTING CIRCUIT	62
63	EXISTING CIRCUIT	20 A	1			0.50	0.50			1	20 A	EXISTING CIRCUIT	64
65	EXISTING CIRCUIT	20 A	1					0.20	0.20	1	20 A	EXISTING CIRCUIT	66
NEW → 67	AHU-2	20 A	2	1.72	1.72					2	20 A	HP-2	68 ← NEW
69						1.72	1.72						70
NEW → 71	HP-4	35 A	2					3.21	1.29	2	15 A	HP-3	72 ← NEW
73				3.21	1.29								74
NEW → 75	HP-7	15 A	2			1.21	3.03			2	35 A	HP-8	76 ← NEW
77								1.21	3.03				78
NEW → 79	ERV-1 CONTROLLER	20 A	2	0.03	0.36					1	20 A	REC. - ROOF GFI	80 ← NEW
81						0.03	0.54			1	20 A	REC. - ROOF GFI	82 ← NEW
83	SPACE	--	1					--	--	1	--	SPACE	84
		TOTAL LOAD:		16.92 kVA		16.53 kVA		17.03 kVA					
		TOTAL AMPS:		141 A		138 A		142 A					

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
Spare	25 kVA	100.00%	25 kVA		
RECEPTACLES	1 kVA	100.00%	1 kVA	**TOTAL CONNECTED LOAD:**	50 kVA
Power	6 kVA	100.00%	6 kVA	**TOTAL EST. DEMAND LOAD:**	50 kVA
HVAC1	18 kVA	100.00%	18 kVA	**TOTAL CONNECTED AMPS:**	140 A
				TOTAL EST. DEMAND AMPS:	140 A

NOTES:
1. CIRCUIT BREAKERS FEEDING F.A. DEVICES SHALL BE RED WITH LOCK-ON DEVICE
2. PROVIDE CLASS A GFI CIRCUIT BREAKER
3. PROVIDE SHUNT-TRIP BREAKER
4. MATCH BREAKER AND WIRE SIZE TO SPD
5. PROVIDE HANDLE TIE BETWEEN 3-P AND 1-P CUBICLE BREAKERS FOR MULTIWIRE BRANCH...

PANEL: DP-3 (EX)

LOCATION: EXISTING | **VOLTAGE:** 480/277V | **A.I.C. RATING:** EXISTING
SUPPLY FROM: EXISTING | **PHASES:** 3 | **MAINS TYPE:** MLO
MOUNTING: SURFACE | **WIRES:** 4 | **MAINS RATING:** 200 A
ENCLOSURE: TYPE 1 | **MCB RATING:** 200 A

CKT	CIRCUIT DESCRIPTION	TRIP	POLES	A		B		C		POLES	TRIP	CIRCUIT DESCRIPTION	CKT
1				0.87	4.19								2
3	HC-2 (PROVIDE IN EXISTING SPACE)	15 A	3			0.87	5.25			3	50 A	TX DP-4 (PROVIDE IN EXISTING SPACE) NEW	4
5								0.87	6.21				6
7				0.00	3.00								8
NEW → 9	EXISTING CIRCUIT	20 A	3			0.00	3.00			3	20 A	EXISTING CIRCUIT	10
11								0.00	3.00				12
13				3.00	3.00								14
15	EXISTING CIRCUIT	20 A	3			3.00	3.00			3	20 A	EXISTING CIRCUIT	16
17								3.00	3.00				18
19				3.00									20
21	EXISTING CIRCUIT	20 A	3			3.00							22
23								3.00					24
		TOTAL LOAD:		17.06 kVA		18.12 kVA		19.08 kVA					
		TOTAL AMPS:		62 A		66 A		69 A					

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
Other	1 kVA	100.00%	1 kVA		
Spare	36 kVA	100.00%	36 kVA	**TOTAL CONNECTED LOAD:**	54 kVA
RECEPTACLES	1 kVA	100.00%	1 kVA	**TOTAL EST. DEMAND LOAD:**	54 kVA
Power	16 kVA	100.00%	16 kVA	**TOTAL CONNECTED AMPS:**	65 A
				TOTAL EST. DEMAND AMPS:	65 A

NOTES:
1. CIRCUIT BREAKERS FEEDING F.A. DEVICES SHALL BE RED WITH LOCK-ON DEVICE
2. PROVIDE CLASS A GFI CIRCUIT BREAKER
3. PROVIDE SHUNT-TRIP BREAKER
4. MATCH BREAKER AND WIRE SIZE TO SPD
5. PROVIDE HANDLE TIE BETWEEN 3-P AND 1-P CUBICLE BREAKERS FOR MULTIWIRE BRANCH...

