GENERAL PROJECT REQUIREMENTS

A. CODE COMPLIANCE:

1. THE CONTRACTOR SHALL COMPLY WITH THE LAWS, ORDINANCES, RULES, AND REGULATIONS OF THE STATE OF NEW YORK, ALL GOVERNMENTAL AUTHORITIES HAVING JURISDICTION, THE NATIONAL FIRE PROTECTION ASSOCIATION, THE NATIONAL ELECTRICAL CODE, AND THE PUBLIC UTILITIES HAVING JURISDICTION OVER ANY OF THE SYSTEMS HEREIN SPECIFIED.

B. PERMIT FEES:

1. THE CONTRACTOR SHALL OBTAIN AND PAY FOR ALL NECESSARY PERMITS, INSPECTIONS, AND APPROVALS TO COMPLETE THE PROJECT WORK. ALL CERTIFICATES SHALL BE IN DUPLICATE AND BE DELIVERED TO THE OWNER'S REPRESENTATIVE.

C. DEFINITIONS:

1. "PROVIDE" UNDER THIS CONTRACT IS DEFINED AS FURNISH AND INSTALL.
2. "CONCEALED" UNDER THIS CONTRACT IS DEFINED AS HIDDEN BY ARCHITECTURAL WALLS AND CEILINGS.
3. "EXPOSED" UNDER THIS CONTRACT IS DEFINED AS VISIBLE TO VIEW.
4. "INDICATED" UNDER THIS CONTRACT IS DEFINED AS SHOWN IN THE CONTRACTED DOCUMENTS.

D. SCOPE OF WORK:

1. PROVIDE ALL WORK INDICATED IN THE CONTRACT DOCUMENTS.

E. CONTRACT DOCUMENTS:

1. THE CONTRACT DOCUMENTS SHALL BE CONSIDERED FOR DIAGRAMMATIC PURPOSES ONLY. ATTENTION IS CALLED TO THE FACT THAT WHILE THE DOCUMENTS ARE GENERALLY TO SCALE AND ARE AS ACCURATE AS THE SCALE WILL PERMIT, ALL IMPORTANT DIMENSIONS SHALL BE DETERMINED IN THE FIELD.
2. THE DRAWINGS ARE NOT TO BE CONSIDERED AS CONSTRUCTION SHOP DRAWINGS. THE DRAWINGS DO NOT INDICATE EVERY FITTING, ELBOW, OFFSET, VALVE, PULL BOX OR SIMILAR COMPONENTS REQUIRED TO COMPLETE THE PROJECT WORK. PREPARE FIELD COORDINATION DRAWINGS TO ENSURE PROPER INSTALLATION. PROVIDE ALL NECESSARY OFFSETS AND FITTINGS TO INSTALL THE SYSTEMS AS DIAGRAMMED AT NO ADDITIONAL COST.

G. EQUIPMENT AND MATERIALS:

1. ALL EQUIPMENT AND MATERIALS SHALL BE NEW, UNLESS INDICATED OTHERWISE, AND THE CURRENT MODEL FOR WHICH REPLACEMENT PARTS ARE AVAILABLE. SUBSTITUTIONS SHALL ONLY BE ACCEPTED AT THE DISCRETION OF THE OWNER'S REPRESENTATIVE OR THE ENGINEER.
2. THE CONTRACTOR SHALL INSTALL AND CONNECT ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH THE BEST ENGINEERING PRACTICE AND UNLESS OTHERWISE INDICATED SHALL FOLLOW THE MANUFACTURER'S PUBLISHED INSTRUCTIONS AND RECOMMENDATIONS.
3. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL REQUIRED AUXILIARY ITEMS FOR A COMPLETE. SYSTEM.
4. ALL EQUIPMENT SHALL BE MOUNTED VIBRATION FREE.

I. COORDINATION:

1. THE CONTRACTOR SHALL INSTALL ALL DUCTWORK, PIPING, RACEWAYS, CIRCUITRY, CONDUIT, ETC., AS HIGH AS POSSIBLE TO MAXIMIZE HEADROOM. RUN PARALLEL OR PERPENDICULAR TO THE BUILDING WALLS IN A NEAT WORKMANLIKE MANNER. AVOID CONFLICT WITH NEW EQUIPMENT, LIGHTS, CABLE TRAYS, ETC. IF CONFLICT WITH DOES OCCUR, THE CONTRACTOR SHALL REROUTE CONFLICTING PROJECT WORK AS DIRECTED BY THE OWNER'S REPRESENTATIVE AT NO ADDITIONAL COST.
2. THE CONTRACTOR SHALL PROVIDE COMPLETE COORDINATION DRAWINGS FOR EACH LEVEL. SHOW ALL RELEVANT TRADES AND AVAILABLE CEILING PLENUM HEIGHT.
3. THE CONTRACTOR SHALL TAKE ALL FIELD MEASUREMENTS NECESSARY FOR THIS WORK AND ASSURE RESPONSIBILITY FOR THEIR ACCURACY. THE DRAWINGS AS SHOWN ARE DIAGRAMMATIC AND SHALL NOT BE SCALED. REFER TO MANUFACTURER'S STANDARD ROUGH-IN DRAWINGS FOR MECHANICAL FIXTURES, AND TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS. REPORT ANY CONFLICTS OR DISCREPANCIES TO THE ARCHITECT/ENGINEER.
4. SHOULD ANY STRUCTURAL IMPEDIMENTS (I.E. BEAMS, SLAB FOLDS, POST-TENSIONED SLABS, COLUMNS, SHEAR WALLS, ETC.) PREVENT THE SETTING OF CABINETS, PANELBOARDS, EQUIPMENT, FEEDER CONDUITS, ETC. AT THE LOCATION INDICATED ON THE PLANS, THE CONTRACTOR SHALL MAKE ANY NECESSARY DEVIATIONS, AS COORDINATED WITH THE ARCHITECT/ENGINEER AND IMPLEMENT AT NO ADDITIONAL COST.
5. COORDINATE WITH ALL TRADES TO AVOID INTERFERENCE AMONG MECHANICAL, ELECTRICAL, ARCHITECTURAL, AND STRUCTURAL ITEMS. PROVIDE ALL NECESSARY OFFSETS AND FITTINGS IN CIRCUITRY AND OTHER ITEMS REQUIRED TO INSTALL THE WORK WITHOUT INTERFERENCES.
6. COORDINATE WITH THE WORK OF OTHER SECTIONS AND TRADES, WITH EQUIPMENT FURNISHED BY OTHERS, AND WITHIN THE CONSTRAINTS OF THE EXISTING CONDITIONS OF THE PROJECT SITE.

K. PARTITIONS AND DUCTWORK:

1. THE CONTRACTOR SHALL REPAIR ALL OPENINGS IN WALLS, CEILINGS, FLOORS, ROOF, ETC., WHICH ARE CREATED BY DEMOLITION AND/OR NEW PROJECT WORK. THE REPAIRS SHALL BE WITH MATERIALS AND FINISH TO MATCH EXISTING. OPENINGS AND PENETRATIONS IN FIRE RATED PARTITIONS OR DUCTWORK SHALL BE SEALED PER U.L. APPROVED FIRE ASSEMBLY TO MAINTAIN FIRE RESISTANT INTEGRITY. DUCTWORK AND PIPING SHALL BE CAPPED, SEALED AIR AND WATERTIGHT, AND INSULATED TO MATCH EXISTING.
2. WHERE IT IS NECESSARY TO CUT WALLS, FLOORS OR CEILINGS FOR THE INSTALLATION OF ANY MECHANICAL WORK, SUCH CUTTING SHALL BE THE RESPONSIBILITY OF THIS CONTRACTOR. ALL AFFECTED AREAS SHALL BE PATCHED BY THE CONTRACTOR TO MATCH THE ORIGINAL CONDITION, RATING AND APPEARANCE. BEFORE CUTTING TAKES PLACE, THE CONTRACTOR SHALL OBTAIN APPROVAL FROM THE ARCHITECT AND/OR BUILDING MANAGEMENT.
3. WHERE IT IS NECESSARY TO CORE DRILL THE FLOORS FOR INSTALLATION OF SPECIFIED WORK, THE CONTRACTOR SHALL HAVE THE AREA TO BE CORE DRILLED X-RAYED TO ENSURE THE STRUCTURAL SYSTEM WILL NOT BE COMPROMISED. DO NOT CORE DRILL, PENETRATE OR CUT EXISTING CONCRETE FLOOR SLABS WITHOUT CONSULTING WITH THE BASE BUILDINGS STRUCTURAL ENGINEER OF RECORD, AND/OR A REGISTERED PROFESSIONAL STRUCTURAL ENGINEER. DO NOT PROCEED WITH WORK WITHOUT WRITTEN PERMISSION FROM THE ABOVE PROFESSIONALS. ARRANGE MOBILIZATION AND PAYMENT FOR X-RAY EQUIPMENT, IF NECESSARY, TO INVESTIGATE ALL POTENTIAL STRUCTURAL IMPEDIMENTS.
4. ALL NEW FLOOR OPENINGS, AND OPENINGS IN SLAB-TO-SLAB WALLS SHALL BE PATCHED BY THE CONTRACTOR OR TRADE WHOSE WORK REQUIRES PATCHING TO MATCH ORIGINAL CONDITION, APPEARANCE AND FIRE RATING.
5. PROTECT ADJACENT MATERIALS INDICATED TO REMAIN. INSTALL AND MAINTAIN DUST AND NOISE BARRIERS TO KEEP DIRT, DUST, AND NOISE FROM BEING TRANSMITTED TO ADJACENT AREAS. REMOVE PROTECTION AND BARRIERS AFTER DEMOLITION OPERATIONS ARE COMPLETE
6. FIRE STOPPING SHALL BE UL APPROVED AND COMPLIANT WITH ALL LOCAL AND FEDERAL CODES AND REGULATIONS. CONTRACTOR SHALL ENGAGE THE SERVICES OF TECHNICIAN'S TRAINED AND CERTIFIED IN THE APPLICATION OF FIRE STOP MATERIALS. WHERE REQUIRED BY LOCAL CODES, THE TECHNICIAN SHALL BE LICENSED.

L. SITE CLEANUP:

1. THE CONTRACTOR SHALL CLEAN UP THE JOBSITE DAILY. THE CONTRACT AREA AND ALL OTHER AREAS USED FOR STORAGE, STAGING, ETC. SHALL BE BROOM CLEANED AND MATERIALS, TOOLS, ETC. SHALL BE LEFT IN AN ORDERLY MANNER.
2. UPON COMPLETION OF THE WORK, THE CONTRACTOR SHALL THOROUGHLY CLEAN THE CONTRACT AREA AND ALL OTHER AREAS USED FOR STORAGE, STAGING, ETC. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO WASHING AND/OR REPAIRING GLASS, REMOVING SPOTS AND STAINS, CLEANING ALL FIXTURES AND WASHING ALL FLOORS, WALLS AND CEILINGS IF APPROPRIATE.

M. GUARANTEES:

1. THE CONTRACTOR SHALL TEST ALL EQUIPMENT INSTALLED UNDER THIS CONTRACT AND DEMONSTRATE TO THE OWNER'S REPRESENTATIVE ITS PROPER OPERATION(S). ALL NEW EQUIPMENT SHALL BE MOUNTED VIBRATION FREE. THE CONTRACTOR SHALL PROVIDE ALL LABOR AS REQUIRED DURING COMMISSIONING AND INSTRUCTION OF OWNERS PERSONNEL PROCESSES.
2. THE CONTRACTOR SHALL REPAIR OR REPLACE ANY DEFECTIVE OR INOPERATIVE EQUIPMENT AND COMPONENTS FURNISHED BY THE CLIENT AT NO COST TO THE CLIENT.
3. THE CONTRACTOR'S GUARANTEE SHALL INCLUDE ALL EQUIPMENT SUPPLIED BY THE CONTRACTOR OR CLIENT.

N. RECORD DRAWINGS:

1. THE CONTRACTOR SHALL MAINTAIN THREE (3) SETS OF ALL RECORD DOCUMENTS, FOR DISTRIBUTION TO THE CLIENT. THESE DOCUMENTS SHALL INCLUDE; CONTRACT DRAWINGS AND SPECIFICATIONS, APPROVED SIGNED-OFF PERMIT DRAWINGS AND BUILDING PERMITS, ADDENDA(S), AND APPROVED SHOP DRAWINGS. THESE DOCUMENTS SHALL BE MARKED AS REQUIRED TO RECORD ALL CHANGES DURING CONSTRUCTION. THESE DRAWINGS SHALL BE DELIVERED TO THE OWNER, IN GOOD CONDITION AND ORDER TO THE FOLLOWING PARTIES: THE ORIGINAL DOCUMENTS TO THE TENANT, ONE (1) COPY TO THE BUILDING MANAGEMENT AND ONE COPY TO THE ARCHITECT.

O. BUILDING SMOKE/FIRE ALARM SYSTEM:

1. PROTECT THE BUILDING SMOKE/FIRE ALARM DETECTION SYSTEM AS REQUIRED TO PREVENT FALSE ALARMS WITHIN THE PROJECT CONSTRUCTION AREA.