PANEL: DPG-1

LOCATION: GREENHOUSE | **VOLTAGE:** 120/208V | **A.I.C. RATING:** 22KAIC
SUPPLY FROM: DP-4 | **PHASES:** 3 | **MAINS TYPE:** MCB
MOUNTING: SURFACE | **WIRES:** 4 | **MAINS RATING:** 60 A
ENCLOSURE: TYPE 1 | **MCB RATING:** 50 A

CKT	CIRCUIT DESCRIPTION	TRIP	POLES	A		B		C		POLES	TRIP	CIRCUIT DESCRIPTION	CKT
1	UH-1	20 A	1	1.40	0.00					1	20 A	SPARE	2
3	SPARE	20 A	1			0.00	0.00			1	20 A	SPARE	4
5	SPARE	20 A	1					0.00	0.00	1	20 A	SPARE	6
7	SPARE	20 A	1	0.00	0.00					1	20 A	SPARE	8
9	SPACE	--	1			--	--			1	--	SPACE	10
11	SPACE	--	1					--	--	1	--	SPACE	12
		TOTAL LOAD:		1.40 kVA		0.00 kVA		0.00 kVA					
		TOTAL AMPS:		12 A		0 A		0 A					

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
Other	1 kVA	100.00%	1 kVA		
				TOTAL CONNECTED LOAD:	1 kVA
				TOTAL EST. DEMAND LOAD:	1 kVA
				TOTAL CONNECTED AMPS:	4 A
				TOTAL EST. DEMAND AMPS:	4 A

NOTES:
1. CIRCUIT BREAKERS FEEDING F.A. DEVICES SHALL BE RED WITH LOCK-ON DEVICE
2. PROVIDE CLASS A GFI CIRCUIT BREAKER
3. PROVIDE SHUNT-TRIP BREAKER
4. MATCH BREAKER AND WIRE SIZE TO SPD
5. PROVIDE HANDLE TIE BETWEEN 3-P AND 1-P CUBICLE BREAKERS FOR MULTIWIRE BRANCH...

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HVAC UPGRADES TO THE EAST GRANBY MIDDLE/HIGH SCHOOL
95 SOUTH MAIN ST., EAST GRANBY, CT

REVISIONS

NO	DATE	DESCRIPTION

Designed: HP
Drawn: DH
Reviewed: JC
Project No.: 2301734
Date: 03/11/2024
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Title: ELECTRICAL PANELBOARD SCHEDULES

Sheet No.: E603

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3-PHASE FEEDER SIZE SCHEDULE (COPPER)

VOLTAGE DROP CALCULATED AT LESS THAN 2% AND 80% OF OCPD RATING

SYMBOL	CIRCUIT OVERCURRENT PROTECTION RATING	CONDUCTORS (3-PH, 3-WIRE) WITH GROUND	CONDUIT (3-WIRE)	SYMBOL	CONDUCTORS (3-PH, 4-WIRE) WITH GROUND	CONDUIT (4-WIRE)	MAX DISTANCE (FT) (480V/3PH)	MAX DISTANCE (FT) (480V/1PH)	MAX DISTANCE (FT) (208V/3PH)
153	15A	3#12 & 1#12 G	3/4"	154	4#12 & 1#12 G	3/4"	260	230	115
203	20A	3#12 & 1#12 G	3/4"	204	4#12 & 1#12 G	3/4"	199	172	85
253	25A	3#10 & 1#10 G	3/4"	254	4#10 & 1#10 G	3/4"	264	228	110
303	30A	3#10 & 1#10 G	3/4"	304	4#10 & 1#10 G	3/4"	220	190	95
353	35A	3#8 & 1#10 G	3/4"	354	4#8 & 1#10 G	3/4"	285	248	124
403	40A	3#8 & 1#10 G	3/4"	404	4#8 & 1#10 G	3/4"	250	217	105
453	45A	3#6 & 1#10 G	3/4"	454	4#6 & 1#10 G	1"	350	300	150
503	50A	3#6 & 1#10 G	3/4"	504	4#6 & 1#10 G	1"	310	271	130
603	60A	3#4 & 1#10 G	1"	604	4#4 & 1#10 G	1-1/4"	400	348	170
703	70A	3#4 & 1#8 G	1"	704	4#4 & 1#8 G	1-1/4"	340	298	145
803	80A	3#3 & 1#8 G	1-1/4"	804	4#3 & 1#8 G	1-1/4"	365	319	155
903	90A	3#2 & 1#8 G	1-1/4"	904	4#2 & 1#8 G	1-1/4"	420	365	180
1003	100A	3#1 & 1#8 G	1-1/4"	1004	4#1 & 1#8 G	1-1/2"	460	404	200
1103	110A	3#1 & 1#6 G	1-1/4"	1104	4#1 & 1#6 G	1-1/2"	424	367	180
1253	125A	3#1/0 & 1#6 G	1-1/2"	1254	4#1/0 & 1#6 G	2"	425	370	185
1503	150A	3#1/0 & 1#6 G	1-1/2"	1504	4#1/0 & 1#6 G	2"	355	308	150
1753	175A	3#2/0 & 1#6 G	2"	1754	4#2/0 & 1#6 G	2"	360	315	157
2003	200A	3#3/0 & 1#6 G	2"	2004	4#3/0 & 1#6 G	2"	395	342	170
2253	225A	3#4/0 & 1#4 G	2"	2254	4#4/0 & 1#4 G	2-1/2"	415	361	180
2503	250A	3#250KCMIL & 1#4 G	2-1/2"	2504	4#250KCMIL & 1#4 G	3"	425	371	185
3003	300A	3#350KCMIL & 1#4 G	2-1/2"	3004	4#350KCMIL & 1#4 G	3"	445	387	190
3503	350A	3#500KCMIL & 1#3 G	3 1/2"	3504	4#500KCMIL & 1#3 G	4"	475	415	205
4003	400A	3#600KCMIL & 1#3 G	4"	4004	4#600KCMIL & 1#3 G	4"	455	397	198
4503	450A	2 SETS OF 3#4/0 & 1#2 G	(2)-2"	4504	2 SETS OF 4#4/0 & 1#2 G	(2)-2-1/2"	415	361	180
5003	500A	2 SETS OF 3#250KCMIL & 1#2 G	(2)-2-1/2"	5004	2 SETS OF 4#250KCMIL & 1#2 G	(2)-3"	425	371	185
6003	600A	2 SETS OF 3#350KCMIL & 1#1 G	(2)-2-1/2"	6004	2 SETS OF 4#350KCMIL & 1#1 G	(2)-3"	445	387	190
7003	700A	2 SETS OF 3#500KCMIL & 1#1/0 G	(2)-3"	7004	2 SETS OF 4#500KCMIL & 1#1/0 G	(2)-3"	475	415	205
8003	800A	2 SETS OF 3#600KCMIL & 1#1/0 G	(2)-4"	8004	2 SETS OF 4#600KCMIL & 1#1/0 G	(2)-4"	455	397	195
9003	900A	3 SETS OF #350KCMIL & 1#2/0 G	(3)-2-1/2"	9004	3 SETS OF 4#350KCMIL & 1#2/0 G	(3)-2-1/2"	445	387	190
10003	1000A	3 SETS OF 3#400KCMIL & 1#2/0 G	(3)-2-1/2"	10004	3 SETS OF 4#400KCMIL & 1#2/0 G	(3)-3"	440	324	190
12003	1200A	3 SETS OF 3#600KCMIL & 1#3/0 G	(3)-4"	12004	3 SETS OF 4#600KCMIL & 1#3/0 G	(3)-4"	455	338	195
16003	1600A	4 SETS OF 3#600KCMIL & 1#4/0 G	(4)-4"	16004	4 SETS OF 4#600KCMIL & 1#4/0 G	(4)-4"	455	397	195
20003	2000A	5 SETS OF#600KCMIL & 1#250KCMIL G	(5)-4"	20004	5 SETS OF 4#600KCMIL & 1#250KCMIL G	(5)-4"	455	397	195
25003	2500A	6 SETS OF #600KCMIL & 1#350KCMIL G	(6)-4"	25004	6 SETS OF 4#600KCMIL & 1#350KCMIL G	(6)-4"	440	324	190
30003	3000A	8 SETS OF #500KCMIL & 1#400KCMIL G	(8)-3"	30004	8 SETS OF 4#500KCMIL & 1#400KCMIL G	(8)-3"	490	387	212
35003	3500A	9 SETS OF #600KCMIL & 1#500KCMIL G	(9)-4"	35004	9 SETS OF 4#600KCMIL & 1#500KCMIL G	(9)-4"	472	347	202
40003	4000A	10 SETS OF 3#600KCMIL & 3#500KCMIL G	(10)-4"	40004	10 SETS OF 4#600KCMIL & 1#500KCMIL G	(10)-4"	455	338	195