P. EQUIPMENT SERVICE ACCESS:

1. PROVIDE ACCESS DOORS IN DRYWALL CEILINGS AND PARTITIONS TO SERVICE EQUIPMENT, BALANCE DIFFUSERS, AND EXPOSE JUNCTION BOXES. COORDINATE THE EXACT LOCATIONS AND STYLE OF FLANGELESS ACCESS DOORS WITH THE ENGINEER.

Q. JOB RESPONSIBILITY:

1. PROVIDE ADEQUATE STORAGE FACILITIES FOR MATERIALS AND EQUIPMENT DURING THE PROGRESS OF THE WORK.
2. BE RESPONSIBLE FOR THE CONDITION OF ALL MATERIAL AND EQUIPMENT EMPLOYED IN THE INSTALLATION UNTIL FINAL ACCEPTANCE BY THE OWNER. PROTECT SAME FROM ANY CAUSE WHATSOEVER.
3. BE RESPONSIBLE FOR THE REPLACEMENT OF ALL DAMAGED OR DEFECTIVE WORK, MATERIALS EQUIPMENT. DO NOT INSTALL SENSITIVE OR DELICATE EQUIPMENT UNTIL MAJOR CONSTRUCTION WORK IS COMPLETED.
4. OBSERVE AND CONFORM TO APPLICABLE SAFETY REGULATIONS, INCLUDING THOSE REQUIRED BY THE OWNER'S REPRESENTATIVE.
5. ERECT AND MAINTAIN SUITABLE BARRIERS, PROTECTIVE DEVICES, LIGHTS AND WARNING SIGNS FOR THE PROTECTION OF OCCUPANTS, TRANSIENTS AND WORKMEN FROM DANGER DUE TO WORK PERFORMED BY THE CONTRACTOR.
6. MAKE GOOD ANY DAMAGE TO THE WORK CAUSED BY FLOODS, STORMS, ACCIDENTS, ACTS OF NEGLIGENCE, STRIKES, VIOLENCE OR THEFT UP TO THE TIME OF FINAL ACCEPTANCE BY THE OWNER.
7. BE RESPONSIBLE FOR ANY LOSS OR INJURY TO PERSONS OR PROPERTY RESULTING FROM NEGLECT OR ANY OTHER CAUSES ON THE PART OF THE EMPLOYEES.
8. DO NOT LEAVE ANY WORK IN A HAZARDOUS CONDITION, EVEN TEMPORARILY.
9. ERECT, MAINTAIN AND FINALLY REMOVE ALL SCAFFOLDING, STAGING, FORMS, PLATFORMS AND LADDERS REQUIRED FOR THE INSTALLATION.
10. DO NOT INSTALL WORK FOR WHICH AN EXTRA CHARGE IS TO BE MADE WITHOUT WRITTEN APPROVAL FROM THE OWNER'S REPRESENTATIVE AND THE OWNER. A WRITTEN REQUEST FOR EXTRA WORK SHALL STATE THE NATURE OF THE WORK, BY WHOM REQUESTED, AND THE PRICE TO BE CHARGED.
11. CONTRACTOR SHALL SUBMIT A COPY OF THEIR SAFETY TRAINING PROGRAM AND QUALITY CONTROL PROGRAM FOR REVIEW AND ACCEPTANCE.
12. CONTRACTOR SHALL ACCEPT ALL OWNER SUPPLIED EQUIPMENT AND PROVIDE ON OR OFF SITE STORAGE, RIGGING, AND HANDLING AS NEEDED.

MECHANICAL SPECIFICATIONS:

A. GENERAL

1. THE DRAWINGS PREPARED FOR THIS PROJECT ARE AN OUTLINE TO SHOW WHERE PIPES, DUCTS AND APPARATUSES MUST GO IN ORDER TO HARMONIZE WITH THE BUILDING AND INSTALLATION OF THE VARIOUS TRADES. WORK MUST BE INSTALLED IN ACCORDANCE WITH THE DRAWINGS AS MUCH AS POSSIBLE. DRAWINGS SHALL BE CAREFULLY CHECKED DURING THE COURSE OF CONSTRUCTION. IF DISCREPANCIES, ERRORS OR OMISSIONS ARE DISCOVERED PRIOR TO OR DURING CONSTRUCTION PHASE, NOTIFY THE ENGINEER IMMEDIATELY FOR INTERPRETATION OR CORRECTION. TAKE NECESSARY MEASUREMENTS AND RESPONSIBILITY FOR SAME, INCLUDING CLEARANCES FOR EQUIPMENT THAT ARE TO BE FURNISHED. THE ARCHITECT /ENGINEER RESERVE THE RIGHT TO MAKE MINOR LOCATION CHANGES OF PIPING AND EQUIPMENT WHERE SUCH ADJUSTMENTS ARE DEEMED DESIRABLE FROM AN APPEARANCE OR OPERATIONAL STANDPOINT. SUCH CHANGES WILL BE ANTICIPATED SUFFICIENTLY IN ADVANCE TO AVOID EXTRA WORK OR DELAY THE PROGRESS OF THE PROJECT.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR VISITING THE SITE AND VERIFYING EXISTING FIELD CONDITIONS PRIOR TO INSTALLATION. THE CONTRACT DOCUMENTS INDICATE APPROXIMATE LOCATIONS OF DUCTWORK AND PIPING AND ARE DIAGRAMMATIC IN NATURE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE ACTUAL LOCATION AND ROUTING OF THE EXISTING PIPING AND NEW DUCTWORK.
3. CONTRACTOR IS RESPONSIBLE FOR COORDINATING HIS WORK WITH THE WORK OF ALL TRADES AND MAKING ANY NECESSARY MODIFICATIONS TO HIS WORK, INCLUDING OFFSETS, AT NO ADDITIONAL COST TO THE OWNER.
4. ALL WORK SHALL BE DONE IN ACCORDANCE WITH LOCAL CODES. THESE CODES SHALL BE FOLLOWED AS A MINIMUM. PROVIDE HIGHER GRADES OF MATERIAL AND WORKMANSHIP WHERE REQUIRED BY THESE DOCUMENTS. PROVIDE ALL TESTS REQUIRED BY LOCAL CODES.
5. ALL PERMITS, FEES, LICENSES, APPROVALS, AND OTHER ARRANGEMENTS FOR THE WORK SHALL BE OBTAINED BY THE CONTRACTOR AT HIS OWN EXPENSE.
6. CONTRACTOR SHALL GUARANTEE ALL WORK AND MATERIAL FOR ONE YEAR AFTER FINAL ACCEPTANCE AGAINST ALL DEFECTS OF MATERIAL, EQUIPMENT AND WORKMANSHIP. PROVIDE AN ADDITIONAL FOUR (4) YEAR WARRANTY (TOTAL OF 5 YEARS) ON ALL REFRIGERATION COMPRESSORS. DELIVER ALL WARRANTY CERTIFICATES TO THE OWNER PRIOR TO FINAL ACCEPTANCE AND BUILDING TURNOVER.
7. PROVIDE ASSEMBLED PRINTED INSTRUCTIONS FOR THE OPERATION AND MAINTENANCE OF EACH ITEM INSTALLED ALONG WITH THE EQUIPMENT CUT SHEETS AND CONTROL WIRING DIAGRAMS.
8. THE MECHANICAL DRAWINGS INDICATE THE GENERAL ROUTING AND LOCATION OF DUCTWORK, PIPING, EQUIPMENT, FIXTURES, TERMINAL DEVICES, ETC. CONTRACTOR SHALL DETERMINE THE EXACT LOCATION FROM ACTUAL FIELD MEASUREMENTS AT THE JOB SITE. ALL DUCTWORK AND PIPING SHALL BE COORDINATED WITH LIGHT FIXTURES, STRUCTURAL SYSTEM, CEILING GRID, SUPPORTS, PLUMBING, SPRINKLER PIPING, AND ARCHITECTURAL FEATURES OF THE BUILDING PRIOR TO FABRICATION OR INSTALLATION. NO EXTRAS WILL BE ALLOWED FOR DUCTWORK OR PIPING WHICH IS FABRICATED AND THEN FOUND UNABLE TO FIT IN THE INTENDED SPACE. ALL EQUIPMENT SHALL BE LOCATED TO ALLOW FOR CLEANING, INSPECTION AND SERVICE.
9. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING CEILING TYPE AND DIFFUSER & GRILLE LOCATIONS WITH ARCHITECT'S REFLECTED CEILING PLANS. DIFFUSER AND GRILLE LOCATION ON SHOP DRAWINGS ARE SUBJECT TO APPROVAL BY ARCHITECT.
10. PROVIDE ACCESS PANELS FOR ANY PIECE OF EQUIPMENT LOCATED ABOVE NON-ACCESSIBLE CEILINGS. NO EQUIPMENT SHALL BE LOCATED ABOVE WALLS.
11. WHEREVER DUCTWORK OR OTHER ITEMS PASS THROUGH FIRE-RATED WALLS AND FLOORS, THE CONTRACTOR SHALL ADEQUATELY FIRE STOP THE SPACE BETWEEN ITEMS AND THE MASONRY OR THE SPACE BETWEEN THE ITEM AND THE SLEEVE. FIRE STOP SHALL BE A NON-COMBUSTIBLE, NON-MELTING, APPROVED MATERIAL.
12. THE DRAWINGS INDICATE GENERAL CHARACTER AND LOCATION OF WORK INCLUDED, BUT MAY HAVE MINOR SPECIALTIES OMITTED THAT SHALL BE PROVIDED WITHOUT EXTRA COST.
13. CONTRACTOR SHALL PROVIDE ALL OPENINGS REQUIRED TO INSTALL IN THE NEW SYSTEMS AND EQUIPMENT. PROVIDE CUTTING AND PATCHING OF WALLS, PARTITIONS, CEILINGS AND FLOORS, AS REQUIRED. PATCH TO MATCH ADJACENT SURFACES UNLESS OTHERWISE NOTED. REFER TO ARCHITECTURAL PLANS FOR FINISHES. SLEEVE ALL PIPE PENETRATIONS AND SEAL ALL OPENINGS. REFER TO ARCHITECTURAL PLANS FOR ADDITIONAL REQUIREMENTS.
14. CONTRACTOR IS RESPONSIBLE FOR SEALING ALL PENETRATIONS TO THE INTERIOR OR EXTERIOR OF THE BUILDING AS A RESULT OF HIS WORK, IN SUCH A MANNER THAT THE DESIGN FIRE RATING IS MAINTAINED. CONTRACTOR SHALL COORDINATE WITH ALL OTHER TRADES AS REQUIRED FOR NECESSARY PENETRATIONS. IN THE ABSENCE OF ARCHITECTURAL SPECIFICATIONS, USE A TWO (2) HOUR FIRE RATING.
15. CONTRACTOR SHALL FURNISH ALL PIPING, VALVES AND FITTINGS AT A PRESSURE RATING OF NO LESS THAN 125 PSI, OR AS REQUIRED BY LOCAL CODES AND REGULATIONS. WHERE LOCAL JURISDICTIONS ALLOW FOR A LOWER PRESSURE RATING THAN THAT SPECIFIED ABOVE, THE ABOVE SPECIFIED PRESSURE RATING SHALL DICTATE.
16. IN CASES WHERE MANUFACTURER PROVIDES INTERNAL MAXIMUM OVERCURRENT PROTECTION (MOCP) DEVICES IN THE EQUIPMENT, THE MANUFACTURER SHALL SUPPLY LABELING STATING SUCH ON THE EQUIPMENT SERVED. OTHERWISE CONTRACTOR TO SHALL SUPPLY EXTERNAL FUSED DISCONNECT SIZED TO PROVIDE MOCP.
17. CONDENSATE PIPING SHALL BE TYPE "L" COPPER OR SCHEDULE 40 PVC.
CONDENSATE PUMP WITH FLEX TUBING TO EXTERIOR IS ACCEPTABLE – AS REQUIRED BY SITE CONDITIONS.

B. INSULATION

1. DUCTWORK
   a. SIZES INDICATED ARE FREE INSIDE AREA, I.E. SIZES DO NOT INCLUDE INSULATION OR LINING THICKNESS.
   b. INSULATION SHALL BE WRAPPED ON DUCTS WITH 1/2" OUTWARD CLINCHING STAPLES ON 4" CENTERS. STAPLES AND SEAMS SHALL BE SEALED WITH A BRUSH COAT OF VAPOR BARRIER MASTIC.
   c. INSULATION SHALL BE FACED WITH FIRE RESISTANT VAPOR BARRIER JACKET WITH A 2" TAB ON ONE EDGE.
   d. SUPPLY, RELIEF AND EXHAUST DUCTWORK INSULATION SHALL BE A 1-1/2" THICK 3/4 LB. DENSITY FLEXIBLE FIBERGLASS BLANKET.
   e. OUTDOOR AIR DUCTWORK AND SUPPLY, RETURN AND OUTDOOR AIR PLENUM INSULATION SHALL BE A 1-1/2" THICK 2 LB. DENSITY RIGID FIBERGLASS BOARD.
   f. EXHAUST AND RELIEF DUCTWORK SHALL BE INSULATED FROM POINT OF EXHAUST FROM THE BUILDING TO THE BACKDRAFT DAMPER OR SHUT-OFF DAMPER CLOSEST TO THE EXIT FROM THE BUILDING.
   g. EXPOSED DUCTWORK SHALL BE EITHER INTERNALLY LINED OR COVERED W/ RIGID FIBERGLASS INSULATION OF SIMILAR THICKNESS AND PERFORMANCE.
   h. INTERNAL LINING OF SIMILAR THICKNESS AND PERFORMANCE MAY BE USED IN LIEU OF WRAPPING THE DUCTWORK WITH INSULATION.
   i. ALL DUCTWORK LOCATED IN UNCONDITIONED SPACES SHALL BE INSULATED WITH A MINIMUM OF R-6 INSULATION. ALL DUCTWORK LOCATED OUTSIDE OF THE BUILDING ENVELOPE SHALL HAVE A MINIMUM OF R-8 INSULATION.
2. INSULATION OF DUCTWORK AND PIPE PASSING THROUGH NON-RATED WALLS SHALL BE CONTINUOUS THROUGH THE WALL PENETRATION.
3. INSULATION OF CONDENSATE PIPING SHALL BE 1" THICK FIBERGLASS INSULATION WITH VAPOR BARRIER.
4. PROVIDE 1" THICK 3/4 LB. DENSITY ACOUSTICAL INTERIOR LINER WHERE INDICATED. ADJUST SHEET METAL SIZE AS REQUIRED TO PROVIDE CLEAR INSIDE DIMENSION INDICATED.