NOTES

1. ACTUAL RUN LENGTH WILL BE GREATER FOR LOAD LESS THAN 80% OF CIRCUIT CAPACITY. CONTRACTOR SHALL CALCULATE ACTUAL LENGTH BASED ON LOAD ON THE CIRCUIT.
2. 2. CONDUCTOR SIZES ARE BASED ON 60 DEGREE CELSIUS TEMPERATURE RATING FOR BREAKER SIZES 100A AND SMALLER AND BASED ON 75 DEGREES CELSIUS FOR BREAKER SIZES LARGER THAN 100A.
3. COORDINATE WITH BREAKER MANUFACTURER FOR ACCEPTABLE RANGE OF WIRE SIZE TERMINAL RATINGS. ADJUST/UPSIZE BREAKER TYPE AS REQUIRED TO ACCOMMODATE INCREASED WIRE SIZES.

DRY-TYPE TRANSFORMER SCHEDULE

XFMR SIZE	SYMBOL	PRIMARY VOLTAGE	PRIMARY OCP	PRIMARY FEEDER	CONDUIT	SYMBOL	SECONDARY VOLTAGE	SECONDARY OCP	SECONDARY FEEDER	CONDUIT
15 KVA	T15P	480V	30A	3#10 & 1#10 G	3/4"	T15S	208Y/120	60A	4#4 & 1#8 G	1-1/4"
30 KVA	T30P	480V	50A	3#6 & 1#10 G	1"	T30S	208Y/120	100A	4#1 & 1#6 G	1-1/2"
45 KVA	T45P	480V	70A	3#4 & 1#8 G	1-1/4"	T45S	208Y/120	175A	4#2/0 & 1#4 G	2"
75 KVA	T75P	480V	125A	3#1/0 & 1#6 G	2"	T75S	208Y/120	250A	4#250KCMIL & 1#2 GND	2-1/2"
112.5 KVA	T1125P	480V	175A	3#2/0 & 1#6 G	2"	T1125S	208Y/120	400A	4#600KCMIL & 1#1/0 GND	4"
150 KVA	T150P	480V	225A	3#4/0 & 1#4 G	2-1/2"	T150S	208Y/120	500A	2 SETS OF 4#250KCMIL & #1/0 G	2-1/2"
225KVA	T225P	480V	350A	3#500 & 1#3 G	3"	T225S	208Y/120	800A	3 SETS OF 4#350KCMIL & 1#2/0 G	3

GROUNDING ELECTRODE CONDUCTOR

SYMBOL	EQUIPMENT SIZE	CONDCUTOR & CONDUIT
G15	15KVA, PRI. 480V, SEC. 208/120V	(1) #8 IN 3/4"C (COPPER)
G30	30KVA, PRI. 480V, SEC. 208/120V	(1) #6 IN 3/4"C (COPPER)
G45	45KVA, PRI. 480V, SEC. 208/120V	(1) #4 IN 3/4"C (COPPER)
G75	75KVA, PRI. 480V, SEC. 208/120V	(1) #2 IN 3/4"C (COPPER)
G1125	112.5KVA, PRI. 480V, SEC. 280/120V	(1) #1/0 IN 3/4"C (COPPER)
G2000	2000A MAIN SERV. DISC	(1) #3/0 IN 3/4"C (COPPER)

NOTES

1. REFER TO TRANSFORMER GROUNDING DETAIL FOR REQUIREMENTS.
2. BOND NEUTRAL OF TRANSFORMER SECONDARY TO THE TRANSFORMER CASE WITH BONDING JUMPER AS PER NATIONAL ELECTRIC CODE.
3. GROUND THE CASING OF TRANSFORMER TO THE NEAREST AVAILABLE EFFECTIVELY GROUNDED STRUCTURAL STEEL AS PER NATIONAL ELECTRIC CODE.
4. ALL CONDUIT SIZES ARE FOR COPPER CONDUCTORS.

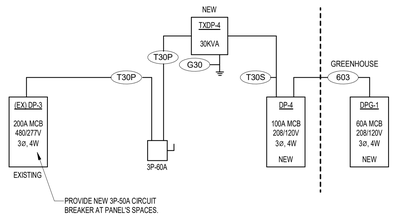
BRANCH CIRCUIT SIZE SCHEDULE (COPPER)

VOLTAGE DROP CALCULATED AT 3% MAX AND 80% OF OCPD RATING

CIRCUIT OVERCURRENT PROTECTION RATING	CONDUCTORS WITH GROUND	CONDUIT	MAX DISTANCE (FT) (277V/1PH)	MAX DISTANCE (FT) (120V/1PH)
15A	2#12 & 1#12 G	3/4"	195	85
20A	2#12 & 1#12 G	3/4"	145	62
25A	2#10 & 1#10 G	3/4"	197	85
30A	2#10 & 1#10 G	3/4"	160	70
35A	2#8 & 1#10 G	3/4"	210	93
40A	2#8 & 1#10 G	3/4"	185	80
45A	2#6 & 1#10 G	3/4"	260	110
50A	2#6 & 1#10 G	3/4"	235	100
60A	2#4 & 1#10 G	1"	300	130
70A	2#4 & 1#8 G	1"	255	111
80A	2#3 & 1#8 G	1"	175	118
90A	2#2 & 1#8 G	1"	315	137
100A	2#1 & 1#8 G	1-1/4"	345	151

NOTES

1. ACTUAL RUN LENGTH WILL BE GREATER FOR LOAD LESS THAN 80% OF CIRCUIT CAPACITY. CONTRACTOR SHALL CALCULATE ACTUAL LENGTH BASED ON LOAD ON THE CIRCUIT.
2. CONDUCTOR SIZES ARE BASED ON 60 DEGREE CELSIUS TEMPERATURE RATING FOR BREAKER SIZES 100A AND SMALLER AND BASED ON 75 DEGREES CELSIUS FOR BREAKER SIZES LARGER THAN 100A.
3. COORDINATE WITH BREAKER MANUFACTURER FOR ACCEPTABLE RANGE OF WIRE SIZE TERMINAL RATINGS. ADJUST/UPSIZE BREAKER TYPE AS REQUIRED TO ACCOMMODATE INCREASED WIRE SIZES.