C. DUCTWORK

1. ALL NEW DUCT TURNS, ELBOWS, ETC. SHALL BE INSTALLED WITH TURNING VANES OR MINIMUM 1-1/2 RADIUS ELBOWS.
2. PROVIDE VOLUME DAMPERS AT ALL BRANCH TAKE-OFFS.
3. CONSTRUCT ALL HIGH PRESSURE VAV DUCTWORK AND ACCESSORIES IN ACCORDANCE WITH THE LATEST EDITION OF SMACNA STANDARDS FOR 2" PRESSURE CLASS AND SEAL CLASS A.
4. CONSTRUCT ALL LOW PRESSURE DUCTWORK AND ACCESSORIES IN ACCORDANCE WITH THE LATEST EDITION OF SMACNA STANDARDS FOR 1/2" PRESSURE CLASS AND SEAL CLASS A.
5. METAL DUCTWORK: FABRICATE ALL DUCTWORK, HOUSINGS, DAMPERS, AND ALL OTHER DUCT RELATED ACCESSORIES FROM GALVANIZED STEEL SHEETS.
6. INSTALL ALL DUCTWORK ABOVE CEILING AND TIGHT TO UNDERSIDE OF STRUCTURE ABOVE UNLESS OTHERWISE INDICATED.
7. CHANGES TO DUCTWORK DUE TO FIELD CONDITIONS SHALL BE MADE PROVIDED THAT THE DUCT FREE AREA IS MAINTAINED AND SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
8. FLEXIBLE DUCTWORK: PROVIDE INSULATED U.L. LISTED CLASS 1 DUCT COMPLYING WITH NFPA 90A. THERMAFLEX G-KM OR APPROVED EQUAL. MAXIMUM LENGTH SHALL BE 8 LINEAR FEET.
9. LEAKAGE:
   a. ALL NEW DUCT JOINTS SHALL BE SEALED WITH HARDCAST 601 OR APPROVED EQUAL.
   b. LEAKAGE TESTING FOR ALL NEW DUCTWORK SHALL BE PER SMACNA.
   c. PERFORM ALL TESTING AFTER THE SEALS HAVE CURED COMPLETELY AND BEFORE COVERING WITH INSULATION OR CONCEALING IN MASONRY OR OTHER PARTITION MATERIAL.

D. TESTING AND BALANCING

1. SCOPE
   a. AN INDEPENDENT CONTRACTOR WITH NEBB OR AABC CERTIFICATION SHALL PROVIDE ALL LABOR, MATERIALS, AND EQUIPMENT TO PERFORM ALL OPERATIONS REQUIRED FOR COMPLETE BALANCING OF THE AIR SYSTEMS AND RELATED WORK AS INDICATED ON DRAWINGS AND SPECIFIED HEREIN.
   b. BALANCING SHALL NOT BE PERFORMED UNTIL ALL MECHANICAL EQUIPMENT IS PROPERLY INSTALLED AND IS 100% OPERATIONAL, ALL TEMPERATURE CONTROLS ARE INSTALLED AND CALIBRATED, AND ALL SYSTEMS ARE CLEANED, PIPES AND STRAINERS FLUSHED, AND CLEAN FILTERS INSTALLED.
   c. BALANCING SHALL BE WITHIN +/- 10% OF THE TOTAL INDICATED VALUES.
   d. IT IS THE INTENT OF THIS SPECIFICATION TO ENSURE THAT THE ENTIRE PROJECT IS SUBSTANTIALLY COMPLETE SO THAT ALL COMPONENTS OF ALL MECHANICAL SYSTEMS CAN BE PUT INTO NORMAL OPERATION WITH ALL WINDOWS AND DOORS CLOSED AND BALANCED IN THAT CONDITION. IN NO CASE IS THE CONTRACTOR TO PERFORM HIS WORK IN A PIECEMEAL FASHION.
2. BELTS AND SHEAVE CHANGES REQUIRED TO MEET SPECIFIED AIR VOLUMES SHALL BE MADE AT NO ADDITIONAL EXPENSE TO THE OWNER.
3. BALANCING REPORT – AFTER FINAL ADJUSTMENTS ARE COMPLETED, THE HVAC SYSTEM SHALL BE TESTED, AND THE FOLLOWING INFORMATION RECORDED AND INCLUDED IN THE BALANCING REPORT.
   a. EACH PIECE OF EQUIPMENT SHALL BE IDENTIFIED WITH LOCATION, SERVICE MANUFACTURER, MODEL NUMBER, ELECTRICAL DATA, AND MEASURED STATIC PRESSURES (EXTERNAL AND TOTAL).
   b. TRAVERSE MAIN SUPPLY DUCT AND INDICATE SIZE. NOTE: TRAVERSE SHALL BE DONE IN A LOCATION NEAR THE FAN BUT AVOIDING TURBULENCE.
   c. EACH AIR DEVICE (NEW AND EXISTING) SHALL BE IDENTIFIED WITH LOCATION AND SERVICE, TYPE, AND SIZE.
   d. BALANCE REPORT SHALL INDICATE REQUIRED CFM AND RESULTANT CFM FOR EACH AIR DEVICE.
4. SHOULD TOTAL INDICATED AIRFLOWS NOT BE ACHIEVABLE, CONTRACTOR SHALL STOP WORK, NOTIFY OWNER, BUILDING ENGINEER AND ARCHITECT. PROPORTIONAL BALANCING IS NOT PERMITTED. WORK SHALL NOT RESUME UNTIL CORRECTIVE MEASURES HAVE BEEN COMPLETED.

E. AIR CLEANING SYSTEM:

1. ALL UNITS SHALL HAVE AIR PURIFICATION SYSTEM OR EQUAL AIR CLEANERS INSTALLED PER MANUFACTURER. COORDINATE WITH ELECTRICAL CONTRACTOR.
2. PROVIDE ATMOS AIR SERIES OR EQUAL. UNITS SHALL BE SIZED PER MFR.
3. UNITS SHALL BE INSTALLED ABOVE THE EVAPORATOR COIL INSIDE THE AHU/RTU AND/OR SUPPLY DUCT.
4. ALL LAMPS SHALL BE REMOVABLE FROM OUTSIDE OF THE AHU/RTU/DUCT CASING FOR MAINTENANCE AND REPLACEMENT PURPOSES.
5. UNITS SHALL HAVE A SAFETY WARNING LABEL APPLIED TO THE EXTERIOR OF EACH SECTION.

Project Name: Hi Tor Animal Shelter	Unit Total Supply Air: 3000 cfm
Date: 8/17/21	Unit Total Outdoor Air: 530 cfm
Unit Designation: RTU-1	

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Room Number	Description	Area (ft²) (Az)	Area Outdoor Air Rate per VMC Table 403.3 (Ra)	Area Outdoor Air (RaAz)	Occupant Load Rate per VMC Table 403.3 (People/ 1000 ft2)	Occupancy C x F/1000 (Pz)	Occupant Outdoor Air Rate per VMC Table 403.3 (Rp)	Occupant Outdoor Air (RpPz)	Breathing Zone Outdoor Air (Vbz = RpPz + RaAz)	Zone Air Distribution Effectiveness (Ez)	Zone Outdoor Air (Voz = Vbz / Ez)	Supply Air Design (Vpz)	Secondary Recirculated Air	Outdoor Air Fraction (Zp = Voz / Vpz)
107-Adtp Cat Hsng	Pet Shop	135	0.18	24	10	2	7.5	15	39	0.8	49	230		0.213
108-Stray Cat Hsng	Pet Shop	120	0.18	22	10	2	7.5	15	37	0.8	47	200		0.235
109-Cat Playroom	Pet Shop	150	0.18	27	10	2	7.5	15	42	0.8	53	270		0.196
110-Cat Playrm 1	Pet Shop	120	0.18	22	10	2	7.5	15	37	0.8	47	300		0.157
111-Cat Playrm 2	Pet Shop	120	0.18	22	10	2	7.5	15	37	0.8	47	300		0.157
112-Cat Playrm 3	Pet Shop	120	0.18	22	10	2	7.5	15	37	0.8	47	300		0.157
113-Cat Playrm 4	Pet Shop	120	0.18	22	10	2	7.5	15	37	0.8	47	300		0.157
114-Cat Playrm 5	Pet Shop	120	0.18	22	10	2	7.5	15	37	0.8	47	300		0.157
115-Cat Playrm 6	Pet Shop	120	0.18	22	10	2	7.5	15	37	0.8	47	300		0.157
116-Cat Playrm 7	Pet Shop	120	0.18	22	10	2	7.5	15	37	0.8	47	300		0.157
117-Cat Playroom	Pet Shop	60	0.18	11	10	1	7.5	7.5	18.5	0.8	24	100		0.240
118-Cat Bonding	Pet Shop	60	0.18	11	10	1	7.5	7.5	18.5	0.8	24	100		0.240
Totals		1365		249		22		165	414		526	3000	0	0.240

Project Name: Hi Tor Animal Shelter	Unit Total Supply Air: 4750 cfm
Date: 8/17/21	Unit Total Outdoor Air: 600 cfm
Unit Designation: RTU-2	

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Room Number	Description	Area (ft²) (Az)	Area Outdoor Air Rate per VMC Table 403.3 (Ra)	Area Outdoor Air (RaAz)	Occupant Load Rate per VMC Table 403.3 (People/ 1000 ft2)	Occupancy C x F/1000 (Pz)	Occupant Outdoor Air Rate per VMC Table 403.3 (Rp)	Occupant Outdoor Air (RpPz)	Breathing Zone Outdoor Air (Vbz = RpPz + RaAz)	Zone Air Distribution Effectiveness (Ez)	Zone Outdoor Air (Voz = Vbz / Ez)	Supply Air Design (Vpz)	Secondary Recirculated Air	Outdoor Air Fraction (Zp = Voz / Vpz)
101A-Entry Vest.	Corridor	35	0.06	2	0	0	0	0	2	0.8	3	70		0.043
101B-Exit Vestibule	Corridor	35	0.06	2	0	0	0	0	2	0.8	3	70		0.043
102-Cler Supplies	Storage Rm	56	0.12	7	0	0	0	0	7	0.8	9	80		0.113
103-Reception Area	Reception	120	0.06	7	30	4	5	20	27	0.8	34	200		0.170
106-Waiting Area	Reception	266	0.06	16	30	8	5	40	56	0.8	70	500		0.140
159-Dog Grooming	Pet Shop	80	0.18	14	10	1	7.5	7.5	21.5	0.8	27	160		0.169
160-Cat Food Stor.	Storage Rm	96	0.12	12	0	0	0	0	12	0.8	15	140		0.107
161-Food Prep Area	Pet Shop	90	0.18	16	10	1	7.5	7.5	23.5	0.8	30	180		0.167
162-Nursing Kitten1	Pet Shop	35	0.18	6	10	1	7.5	7.5	13.5	0.8	17	70		0.243
163-Nursing Kitten2	Pet Shop	35	0.18	6	10	1	7.5	7.5	13.5	0.8	17	70		0.243
164-Nursing Kitten3	Pet Shop	35	0.18	6	10	1	7.5	7.5	13.5	0.8	17	70		0.243
165-Temp. Cat Hldg	Pet Shop	105	0.18	19	10	2	7.5	15	34	0.8	43	210		0.205
166-Kitten Nursery2	Pet Shop	24	0.18	4	10	1	7.5	7.5	11.5	0.8	15	50		0.300
167-Kitten Display	Pet Shop	24	0.18	4	10	1	7.5	7.5	11.5	0.8	15	50		0.300
168-Pet Adoption	Office	120	0.06	7	5	1	5	5	12	0.8	15	240		0.063
169-Small Mammal	Pet Shop	110	0.18	20	10	2	7.5	15	35	0.8	44	220		0.200
170-Temp Dog Hdg	Pet Shop	110	0.18	20	10	2	7.5	15	35	0.8	44	220		0.200
171-Kitty Litter Stor	Storage Rm	171	0.12	21	0	0	0	0	21	0.8	27	250		0.108
172-Cat Bathing	Pet Shop	35	0.18	6	10	1	7.5	7.5	13.5	0.8	17	70		0.243
173-Cat Carrier Dunl	Pet Shop	60	0.18	11	10	1	7.5	7.5	18.5	0.8	24	120		0.200
174-Dog Bathing	Pet Shop	38	0.18	7	10	1	7.5	7.5	14.5	0.8	19	80		0.238
C101 Corridor	Corridor	50	0.06	3	0	0	0	0	3	0.8	4	80		0.050
C102-Corridor	Corridor	136	0.06	8	0	0	0	0	8	0.8	10	200		0.050
C103-Corridor	Corridor	335	0.06	20	0	0	0	0	20	0.8	25	500		0.050
C104-Corridor	Corridor	110	0.06	7	0	0	0	0	7	0.8	9	160		0.056
C105-Corridor	Corridor	420	0.06	25	0	0	0	0	25	0.8	32	630		0.051
105-Public RR	Restroom	56	0	0	0	0	0	0	0	0.8	0	60		0.000
Totals		2787		276		29		185	461		585	4750	0	0.300

Project Name: Hi Tor Animal Shelter	Unit Total Supply Air: 4000 cfm
Date: 8/19/21	Unit Total Outdoor Air: 400 cfm
Unit Designation: RTU-3	

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Room Number	Description	Area (ft²) (Az)	Area Outdoor Air Rate per VMC Table 403.3 (Ra)	Area Outdoor Air (RaAz)	Occupant Load Rate per VMC Table 403.3 (People/ 1000 ft2)	Occupancy C x F/1000 (Pz)	Occupant Outdoor Air Rate per VMC Table 403.3 (Rp)	Occupant Outdoor Air (RpPz)	Breathing Zone Outdoor Air (Vbz = RpPz + RaAz)	Zone Air Distribution Effectiveness (Ez)	Zone Outdoor Air (Voz = Vbz / Ez)	Supply Air Design (Vpz)	Secondary Recirculated Air	Outdoor Air Fraction (Zp = Voz / Vpz)
120-Clerical Area	Office	56	0.06	3	5	1	5	5	8	0.8	10	130		0.077
121-Quarantine Hsg	Pet Shop	72	0.18	13	10	1	7.5	7.5	20.5	0.8	26	170		0.153
122-Executive Office	Office	80	0.06	5	5	1	5	5	10	0.8	13	175		0.074
123-Housing Mgr	Office	120	0.06	7	5	1	5	5	12	0.8	15	260		0.058
124-Breakroom	Break Room	216	0.06	13	5	2	5	10	23	0.8	29	480		0.060
125-General Storage	Storage Rm	168	0.12	20	0	0	0	0	20	0.8	25	290		0.086
126-Document Stor	Storage Rm	84	0.12	10	0	0	0	0	10	0.8	13	140		0.093
141-Laundry Stor	Storage Rm	108	0.12	13	0	0	0	0	13	0.8	17	170		0.100
144-Laundry Room	Commercial Laundry	156	0	0	10	2	25	50	50	0.8	63	310		0.203
156-Dog Food Stor	Storage Rm	96	0.12	12	0	0	0	0	12	0.8	15	165		0.091
157-Food Prep Area	Pet Shop	90	0.18	16	10	1	7.5	7.5	23.5	0.8	30	150		0.200
158-Bowl Wash	Pet Shop	84	0.18	15	10	1	7.5	7.5	22.5	0.8	29	150		0.193
C106/107-Corridor	Corridor	410	0.06	25	0	0	0	0	25	0.8	32	670		0.048
C111-Corridor	Corridor	125	0.06	8	0	0	0	0	8	0.8	10	210		0.048
U102-Sprinkler Rm	Storage Rm	80	0.12	10	0	0	0	0	10	0.8	13	130		0.100
U103 Mechanical	Storage Rm	120	0.12	14	0	0	0	0	14	0.8	18	100		0.180
U104-Telephone	Storage Rm	45	0.12	5	0	0	0	0	5	0.8	7	80		0.088
U105 Server Rm	Storage Rm	40	0.12	5	0	0	0	0	5	0.8	7	100		0.070
153-Unisex Staff Rr	Restroom	56	0	0	0	0	0	0	0	0.8	0	60		0.000
154-Unisex Staff Rr	Restroom	56		0		0		0	0	0.8	0	60		0.000
Totals		2262		194		10		97.5	291.5		372	4000	0	0.203

Project Name: Hi Tor Animal Shelter	Unit Total Supply Air: 3000 cfm
Date: 8/17/21	Unit Total Outdoor Air: 450 cfm
Unit Designation: RTU-4	

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Room Number	Description	Area (ft²) (Az)	Area Outdoor Air Rate per VMC Table 403.3 (Ra)	Area Outdoor Air (RaAz)	Occupant Load Rate per VMC Table 403.3 (People/ 1000 ft2)	Occupancy C x F/1000 (Pz)	Occupant Outdoor Air Rate per VMC Table 403.3 (Rp)	Occupant Outdoor Air (RpPz)	Breathing Zone Outdoor Air (Vbz = RpPz + RaAz)	Zone Air Distribution Effectiveness (Ez)	Zone Outdoor Air (Voz = Vbz / Ez)	Supply Air Design (Vpz)	Secondary Recirculated Air	Outdoor Air Fraction (Zp = Voz / Vpz)
138-Surgery Room	Medical Procedure Room	156	0	0	20	4	15	60	60	0.8	75	300		0.250
139-Pre-op/Rcvr/ICU	Medical Procedure Room	90	0	0	20	2	15	30	30	0.8	38	180		0.211
140-Puppy Welping	Pet Shop	48	0.18	9	10	1	7.5	7.5	16.5	0.8	21	100		0.210
145-VMA Gen Stor	Storage Rm	90	0.12	11	0	0	0	0	11	0.8	14	130		0.108
146-Treatment&Prep	Medical Procedure Room	145	0	0	20	3	15	45	45	0.8	57	300		0.190
147-Pack Prep Area	Medical Procedure Room	88	0	0	20	2	15	30	30	0.8	38	180		0.211
148-Lab & Pharm	Pharmacy	104	0.18	19	10	2	5	10	29	0.8	37	200		0.185
149-Spay/Neut Exm	Medical Procedure Room	100	0	0	20	2	15	30	30	0.8	38	200		0.190
150-VMA Isolation	Pet Shop	84	0.18	15	10	1	7.5	7.5	22.5	0.8	29	160		0.181
151-VMA Isolation	Pet Shop	48	0.18	9	10	1	7.5	7.5	16.5	0.8	21	100		0.210
152-Laundry Stor	Storage Rm	56	0.12	7	0	0	0	0	7	0.8	9	80		0.113
C112-Corridor	Corridor	149	0.06	9	0	0	0	0	9	0.8	12	220		0.055
C110-Corridor	Corridor	226	0.06	14	0	0	0	0	14	0.8	18	340		0.053
C113-Corridor	Corridor	123	0.06	7	0	0	0	0	7	0.8	9	160		0.056
C114-Corridor	Corridor	234	0.06	14	0	0	0	0	14	0.8	18	350		0.051
Totals		1741		114		18		227.5	341.5		434	3000	0	0.250

Project Name: Hi Tor Animal Shelter	Unit Total Supply Air: 4000 cfm
Date: 9/27/21	Unit Total Outdoor Air: 900 cfm
Unit Designation: RTU-5	

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Room Number	Description	Area (ft²) (Az)	Area Outdoor Air Rate per VMC Table 403.3 (Ra)	Area Outdoor Air (RaAz)	Occupant Load Rate per VMC Table 403.3 (People/ 1000 ft2)	Occupancy C x F/1000 (Pz)	Occupant Outdoor Air Rate per VMC Table 403.3 (Rp)	Occupant Outdoor Air (RpPz)	Breathing Zone Outdoor Air (Vbz = RpPz + RaAz)	Zone Air Distribution Effectiveness (Ez)	Zone Outdoor Air (Voz = Vbz / Ez)	Supply Air Design (Vpz)	Secondary Recirculated Air	Outdoor Air Fraction (Zp = Voz / Vpz)
132-Transition Vest	Corridor	38	0.06	2	0	0	0	0	2	0.8	3	50		0.060
133-Isolation Hsg	Pet Shop	133	0.18	24	10	2	7.5	15	39	0.8	49	200		0.245
134-Transition Vest	Corridor	38	0.06	2	0	0	0	0	2	0.8	3	50		0.060
135-Isolation Hsg	Pet Shop	133	0.18	24	10	2	7.5	15	39	0.8	49	200		0.245
136-Isolation Hsg	Pet Shop	72	0.18	13	10	1	7.5	7.5	20.5	0.8	26	100		0.260
137-Quarantine Hsg	Pet Shop	72	0.18	13	10	1	7.5	7.5	20.5	0.8	26	100		0.260
174-Dog Bonding	Pet Shop	78	0.18	14	10	1	7.5	7.5	21.5	0.8	27	100		0.270
175-Gen Dog Supply	Storage Rm	46	0.12	6	0	0	0	0	6	0.8	8	50		0.160
176-Dog Bonding	Pet Shop	100	0.18	18	10	1	7.5	7.5	25.5	0.8	32	130		0.246
177-Dog Ward 2	Pet Shop	280	0.18	50	10	3	7.5	22.5	72.5	0.8	91	420		0.217
178-Dog Ward 1	Pet Shop	370	0.18	67	10	4	7.5	30	97	0.8	122	550		0.222
179-Dog Ward	Pet Shop	275	0.18	50	10	3	7.5	22.5	72.5	0.8	91	420		0.217
180-Dog Bonding	Pet Shop	100	0.18	18	10	1	7.5	7.5	25.5	0.8	32	130		0.246
181-Dog Ward 3	Pet Shop	370	0.18	67	10	4	7.5	30	97	0.8	122	550		0.222
182-Dog Ward 2	Pet Shop	220	0.18	40	10	3	7.5	22.5	62.5	0.8	79	330		0.239
183-Dog Ward 1	Pet Shop	275	0.18	50	10	3	7.5	22.5	72.5	0.8	91	420		0.217
U108-Power Wash	Storage Rm	52	0.12	6	0	0	0	0	6	0.8	8	40		0.200
C104 Corridor	Corridor	100	0.06	6	0	0	0	0	6	0.8	8	100		0.080
C111 Corridor	Corridor	60	0.06	4	0	0	0	0	4	0.8	5	60		0.083
Totals		2812		474		29		217.5	691.5		872	4000	0	0.270

MECHANICAL SYMBOLS

PLAN SYMBOLS

- RTU 1 — MECHANICAL EQUIPMENT IDENTIFICATION
- 1 / M-6 — DETAIL IDENTIFICATION
DETAIL NUMBER AND DRAWING NUMBER AS INDICATED.
- 1 — NEW WORK NOTE IDENTIFICATION

MECHANICAL SYMBOLS

- 100 — SUPPLY DIFFUSER/TYPE IDENTIFICATION
CFM
- RETURN REGISTER/TYPE IDENTIFICATION
- EXHAUST REGISTER/TYPE IDENTIFICATION
- AIR FLOW DIRECTION
- FLEXIBLE DUCTWORK–PROVIDE VOLUME DAMPER
ON ALL BRANCH FLEX DUCT WITH LOCKING QUADRANTS
- DUCTWORK TURNED UP OR TOWARDS
- DUCTWORK TURNED DOWN OR AWAY
- DUCTWORK TRANSITION
- AD — ACCESS DOOR, SIZED AS INDICATED
- FD — FIRE DAMPER WITH ACCESS DOOR
- SD — SMOKE DAMPER WITH ACCESS DOOR
- VOLUME DAMPER WITH LOCKING QUADRANTS
- M — MODULATING MOTORIZED DAMPER
- T — DUCT MOUNTED TEMPERATURE SENSOR
- AHU-# T — WALL THERMOSTAT
- AHU-# H — WALL HUMIDISTAT
- SD — DUCT SMOKE DETECTOR
- U — 3/4" DOOR UNDERCUT
- CO2 — CARBON DIOXIDE WALL SENSOR
- D — CONDENSATE DRAIN
- PIPE TURNED DOWN
- PIPE TURNED UP

MECHANICAL SYMBOLS

ABBREVIATIONS

ABV	ABOVE
ACU	AIR CONDITIONING UNIT
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
BAS	BUILDING AUTOMATION SYSTEM
BHP	BRAKE HORSEPOWER
BOD	BOTTOM OF DUCT
BDD	BACK DRAFT DAMPER
BFC	BELOW FINISHED CEILING
CLG	CEILING
CP	CONDENSATE PUMP
D	CONDENSATE DRAIN
DN	DOWN
(E)	EXISTING
EA	EXHAUST AIR
EHC	ELECTRIC HEATING COIL
EF	EXHAUST FAN
(ER)	EXISTING RELOCATED
F	FAN
FA	FRESH AIR
FPB	FAN POWERED BOX
MAU	MAKE-UP AIR
MD	MOTORIZED DAMPER
MHP	MOTOR HORSEPOWER
(N)	NEW
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OA	OUTSIDE AIR
RA	RETURN AIR
RTU	ROOFTOP UNIT
SA	SUPPLY AIR
SL	SOUND LINED DUCT
SS	STAINLESS STEEL
TR	TRANSFER AIR
TOD	TOP OF DUCT
VAV	VARIABLE AIR VOLUME
VFD	VARIABLE FREQUENCY DRIVE
W/O	WALL OPENING ABOVE CEILING
WSHP	WATER SOURCE HEAT PUMP