1 RISER DIAGRAM
NOT TO SCALE

MECHANICAL FEEDER SCHEDULE

EQUIPMENT	VOLTAGE	POLES	AMPS	KW	DISCONNECT SW.	CIRCUIT BREAKER	FEEDER	REMARKS
AHU-2	208 V	1	0.50 A	0.104 KW	30A, 2P,240V, NEMA 1	15A	(2) #12 & (1) #12 G, IN 3/4"C	1
AHU-3	208 V	1	0.00 A	0.000 KW	THERMAL SWITCH	N/A	(2) #12 & (1) #12 G, IN 3/4"C	1
AHU-4	208 V	1	0.00 A	0.000 KW	THERMAL SWITCH	N/A	(3) #12 & (1) #12 G, IN 3/4"C	1
AHU-5	208 V	1	0.00 A	0.000 KW	THERMAL SWITCH	N/A	(3) #12 & (1) #12 G, IN 3/4"C	1
AHU-6	208 V	1	0.00 A	0.000 KW	THERMAL SWITCH	N/A	(2) #12 & (1) #12 G, IN 3/4"C	1
AHU-7	208 V	1	0.00 A	0.000 KW	THERMAL SWITCH	N/A	(2) #12 & (1) #12 G, IN 3/4"C	1
AHU-8	208 V	1	0.00 A	0.000 KW	THERMAL SWITCH	N/A	(3) #12 & (1) #12 G, IN 3/4"C	1
AHU-9	208 V	1	0.00 A	0.000 KW	THERMAL SWITCH	N/A	(2) #12 & (1) #12 G, IN 3/4"C	1
CC-1	208 V	1	0.00 A	0.000 KW	THERMAL SWITCH	N/A	(2) #12 & (1) #12 G, IN 3/4"C	1
CC-2	208 V	1	0.00 A	0.000 KW	THERMAL SWITCH	N/A	(2) #12 & (1) #12 G, IN 3/4"C	1
ERV-1	480 V	3	9.14 A	7.595 KW	30A, 3P, 480V, NEMA 1	15A	(2) #12 & (1) #12 G, IN 3/4"C	
ERV-2	208 V	1	5.90 A	1.227 KW	30A, 2P,240V, NEMA 1	15A	(2) #12 & (1) #12 G, IN 3/4"C	
HC-1	480 V	3	4.73 A	3.931 KW	30A, 3P, 600V, NEMA 1	15A	(3) #12 & (1) #12 G, IN 3/4"C	PART OF ERV-1
HC-2	480 V	3	3.15 A	2.618 KW	30A, 3P, 600V, NEMA 1	15A	(3) #12 & (1) #12 G, IN 3/4"C	PART OF ERV-2
HP-2	208 V	1	16.50 A	3.432 KW	30A, 2P,240V, NEMA 1	20A	(2) #12 & (1) #12 G, IN 3/4"C	
HP-3	208 V	1	12.40 A	2.579 KW	30A, 2P,240V, NEMA 1	15A	(2) #12 & (1) #12 G, IN 3/4"C	
HP-4	208 V	1	30.80 A	6.406 KW	60A, 2P,240V, NEMA 1	35A	(2) #8 & (1) #8 G, IN 3/4"C	
HP-5	208 V	1	30.80 A	6.406 KW	60A, 2P,240V, NEMA 1	35A	(2) #8 & (1) #8 G, IN 3/4"C	
HP-6	208 V	1	12.40 A	2.579 KW	30A, 2P,240V, NEMA 1	15A	(2) #12 & (1) #12 G, IN 3/4"C	
HP-7	208 V	1	11.60 A	2.413 KW	30A, 2P,240V, NEMA 1	15A	(2) #12 & (1) #12 G, IN 3/4"C	
HP-8	208 V	1	29.10 A	6.053 KW	60A, 2P,240V, NEMA 1	35A	(2) #8 & (1) #8 G, IN 3/4"C	
HP-9	208 V	1	16.50 A	3.432 KW	30A, 2P,240V, NEMA 1	20A	(2) #12 & (1) #12 G, IN 3/4"C	
UH-1	120 V	1	1.50 A	0.173 KW	30A, 1P, 120V, NEMA 1	15A	(2) #12 & (1) #12 G, IN 3/4"C	
UV-1	460 V	1	12.40 A	EXISTING	30A, 3P, 600V, NEMA 1	EXISTING	EXISTING FEEDER	
UV-2	480 V	1	12.40 A	EXISTING	30A, 3P, 600V, NEMA 1	EXISTING	EXISTING FEEDER	
UV-3	480 V	1	12.40 A	EXISTING	30A, 3P, 600V, NEMA 1	EXISTING	EXISTING FEEDER	
UV-4	480 V	1	12.40 A	EXISTING	30A, 3P, 600V, NEMA 1	EXISTING	EXISTING FEEDER	
UV-5	480 V	1	14.40 A	EXISTING	30A, 3P, 600V, NEMA 1	EXISTING	EXISTING FEEDER	
UV-6	480 V	1	14.40 A	EXISTING	30A, 3P, 600V, NEMA 1	EXISTING	EXISTING FEEDER	
UV-7	480 V	1	14.40 A	EXISTING	30A, 3P, 600V, NEMA 1	EXISTING	EXISTING FEEDER	
UV-8	480 V	1	14.40 A	EXISTING	30A, 3P, 600V, NEMA 1	EXISTING	EXISTING FEEDER	
UV-9	480 V	1	14.40 A	EXISTING	30A, 3P, 600V, NEMA 1	EXISTING	EXISTING FEEDER	

1. AHU/CC UNIT POWERED FROM ASSOCIATED HP UNIT. SEE ELECTRICAL PLANS AND MECHANICAL SCHEDULES FOR MORE INFORMATION.

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HVAC UPGRADES TO THE EAST GRANBY MIDDLE/HIGH SCHOOL
95 SOUTH MAIN ST., EAST GRANBY, CT

REVISIONS

NO	DATE	DESCRIPTION

Designed: HP
Drawn: DH
Reviewed: JC
Project No.: 2301734
Date: 03/11/2024
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Title:
ELECTRICAL RISER DIAGRAM

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