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Job # E2119

REVISION		
NO.	DESCRIPTION	DATE

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CAPITOL PROJECT 1483

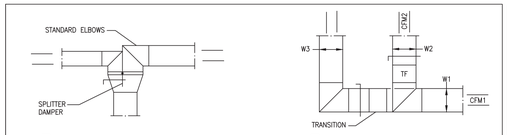
CONSTRUCTION OF A NEW ANIMAL SHELTER FACILITY
65 FIREMANS MEMORIAL DRIVE, POMONA, NY 10970

MECHANICAL NOTES

DRAWN BY: JLC
CHECKED BY: CRS
SCALE: AS NOTED
DATE: 20 OCT. 2021
PROJECT NO: 2019

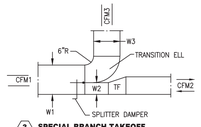
PROGRESS SET ☐ BID SET ■ PERMIT SET ☐ CONSTRUCTION SET ☐

M1.00

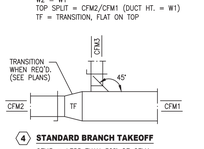


1 UNEQUAL HORIZONTAL SPLIT
(NO CHANGE IN DUCT HEIGHT)

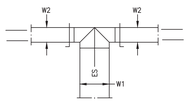
2 EQUAL/UNEQUAL VERTICAL SPLIT
W2 = W1
TOP SPLIT = CFM2/CFM1 (DUCT HT. = W1)
TF = TRANSITION, FLAT ON TOP



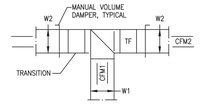
3 SPECIAL BRANCH TAKEOFF
W2 = (CFM2/CFM1) x W1
W3 = REQUIRED DUCT WIDTH
CFM3 = 30% OR MORE OF CFM1
(NO CHANGE IN DUCT HEIGHT)
SEE SMACNA FIG. 2-7



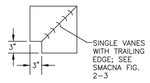
4 STANDARD BRANCH TAKEOFF
CFM3 = LESS THAN 30% OF CFM1
TF = TRANSITION, FLAT ON TOP
SEE SMACNA FIG. 2-8 AND 2-9



5 EQUAL HORIZONTAL SPLIT
W2 = W1 x 0.6
ES = EQUAL SPLIT



6 EQUAL/UNEQUAL VERTICAL SPLIT
W2 = W1
TOP SPLIT = CFM2/CFM1 (DUCT HT. = W1)
TF = TRANSITION, FLAT ON TOP



7 STANDARD ELBOW
SEE SMACNA FIG. 2-2

8 RADIUS ELBOW
USE ONLY WHEN NOTED ON PLANS; OTHERWISE USE STANDARD ELBOW.
SEE SMACNA FIG. 2-2

NOTES:
1. REFER TO PLANS FOR SPECIFIC FITTING TYPES.

1 DUCTWORK FITTINGS DETAIL
NOT TO SCALE

GAS PACKAGE ROOFTOP UNIT SCHEDULE

UNIT DESIGNATION	TOTAL CFM	MINIMUM O.A. CFM	NOMINAL TONS	FAN BHP	E.S.P. IN. W.C.	GAS HEATER EFF.	GAS HEATER INPUT(BTUH)	GAS HEATER OUTPUT(BTUH)	TOTAL MBH	SENSIBLE MBH	OA DB (°F)	EER AT A/B	IEER AT A/B	V/PH/HZ	MCA	MOCP	WEIGHT LBS	BASIS OF DESIGN	NOTES
RTU 1	3,000	530	7.5	2.4	1.0	82.0%	224,000	184,000	86.8	54.1	95	12.0	13.8	208/3/60	50	60	1,600	CARRIER 48HCFE08K2AA5OWH	3,4,7,8,9,10,13,14,15,16,17
RTU 2	4,750	600	12.5	3.7	1.0	81.0%	240,000	195,000	141.6	93.4	95	12.2	13.9	208/3/60	68	80	2,200	CARRIER 48HCFE14K2AA5OWH	3,4,7,8,9,10,13,14,15,16,17
RTU 3	4,000	400	10.0	3.7	1.0	80.0%	250,000	205,000	113.6	70.5	95	11.5	12.7	208/3/60	62	70	1,800	CARRIER 48HCFE12K2AA5OWH	3,4,7,8,9,10,13,14,15,16,17
RTU 4	3,000	450	7.5	2.4	1.0	82.0%	224,000	184,000	86.8	54.1	95	12.0	13.8	208/3/60	50	60	1,600	CARRIER 48HCFE08K2AA5OWH	3,4,7,8,9,10,13,14,15,16,17
RTU 5	4,000	ERV 2000	10.0	3.7	1.0	80.0%	250,000	205,000	113.6	70.5	95	11.5	12.7	208/3/60	81	90	2,700	CARRIER 48HCFE12K2AA5DTH	3,4,7,8,9,10,12,14,15,16,17

NOTES:
1. THRU-THE-BASE GAS CONNECTION
2. TWO (2) STAGE COOLING
3. SINGLE (1) STAGE COOLING
4. TWO (2) STAGE GAS HEATING
5. SINGLE (1) STAGE GAS HEATING
6. HIGH STATIC BELT DRIVE BLOWER
7. MEDIUM STATIC BELT DRIVE BLOWER
8. 2-SPEED INDOOR FAN MOTOR CONTROLLED BY VFD
9. PROVIDE LOW AMBIENT COOLING TO 40°F MINIMUM OR 0°F (WHERE AVAILABLE).
10. HINGED ACCESS DOOR & SIDE FILTER ACCESS DOOR KIT.
11. HORIZONTAL AIRFLOW DISCHARGE.
12. ENTHALPY LOW LEAK ECONOMIZER W/ ERV & HOODS.
13. ENTHALPY LOW LEAK ECONOMIZER W/ BAROMETRIC RELIEF & HOODS.
14. PROVIDE DEHUMIDIFICATION OPTION W/ HUMIDITY SENSOR
15. PROVIDE CARRIER 7-DAY PROGRAMMABLE THERMOSTAT OR EQUAL.
16. PROVIDE POWERED CONVENIENCE OUTLET.
17. PROVIDE 14 INCH TALL ROOF CURB.

SCHEDULE NOTES FOR RTU-5 (WITH ERV):
1. BASIS OF DESIGN IS CARRIER 48HCFE12K2AA5DTH W/ ENERGYX ERV W/ ECONOMIZER AND FREEZE PROTECTION. ONLY PREAPPROVED ALTERNATES MEETING ALL THE PROJECT REQUIREMENTS WILL BE CONSIDERED
2. IN ORDER TO BE CONSIDERED AN ACCEPTABLE ALTERNATE, PROPOSED UNIT MUST MEET THE SPECIFIED PERFORMANCE INCLUDING, BUT NOT LIMITED TO, DX COIL LEAVING DEWPOINT (DPC<47)
3. PROVIDE UNITS WITH THE FOLLOWING FEATURES:
   a. 2" DOUBLE WALL FOAM INJECTED R13 INSULATED CASING (INCLUDING R13 INSULATED BASE), ENTIRELY PRE-PAINTED EXTERIOR,
   b. DIGITAL SCROLL COMPRESSOR, BOTH CIRCUITS (IF APPLICABLE); HOT GAS BYPASS IS NOT ACCEPTABLE
   c. MODULATING HOT GAS REHEAT WITH ACTIVE HEAD PRESSURE CONTROL VFD DRIVEN CONDENSER FANS TO ENSURE 70 DEG F UNIT LEAVING AIR TEMPERATURE
   d. UV LIGHTS BETWEEN DX AND HOT GAS REHEAT COIL
   e. DIRECT DRIVE PLENUM SUPPLY AND POWERED EXHAUST FANS W/VFD AND PIEZO RINGS FOR AIR MEASUREMENT
   e.a. BOTH FANS SHALL HAVE SLIDE-OUT FEATURE FOR SERVICEABILITY
   f. MODULATING GAS HEATING (10:1 TURNDOWN)
   g. COMPARATIVE ENTHALPY ECONOMIZER CONTROL
   h. ALL ALUMINUM ENERGY RECOVERY WHEEL WITH BYPASS DAMPERS AND SLIDE OUT FOR SERVICEABILITY
      h.a. WHEEL SHALL HAVE A PURGE RATED FOR NO MORE THAN 0.04% CROSSOVER BETWEEN SUPPLY AND EXHAUST AIR PATH
      h.b. ALL OUTDOOR AIR SHALL PASS THRU THE WHEEL WHEN UNIT IS NO ECONOMIZING
      h.c. MERV 8 FILTRATION
   j. NON-FUSED DISCONNECT SWITCH W/CONVENIENCE OUTLET
   k. BACNET COMPATIBLE DDC CONTROLLER INCLUDING PROGRAMMING/SEQUENCING AND SENSORS AS REQUIRED FOR CONSTANT VOLUME SPACE CONTROL
      k.a. AUTO-RESTART AFTER A POWER FAILURE
   l. STANDARD MANUFACTURER KNOCKDOWN CURB
   m. STARTUP & 1-YEAR WARRANTY LABOR BY MANUFACTURER; EXTENDED 5 YEAR COMPRESSOR PARTS ONLY WARRANTY

AIR CLEANING UNIT SCHEDULE

MARK	MFR*	MODEL	MAX AIR TEMP (F)	TUBE QTY.	CURRENT AMP	POWER WATTS	VOLTAGE	WEIGHT LBS.
ACU	ATMOS AIR	500EC	200	5	0.6	52	115/1/60	15

1. MANUFACTURER OR APPROVED EQUAL
3. UNITS SHALL BE INSTALLED IN THE SUPPLY DUCT DISCHARGE AIR
4. UNIT SHALL INTERLOCK TO ENERGIZE WITH RTU FAN OR AIR PRESSURE SWITCH
2. PROVIDE NEMA 5-15 PLUG OR 3 WIRE TO JUNCTION BOX
5. COORDINATE WITH ELECTRICAL CONTRACTOR.

ELECTRIC HEATER SCHEDULE

			CONSTRUCTION DATA	ELECTRICAL DATA					
MARK	AREA / SERVICE	CFM	TYPE	KW	VOLT	PH	AMPS	MANUFACTURER	NOTES
EH 1	ENTRY/EXIT	100	WALL MOUNTED	2	208/230	1	8.3	MARKEL F3507ZDWB	1,2

1. ELECTRICAL CORD SHALL BE CONCEALED W/ CASING.
2. BUILT IN CONTROLLABLE THERMOSTAT

GAS UNIT HEATER SCHEDULE

			CONSTRUCTION DATA			ELECTRICAL DATA					
MARK	AREA / SERVICE	CFM	TYPE	GAS INPUT	GAS OUTPUT	VOLT	PH	AMPS	MOTOR HP	MANUFACTURER	NOTES
GH 1	CREMATORY	720	CEILING/WALL MOUNTED	45,000	36,900	115	1	--	1/15	MODINE HD45	1,2,3,4

NOTES:
1. MAXIMUM MOUNTING HEIGHT = 10 FT.
2. BUILT IN CONTROLLABLE THERMOSTAT
3. PROVIDE VENT FOR COMBUSTION AIR & EXHAUST VENTING
4. PROVIDE HANGERS AND STRUCTURAL SUPPORT PER MFR.

EXHAUST FAN SCHEDULE

	PERFORMANCE DATA			CONSTRUCTION DATA		ELECTRICAL DATA					
MARK	CFM	SP (IN. W.G.)	RPM	TYPE	DRIVE	MOTOR H.P. (WATTS)	VOLT	PH	MAX. WEIGHT (LB)	MANUFACTURER OR EQUAL	NOTES
EF 1	70	0.375	838	CEILING MOUNTED	DIRECT	(24.1)	115	1	12	GREENHECK SP-A50-90-VG	1,2,6,7
EF 2	1380	0.500	1385	ROOF MOUNTED	DIRECT	1/2	115	1	65	GREENHECK G-120-VG	4,5,6,7
EF 3	1000	0.500	1650	ROOF MOUNTED	DIRECT	1/4	115	1	56	GREENHECK G-099-VG	3,4,5,6,7
EF 4	220	0.250	1664	INLINE MOUNTED	DIRECT	1/15	115	1	41	GREENHECK SQ-70-VG	4,6,7

NOTES:
1. FANS IN RESTROOMS SHALL SWITCH WITH LIGHT.
2. FANS IN BATHING, MOP CLOSETS, & EXAM ROOMS SHALL ENERGIZE WITH WALL SWITCH.
3. FANS IN ISOLATION & OXYGEN ROOMS SHALL RUN CONTINUOUSLY.
4. FANS IN HOUSING, RUNS, & WARDS SHALL RUN CONTINUOUSLY.
5. PROVIDE 12" ROOF CURB FOR ALL ROOF EXHAUST CAPS ON FLAT ROOF.
6. STANDARD PREWIRED DISCONNECT SWITCH.
7. VIBRATION ISOLATORS AND BRACKETS.

LOUVER SCHEDULE

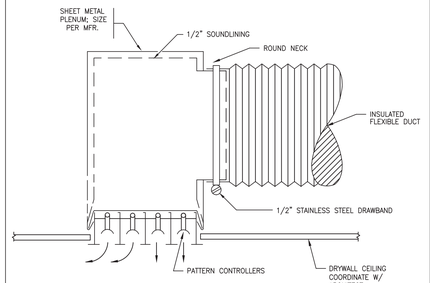
TYPE	SERVICE	CFM	DIMENSIONS W×L×H	FREE AREA FT2	FINISH	BASIS OF DESIGN	NOTES
L 1	EXHAUST	220	15"x10"x2"	0.28	ALUMINUM	GREENHECK: ESJ-202	1-2
L 2	EXHAUST	140	13"x10"x2"	0.23	ALUMINUM	GREENHECK: ESJ-202	1-2
L 3	OUTSIDE AIR INTAKE	70	11"x7"x2"	0.10	ALUMINUM	GREENHECK: ESJ-202	1-2

1. COORDINATE WITH OWNER FINAL COLOR & FINISH (IF PAINTED).
2. CONTRACTOR SHALL CONFIRM ACTUAL FINAL DIMENSIONS WITH VENDOR.

DIFFUSER, REGISTER AND GRILLE SCHEDULE

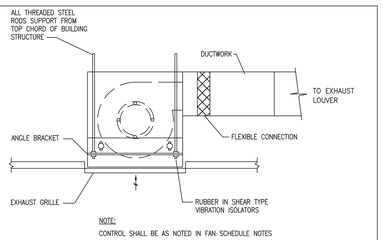
TYPE	SERVICE	CFM RANGE	FACE DIMENSION	NECK DIMENSION	FINISH	BASIS OF DESIGN	NOTES
1	SUPPLY AIR DIFFUSER	0 - 125	24"x24"	6"ø	WHITE	TUTTLE & BAILEY: T1100	1,2,3,4,5,7
		126 - 250		8"ø			
		251 - 400		10"ø			
2	SUPPLY AIR DIFFUSER	0 - 125	12"x12"	6"ø	WHITE	TUTTLE & BAILEY: T1100	1,2,3,4,5,7
		126 - 250		8"ø			
3	SUPPLY AIR DIFFUSER	126 - 250	48"x2.5"	8"ø	WHITE	TUTTLE & BAILEY: 4000	1,2,4,5,7,9
4	SUPPLY AIR DIFFUSER	251 - 400	48"x3"	10"ø	WHITE	TUTTLE & BAILEY: 4000	1,2,4,5,7,9
1	RETURN AIR DIFFUSER	0 - 125	24"x24"	6"ø	WHITE	TUTTLE & BAILEY: PR	1,2,6,7
		126 - 250		8"ø			
		251 - 400		10"ø			
		401 - 600		12"ø			
2	RETURN AIR DIFFUSER	0 - 125	12"x12"	6"ø	WHITE	TUTTLE & BAILEY: PR	1,2,6,7
		126 - 250		8"ø			
3	RETURN AIR DIFFUSER	851 - 1000	24"x8"	N/A	WHITE	TUTTLE & BAILEY: 4000	1,2,5,8,9
1	EXHAUST AIR GRILLE	101 - 250	24"x24"	8"ø	WHITE	TUTTLE & BAILEY: PR	1,2,6,7
		251 - 400		10"ø			
2	EXHAUST AIR GRILLE	0 - 125	12"x12"	6"ø	WHITE	TUTTLE & BAILEY: PR	1,2,6,7
3	INTAKE AIR GRILLE	126 - 250	20"x20"	18"x18"	WHITE	TUTTLE & BAILEY: PR	1,2,6,7
4	DOOR TRANSFER GRILLE	251 - 400	16"x16"	N/A	WHITE	TUTTLE & BAILEY: DXFR	1,2

NOTES:
1. COORDINATE WITH OWNER COLOR & FINISH.
2. CONTRACTOR SHALL CONFIRM ACTUAL FINAL DIFFUSER DIMENSIONS WITH VENDOR, AND COORDINATE W/ CEILING/WALL/DOOR TYPE AS NECESSARY.
3. 4 WAY THROW PATTERN.
4. PROVIDE WITH OPPOSED BLADE DAMPER.
5. PROVIDE INSULATED BACKPANS WHEN INSTALLED ABOVE CEILINGS, UNCONDITIONED, AND/OR PARTIALLY CONDITIONED SPACE.
6. PERFORATED PATTERN
7. CEILING MOUNTED
8. WALL MOUNTED
9. AO CORE, STANDARD UNIT, & 1/2" MARGINS



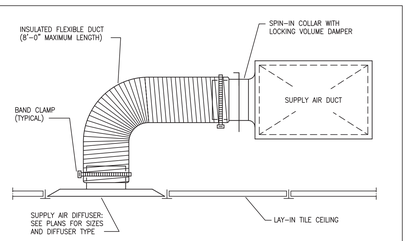
NOTES:
1. ADJUST VOLUME DAMPERS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS FOR SPECIFIED AIR FLOW.
2. REFER TO DIFFUSER SCHEDULE FOR QUANTITY AND SIZES OF SLOTS.

9 LINEAR SLOT DIFFUSER DETAIL
NOT TO SCALE



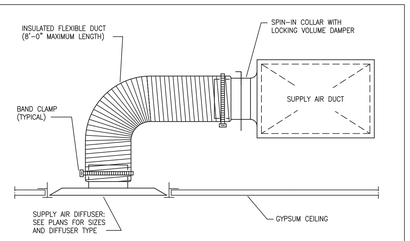
NOTE:
CONTROL SHALL BE AS NOTED IN FAN SCHEDULE NOTES

2 CEILING CABINET EXHAUST FAN DETAIL
NOT TO SCALE



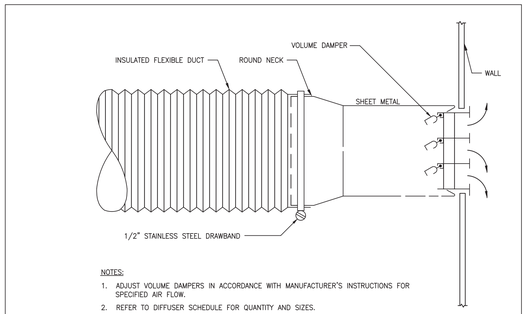
NOTE:
1. FLEXIBLE DUCT SHALL BE SUPPORTED FROM STRUCTURE ABOVE TO PREVENT SAGGING.

3 SUPPLY AIR DIFFUSER IN ACOUSTICAL CEILING
NOT TO SCALE



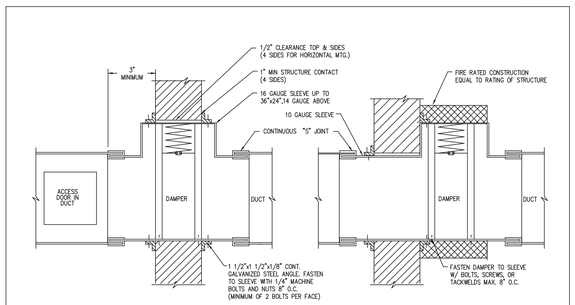
NOTE:
1. FLEXIBLE DUCT SHALL BE SUPPORTED FROM STRUCTURE ABOVE TO PREVENT SAGGING.

4 SUPPLY AIR DIFFUSER IN GYPSUM CEILING
NOT TO SCALE



NOTES:
1. ADJUST VOLUME DAMPERS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS FOR SPECIFIED AIR FLOW.
2. REFER TO DIFFUSER SCHEDULE FOR QUANTITY AND SIZES.

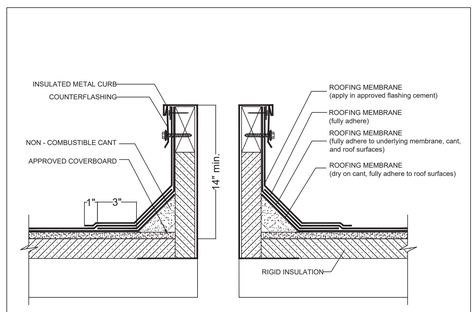
5 SIDEWALL DIFFUSER/GRILLE DETAIL
NOT TO SCALE



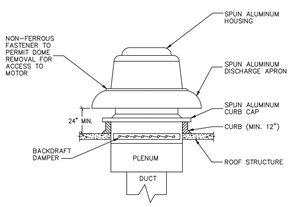
FIRE DAMPER MOUNTING
NO SCALE

NOTE: PROVIDE ACCESS DOOR FOR FINISHED SURFACE

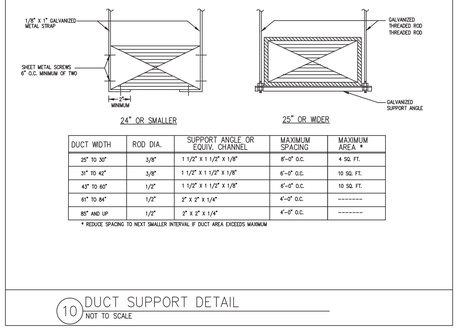
6 RATED WALL OPENING FIRE DAMPER
NOT TO SCALE



7 ROOF CURB DETAIL
NOT TO SCALE



8 ROOF EXHAUST FAN DETAIL
NOT TO SCALE



DUCT WIDTH	ROD DIA.	SUPPORT ANGLE OR EQUIV. CHANNEL	MAXIMUM SPACING	MAXIMUM AREA *
25" TO 30"	3/8"	1 1/2" X 1 1/2" X 1/8"	6'-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

10 DUCT SUPPORT DETAIL
NOT TO SCALE

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Comfort Design Inc.
Mechanical & Electrical Engineers
620 Pennsylvania Ave
Winchester, VA 22601
Phone 540-665-2846
Fax 540-667-3284

Job # E2119

NO.	DESCRIPTION	DATE
	REVISION	

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rauhaus freedenfeld & associates

CAPITOL PROJECT 1483

CONSTRUCTION OF A NEW ANIMAL SHELTER FACILITY
65 FIREMANS MEMORIAL DRIVE, POMONA, NY 10970

DRAWN BY:	JLC
CHECKED BY:	CRS
SCALE:	AS NOTED
DATE:	20 OCT 2021
PROJECT NO:	2019

PROGRESS SET ☐ BID SET ☐ PERMIT SET ☐ CONSTRUCTION SET ☐

MECHANICAL DETAILS

M1.01

GUIDE SPECIFICATIONS

GAS HEAT/ELECTRIC COOLING PACKAGED ROOFTOP

PART 1: SCHEDULES FOR DECENTRALIZED HVAC EQUIPMENT
DECENTRALIZED UNITARY HVAC EQUIPMENT SCHEDULE
1.1. ROOFTOP UNIT SCHEDULE
A. SCHEDULE IS PER THE PROJECT SPECIFICATION REQUIREMENTS.
PART 2: HVAC EQUIPMENT INSULATION
DECENTRALIZED, ROOFTOP UNITS:
2.1. EVAPORATOR FAN COMPARTMENT:
A. INTERIOR CABINET SURFACES SHALL BE INSULATED WITH A MINIMUM 1/2-IN. THICK, MINIMUM 1 1/2 LB DENSITY, FLEXIBLE FIBERGLASS INSULATION BONDED WITH A PHENOLIC BINDER, NEOPRENE COATED ON THE AIR SIDE.
B. INSULATION AND ADHESIVE SHALL MEET NFPA 90A REQUIREMENTS FOR FLAME SPREAD AND SMOKE GENERATION.
2.1. GAS HEAT COMPARTMENT:
A. ALUMINUM FOIL-FACED FIBERGLASS INSULATION SHALL BE USED.
B. INSULATION AND ADHESIVE SHALL MEET NFPA 90A REQUIREMENTS FOR FLAME SPREAD AND SMOKE GENERATION.
2.1. COMFORTLINK UNIT CONTROLS SHALL CONTAIN:
A. FOUR BUTTON DETAILED ENGLISH SCROLLING MARQUEE DISPLAY.
B. CCN (CARRIER COMFORT NETWORK) CAPABLE.
C. UNIT CONTROL WITH STANDARD SUCTION PRESSURE TRANSDUCERS AND CONDENSING TEMPERATURE THERMISTORS.
D. SHALL PROVIDE A 5°F TEMPERATURE DIFFERENCE BETWEEN COOLING AND HEATING SET POINTS TO MEET ASHRAE 90.1 ENERGY STANDARD.
E. SHALL PROVIDE AND DISPLAY A CURRENT ALARM LIST AND AN ALARM HISTORY LIST.
F. SERVICE RUN TEST CAPABILITY.
G. SHALL ACCEPT INPUT FROM A CO2 SENSOR (BOTH INDOOR AND OUTDOOR).
H. CONFIGURABLE ALARM LIGHT SHALL BE PROVIDED WHICH ACTIVATES WHEN CERTAIN TYPES OF ALARMS OCCUR.
I. COMPRESSOR MINIMUM RUN TIME (3 MINUTES) AND MINIMUM OFF TIME (5 MINUTES) ARE PROVIDED.
J. SERVICE DIAGNOSTIC MODE.
K. ECONOMIZER CONTROL (OPTIONAL).
L. CONTROL MULTI CAPACITY STAGES
M. UNIT SHALL BE COMPLETE WITH SELF-CONTAINED LOW VOLTAGE CONTROL CIRCUIT.
N. UNIT SHALL HAVE 0°F LOW AMBIENT COOLING OPERATION.
PART 3: ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC
DECENTRALIZED, ROOFTOP UNITS:
3.1. GENERAL:
A. SHALL BE COMPLETE WITH SELF-CONTAINED LOW-VOLTAGE CONTROL CIRCUIT PROTECTED BY A RESETTABLE CIRCUIT BREAKER ON THE 24-V TRANSFORMER SIDE. TRANSFORMER SHALL HAVE 75VA CAPABILITY.
B. SHALL UTILIZE COLOR-CODED WIRING.
C. SHALL INCLUDE A CENTRAL CONTROL TERMINAL BOARD TO CONVENIENTLY AND SAFELY PROVIDE CONNECTION POINTS FOR VITAL CONTROL FUNCTIONS SUCH AS: SMOKE DETECTORS, PHASE MONITOR, GAS CONTROLLER, ECONOMIZER, THERMOSTAT, DDC CONTROL OPTIONS, AND LOW AND HIGH PRESSURE SWITCHES.
D. THE HEAT EXCHANGER SHALL BE CONTROLLED BY AN INTEGRATED GAS CONTROLLER (IGC) MICROPROCESSOR. SEE HEAT EXCHANGER SECTION OF THIS SPECIFICATION.
E. UNIT SHALL INCLUDE A MINIMUM OF ONE 8-PIN SCREW TERMINAL CONNECTION BOARD FOR CONNECTION OF CONTROL WIRING.
3.1. SAFETIES:
A. COMPRESSOR OVER-TEMPERATURE, OVER-CURRENT. HIGH INTERNAL PRESSURE DIFFERENTIAL.
B. LOW-PRESSURE SWITCH.
1. UNITS WITH 2 COMPRESSORS SHALL HAVE DIFFERENT SIZED CONNECTORS FOR THE CIRCUIT 1 AND CIRCUIT 2 LOW AND HIGH PRESSURE SWITCHES. THEY SHALL PHYSICALLY PREVENT THE CROSS-WIRING OF THE SAFETY SWITCHES BETWEEN CIRCUITS 1 AND 2.
2. LOW PRESSURE SWITCH SHALL USE DIFFERENT COLOR WIRE THAN THE HIGH PRESSURE SWITCH. THE PURPOSE IS TO ASSIST THE INSTALLER AND SERVICE TECHNICIAN TO CORRECTLY WIRE AND OR TROUBLESHOOT THE ROOFTOP UNIT.
C. HIGH-PRESSURE SWITCH.
1. UNITS WITH 2 COMPRESSORS SHALL HAVE DIFFERENT SIZED CONNECTORS FOR THE CIRCUIT 1 AND CIRCUIT 2 LOW AND HIGH PRESSURE SWITCHES. THEY SHALL PHYSICALLY PREVENT THE CROSS-WIRING OF THE SAFETY SWITCHES BETWEEN CIRCUITS 1 AND 2.
2. HIGH PRESSURE SWITCH SHALL USE DIFFERENT COLOR WIRE THAN THE LOW PRESSURE SWITCH. THE PURPOSE IS TO ASSIST THE INSTALLER AND SERVICE TECHNICIAN TO CORRECTLY WIRE AND OR TROUBLESHOOT THE ROOFTOP UNIT.
D. AUTOMATIC RESET, MOTOR THERMAL OVERLOAD PROTECTOR.
E. HEATING SECTION SHALL BE PROVIDED WITH THE FOLLOWING MINIMUM PROTECTIONS:
1. HIGH-TEMPERATURE LIMIT SWITCHES.
2. INDUCED DRAFT MOTOR SPEED SENSOR.
3. FLAME ROLLOUT SWITCH.
4. FLAME PROVING CONTROLS.
PART 4: SEQUENCE OF OPERATIONS FOR HVAC CONTROLS
DECENTRALIZED, ROOFTOP UNITS:
4.1. INSERT SEQUENCE OF OPERATION
A. SEE SQUENE OF OPERATION FOR RTU & RTU WITH ERV.
PART 5: PANEL AIR FILTERS
DECENTRALIZED, ROOFTOP UNITS:
5.1. STANDARD FILTER SECTION
A. SHALL CONSIST OF FACTORY-INSTALLED, LOW VELOCITY, DISPOSABLE 2-IN. THICK FIBERGLASS FILTERS OF COMMERCIALLY AVAILABLE SIZES.
B. UNIT SHALL USE ONLY ONE FILTER SIZE. MULTIPLE SIZES ARE NOT ACCEPTABLE.
C. FILTERS SHALL BE ACCESSIBLE THROUGH AN ACCESS PANEL WITH "NO-TOOL" REMOVAL AS DESCRIBED IN THE UNIT CABINET SECTION OF THIS SPECIFICATION.
PART 6: SELF-CONTAINED AIR CONDITIONERS
SMALL-CAPACITY SELF-CONTAINED AIR CONDITIONERS (48HC**04-14)
6.1. GENERAL
A. OUTDOOR, ROOFTOP MOUNTED, ELECTRICALLY CONTROLLED, HEATING AND COOLING UNIT UTILIZING A FULLY HERMETIC SCROLL COMPRESSOR(S) FOR COOLING DUTY AND GAS COMBUSTION FOR HEATING DUTY.
B. FACTORY ASSEMBLED, SINGLE-PIECE HEATING AND COOLING ROOFTOP UNIT. CONTAINED WITHIN THE UNIT ENCLOSURE SHALL BE ALL FACTORY WIRING, PIPING, CONTROLS, AND SPECIAL FEATURES REQUIRED PRIOR TO FIELD START-UP.
C. UNIT SHALL USE ENVIRONMENTALLY SOUND, PURONÃ REFRIGERANT.
D. UNIT SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
E. UNIT MUST BE SELECTED AND INSTALLED IN COMPLIANCE WITH LOCAL, STATE, AND FEDERAL CODES.
6.1. QUALITY ASSURANCE
A. UNIT MEETS ASHRAE 90.1 MINIMUM EFFICIENCY REQUIREMENTS.
B. 3-PHASE UNITS ARE ENERGY STAR CERTIFIED.
C. UNIT SHALL BE RATED IN ACCORDANCE WITH AHRI STANDARDS 340/360.
D. UNIT SHALL BE DESIGNED TO CONFORM TO ASHRAE 15- 2001.
E. UNIT SHALL BE UL-TESTED AND CERTIFIED IN ACCORDANCE WITH ANSI Z21.47 STANDARDS AND UL OR ETL-LISTED AND CERTIFIED UNDER CANADIAN STANDARDS AS A TOTAL PACKAGE FOR SAFETY REQUIREMENTS.
F. INSULATION AND ADHESIVE SHALL MEET NFPA 90A REQUIREMENTS FOR FLAME SPREAD AND SMOKE GENERATION.
G. UNIT CASING SHALL BE CAPABLE OF WITHSTANDING 500-HOUR SALT SPRAY EXPOSURE PER ASTM B117 (SCRIBED SPECIMEN).
H. UNIT CASING SHALL BE CAPABLE OF WITHSTANDING FEDERAL TEST METHOD STANDARD NO. 141 (METHOD 6061) 500-HOUR SALT SPRAY.
I. UNIT SHALL BE DESIGNED IN ACCORDANCE WITH ISO 9001, AND SHALL BE MANUFACTURED IN A FACILITY REGISTERED BY ISO 9001.
J. ROOF CURB SHALL BE DESIGNED TO CONFORM TO NRCA STANDARDS.
K. UNIT SHALL BE SUBJECTED TO A COMPLETELY AUTOMATED RUN TEST ON THE ASSEMBLY LINE. THE DATA FOR EACH UNIT WILL BE STORED AT THE FACTORY, AND MUST BE AVAILABLE UPON REQUEST.
L. UNIT SHALL BE DESIGNED IN ACCORDANCE WITH UL STANDARD 1995, INCLUDING TESTED TO WITHSTAND RAIN.
M. UNIT SHALL BE CONSTRUCTED TO PREVENT INTRUSION OF SNOW AND TESTED TO PREVENT SNOW INTRUSION INTO THE CONTROL BOX UP TO 40 MPH.
N. UNIT SHAKE TESTED TO ASSURANCE LEVEL 1, ASTM D4169 TO ENSURE SHIPPING RELIABILITY.
O. HIGH EFFICIENT MOTORS LISTED SHALL MEET SECTION 313 OF THE ENERGY INDEPENDENCE AND SECURITY ACT OF 2007 (EISA 2007).
6.1. DELIVERY, STORAGE, AND HANDLING
A. UNIT SHALL BE STORED AND HANDLED PER MANUFACTURER'S RECOMMENDATIONS.
B. LIFTED BY CRANE REQUIRES EITHER SHIPPING TOP PANEL OR SPREADER BARS.
C. UNIT SHALL ONLY BE STORED OR POSITIONED IN THE UPRIGHT POSITION.
6.1. PROJECT CONDITIONS
A. AS SPECIFIED IN THE CONTRACT.
6.1. OPERATING CHARACTERISTICS
A. UNIT SHALL BE CAPABLE OF STARTING AND RUNNING AT 125°F (52°C) AMBIENT OUTDOOR TEMPERATURE, MEETING MAXIMUM LOAD CRITERIA OF AHRI STANDARD 210/240 OR 340/360 AT ± 10% VOLTAGE.
B. COMPRESSOR WITH STANDARD CONTROLS SHALL BE CAPABLE OF OPERATION DOWN TO 35°F (2°C), AMBIENT OUTDOOR TEMPERATURES. ACCESSORY LOW AMBIENT KITS SHALL BE AVAILABLE IF OPERATION BELOW 35°F (2°C), IS REQUIRED. SEE BELOW FOR HEAD PRESSURE CONTROL PACKAGE OR WINTER START KIT.
C. UNIT SHALL DISCHARGE SUPPLY AIR VERTICALLY OR HORIZONTALLY AS SHOWN ON CONTRACT DRAWINGS.
D. UNIT SHALL BE FACTORY CONFIGURED FOR VERTICAL SUPPLY & RETURN CONFIGURATIONS.
E. UNIT SHALL BE FIELD CONVERTIBLE FROM VERTICAL TO HORIZONTAL AIRFLOW ON ALL MODELS, NO SPECIAL KIT REQUIRED.
F. UNIT SHALL BE CAPABLE OF MIXED OPERATION: VERTICAL SUPPLY WITH HORIZONTAL RETURN OR HORIZONTAL SUPPLY WITH VERTICAL RETURN.
6.1. ELECTRICAL REQUIREMENTS
A. MAIN POWER SUPPLY VOLTAGE, PHASE, AND FREQUENCY MUST MATCH THOSE REQUIRED BY THE MANUFACTURER.
6.1. UNIT CABINET
A. UNIT CABINET SHALL BE CONSTRUCTED OF GALVANIZED STEEL, AND SHALL BE BONDERIZED AND COATED WITH A PRE-PAINTED BAKED ENAMEL FINISH ON ALL EXTERNALLY EXPOSED SURFACES.
B. UNIT CABINET EXTERIOR PAINT SHALL BE: FILM THICKNESS, (DRY) 0.003 INCHES MINIMUM, GLOSS (PER ASTM D523, 60°F / 16°C): 60, HARDNESS: H-2H PENCIL HARDNESS.
C. EVAPORATOR FAN COMPARTMENT INTERIOR CABINET INSULATION SHALL CONFORM TO AHRI STANDARDS 340/360 MINIMUM EXTERIOR SWEAT CRITERIA. INTERIOR SURFACES SHALL BE INSULATED WITH A MINIMUM 1/2-IN. THICK, 1 LB DENSITY, FLEXIBLE FIBERGLASS INSULATION, NEOPRENE COATED ON THE AIR SIDE. ALUMINUM FOIL-FACED FIBERGLASS INSULATION SHALL BE USED IN THE GAS HEAT COMPARTMENT.
D. BASE OF UNIT SHALL HAVE A MINIMUM OF FOUR LOCATIONS FOR THRU-THE-BASE GAS AND ELECTRICAL CONNECTIONS (FACTORY INSTALLED OR FIELD INSTALLED), STANDARD.
E. BASE RAIL
1. UNIT SHALL HAVE BASE RAILS ON A MINIMUM OF 3 SIDES.
2. HOLES SHALL BE PROVIDED IN THE BASE RAILS FOR RIGGING SHACKLES TO FACILITATE MANEUVERING AND OVERHEAD RIGGING.
3. HOLES SHALL BE PROVIDED IN THE BASE RAIL FOR MOVING THE ROOFTOP BY FORK TRUCK.
4. BASE RAIL SHALL BE A MINIMUM OF 16 GAUGE THICKNESS.
F. CONDENSATE PAN AND CONNECTIONS:
1. SHALL BE AN INTERNALLY SLOPED CONDENSATE DRAIN PAN MADE OF A NON-CORROSIVE MATERIAL.
2. SHALL COMPLY WITH ASHRAE STANDARD 62.
3. SHALL USE A 3/4" -14 NPT DRAIN CONNECTION, POSSIBLE EITHER THROUGH THE BOTTOM OR SIDE OF THE DRAIN PAN. CONNECTION SHALL BE MADE PER MANUFACTURER'S RECOMMENDATIONS.
G. TOP PANEL:
1. SHALL BE A SINGLE PIECE TOP PANEL.
H. GAS CONNECTIONS:
1. ALL GAS PIPING CONNECTING TO UNIT GAS VALVE SHALL ENTER THE UNIT CABINET AT A SINGLE LOCATION ON SIDE OF UNIT (HORIZONTAL PLANE).
2. THRU-THE-BASE CAPABILITY
a. STANDARD UNIT SHALL HAVE A THRU-THE-BASE GAS-LINE LOCATION USING A RAISED, EMBOSSED PORTION OF THE UNIT BASEPAN.
b. OPTIONAL, FACTORY-APPROVED, WATER-TIGHT CONNECTION METHOD MUST BE USED FOR THRU-THE-BASE GAS CONNECTIONS.
c. NO BASEPAN PENETRATION, OTHER THAN THOSE AUTHORIZED BY THE MANUFACTURER, IS PERMITTED.
I. ELECTRICAL CONNECTIONS
1. ALL UNIT POWER WIRING SHALL ENTER UNIT CABINET AT A SINGLE, FACTORY-PREPARED, KNOCKOUT LOCATION.
2. THRU-THE-BASE CAPABILITY.
a. STANDARD UNIT SHALL HAVE A THRU-THE-BASE ELECTRICAL LOCATION (S) USING A RAISED, EMBOSSED PORTION OF THE UNIT BASEPAN.
b. OPTIONAL, FACTORY-APPROVED, WATER-TIGHT CONNECTION METHOD MUST BE USED FOR THRU-THE-BASE ELECTRICAL CONNECTIONS.
c. NO BASEPAN PENETRATION, OTHER THAN THOSE AUTHORIZED BY THE MANUFACTURER, IS PERMITTED.
J. COMPONENT ACCESS PANELS (STANDARD)
1. CABINET PANELS SHALL BE EASILY REMOVABLE FOR SERVICING.
2. UNIT SHALL HAVE ONE FACTORY INSTALLED, TOOL-LESS, REMOVABLE, FILTER ACCESS PANEL.
3. PANELS COVERING CONTROL BOX, INDOOR FAN, INDOOR FAN MOTOR, GAS COMPONENTS (WHERE APPLICABLE), AND COMPRESSORS SHALL HAVE A MOLDED COMPOSITE HANDLES.
4. HANDLES SHALL BE UV MODIFIED, COMPOSITE. THEY SHALL BE PERMANENTLY ATTACHED, AND RECESSED INTO THE PANEL.
5. SCREWS ON THE VERTICAL PORTION OF ALL REMOVABLE ACCESS PANEL SHALL ENGAGE INTO HEAT RESISTANT, MOLDED COMPOSITE COLLARS.
6. COLLARS SHALL BE REMOVABLE AND EASILY REPLACEABLE USING MANUFACTURER RECOMMENDED PARTS.
6.1. GAS HEAT
A. GENERAL
1. HEAT EXCHANGER SHALL BE AN INDUCED DRAFT DESIGN. POSITIVE PRESSURE HEAT EXCHANGER DESIGNS SHALL NOT BE ALLOWED.
2. SHALL INCORPORATE A DIRECT-SPARK IGNITION SYSTEM AND REDUNDANT MAIN GAS VALVE.
3. GAS SUPPLY PRESSURE AT THE INLET TO THE ROOFTOP UNIT GAS VALVE MUST MATCH THAT REQUIRED BY THE MANUFACTURER.
B. THE HEAT EXCHANGER SHALL BE CONTROLLED BY AN INTEGRATED GAS CONTROLLER (IGC) MICROPROCESSOR.
1. IGC BOARD SHALL NOTIFY USERS OF FAULT USING AN LED (LIGHT-EMITTING DIODE).
2. THE LED SHALL BE VISIBLE WITHOUT REMOVING THE CONTROL BOX ACCESS PANEL.
3. IGC BOARD SHALL CONTAIN ALGORITHMS THAT MODIFY EVAPORATOR-FAN OPERATION TO PREVENT FUTURE CYCLING ON HIGH TEMPERATURE LIMIT SWITCH.
4. UNIT SHALL BE EQUIPPED WITH ANTI-CYCLE PROTECTION WITH ONE SHORT CYCLE ON UNIT FLAME ROLLOUT SWITCH OR 4 CONTINUOUS SHORT CYCLES ON THE HIGH TEMPERATURE LIMIT SWITCH. FAULT INDICATION SHALL BE MADE USING AN LED.
C. STANDARD HEAT EXCHANGER CONSTRUCTION
1. HEAT EXCHANGER SHALL BE OF THE TUBULAR-SECTION TYPE CONSTRUCTED OF A MINIMUM OF 20-GAUGE STEEL COATED WITH A NOMINAL 1.2 MIL ALUMINUM-SILICONE ALLOY FOR CORROSION RESISTANCE.
2. BURNERS SHALL BE OF THE IN-SHOT TYPE CONSTRUCTED OF ALUMINUM-COATED STEEL.
3. BURNERS SHALL INCORPORATE ORIFICES FOR RATED HEAT OUTPUT UP TO 2000 FT (610M) ELEVATION. ADDITIONAL ACCESSORY KITS MAY BE REQUIRED FOR APPLICATIONS ABOVE 2000 FT (610M) ELEVATION, DEPENDING ON LOCAL GAS SUPPLY CONDITIONS.
4. EACH HEAT EXCHANGER TUBE SHALL CONTAIN MULTIPLE DIMPLES FOR INCREASED HEATING EFFECTIVENESS.
D. INDUCED DRAFT COMBUSTION MOTOR AND BLOWER
1. SHALL BE A DIRECT-DRIVE, SINGLE INLET, FORWARD-CURVED CENTRIFUGAL TYPE.
2. SHALL BE MADE FROM STEEL WITH A CORROSION-RESISTANT FINISH.
3. SHALL HAVE PERMANENTLY LUBRICATED SEALED BEARINGS.
4. SHALL HAVE INHERENT THERMAL OVERLOAD PROTECTION.
5. SHALL HAVE AN AUTOMATIC RESET FEATURE.
6.1. COILS
A. STANDARD ALUMINUM FIN/COPPER TUBE COILS:
1. STANDARD EVAPORATOR AND CONDENSER COILS SHALL HAVE ALUMINUM LANCED PLATE FINS MECHANICALLY BONDED TO SEAMLESS INTERNALLY GROOVED COPPER TUBES WITH ALL JOINTS BRAZED.
2. EVAPORATOR COILS SHALL BE LEAK TESTED TO 150 PSIG; PRESSURE TESTED TO 450 PSIG, AND QUALIFIED TO UL 1995 BURST TEST AT 1775 PSIG.
3. CONDENSER COILS SHALL BE LEAK TESTED TO 150 PSIG; PRESSURE TESTED TO 650 PSIG, AND QUALIFIED TO UL 1995 BURST TEST AT 1980 PSIG.
6.1. REFRIGERANT COMPONENTS
A. REFRIGERANT CIRCUIT SHALL INCLUDE THE FOLLOWING CONTROL, SAFETY, AND MAINTENANCE FEATURES:
1. THERMOSTATIC EXPANSION VALVE (TXV) SHALL HELP PROVIDE OPTIMUM PERFORMANCE ACROSS THE ENTIRE OPERATING RANGE. SHALL CONTAIN REMOVABLE POWER ELEMENT TO ALLOW CHANGE OUT OF POWER ELEMENT AND BULB WITHOUT REMOVING THE VALVE BODY.
2. REFRIGERANT FILTER DRIER – SOLID CORE DESIGN.
3. SERVICE GAUGE CONNECTIONS ON SUCTION AND DISCHARGE LINES.
4. PRESSURE GAUGE ACCESS THROUGH A SPECIALLY DESIGNED ACCESS PORT IN THE TOP PANEL OF THE UNIT.
B. THERE SHALL BE GAUGE LINE ACCESS PORT IN THE SKIN OF THE ROOFTOP, COVERED BY A BLACK, REMOVABLE PLUG.
1. THE PLUG SHALL BE EASY TO REMOVE AND REPLACE.
2. WHEN THE PLUG IS REMOVED, THE GAUGE ACCESS PORT SHALL ENABLE MAINTENANCE PERSONNEL TO ROUTE THEIR PRESSURE GAUGE LINES.
3. THIS GAUGE ACCESS PORT SHALL FACILITATE CORRECT AND ACCURATE CONDENSER PRESSURE READINGS BY ENABLING THE READING WITH THE COMPRESSOR ACCESS PANEL ON.
4. THE PLUG SHALL BE MADE OF A LEAK PROOF, UV-RESISTANT, COMPOSITE MATERIAL.
C. COMPRESSORS
1. UNIT SHALL USE FULLY HERMETIC, SCROLL COMPRESSOR FOR EACH INDEPENDENT REFRIGERATION CIRCUIT.
2. MODELS SHALL BE AVAILABLE WITH SINGLE COMPRESSOR/SINGLE STAGE COOLING DESIGNS ON 04 – 07 SIZES MODELS, AND 2 COMPRESSOR/2-STAGE COOLING MODELS ON 08 – 14 SIZES.
3. MODELS SHALL BE AVAILABLE WITH SINGLE COMPRESSOR/SINGLE STAGE COOLING DESIGNS ON 04 – 07 SIZES MODELS, AND 2 COMPRESSOR/2-STAGE COOLING MODELS ON 08 – 14 SIZES.
4. COMPRESSOR MOTORS SHALL BE COOLED BY REFRIGERANT GAS PASSING THROUGH MOTOR WINDINGS.
5. COMPRESSORS SHALL BE INTERNALLY PROTECTED FROM HIGH DISCHARGE TEMPERATURE CONDITIONS.
6. COMPRESSORS SHALL BE PROTECTED FROM AN OVER-TEMPERATURE AND OVER-AMPERAGE CONDITIONS BY AN INTERNAL, MOTOR OVERLOAD DEVICE.
7. COMPRESSOR SHALL BE FACTORY MOUNTED ON RUBBER GROMMETS.
8. COMPRESSOR MOTORS SHALL HAVE INTERNAL LINE BREAK THERMAL, CURRENT OVERLOAD AND HIGH PRESSURE DIFFERENTIAL PROTECTION.
9. CRANKCASE HEATERS SHALL NOT BE REQUIRED FOR NORMAL OPERATING RANGE, UNLESS PROVIDED BY THE FACTORY.
6.1. FILTER SECTION
A. FILTERS ACCESS IS SPECIFIED IN THE UNIT CABINET SECTION OF THIS SPECIFICATION.
B. FILTERS SHALL BE HELD IN PLACE BY A PIVOTING FILTER TRAY, FACILITATING EASY REMOVAL AND INSTALLATION.
C. SHALL CONSIST OF FACTORY-INSTALLED, LOW VELOCITY, THROW-AWAY 2-IN. THICK FIBERGLASS FILTERS.
D. FILTERS SHALL BE STANDARD, COMMERCIALLY AVAILABLE SIZES.
E. ONLY ONE SIZE FILTER PER UNIT IS ALLOWED.
6.1. EVAPORATOR FAN AND MOTOR
A. EVAPORATOR FAN MOTOR:
1. SHALL HAVE PERMANENTLY LUBRICATED BEARINGS.
2. SHALL HAVE INHERENT AUTOMATIC-RESET THERMAL OVERLOAD PROTECTION OR CIRCUIT BREAKER.
3. SHALL HAVE A MAXIMUM CONTINUOUS BHP RATING FOR CONTINUOUS DUTY OPERATION; NO SAFETY FACTORS ABOVE THAT RATING SHALL BE REQUIRED.
B. BELT-DRIVEN EVAPORATOR FAN:
1. BELT DRIVE SHALL INCLUDE AN ADJUSTABLE-PITCH MOTOR PULLEY.
2. SHALL USE SEALED, PERMANENTLY LUBRICATED BALL-BEARING TYPE.
3. BLOWER FAN SHALL BE DOUBLE-INLET TYPE WITH FORWARD-CURVED BLADES.
4. SHALL BE CONSTRUCTED FROM STEEL WITH A CORROSION RESISTANT FINISH AND DYNAMICALLY BALANCED.
6.1. CONDENSER FANS AND MOTORS
A. CONDENSER FAN MOTORS:
1. SHALL BE A TOTALLY ENCLOSED MOTOR.
2. SHALL USE PERMANENTLY LUBRICATED BEARINGS.
3. SHALL HAVE INHERENT THERMAL OVERLOAD PROTECTION WITH AN AUTOMATIC RESET FEATURE.
4. SHALL USE A SHAFT-DOWN DESIGN.
B. CONDENSER FANS:
1. SHALL BE A DIRECT-DRIVEN PROPELLER TYPE FAN.
2. SHALL HAVE GALVALUM BLADES RIVETED TO CORROSION-RESISTANT STEEL SPIDERS AND SHALL BE DYNAMICALLY BALANCED.
6.1. SPECIAL FEATURES OPTIONS AND ACCESSORIES
A. STAGED AIR VOLUME SYSTEM (SAV) FOR 2-STAGE COOLING MODELS ONLY:
1. EVAPORATOR FAN MOTOR:
a. SHALL HAVE PERMANENTLY LUBRICATED BEARINGS.
b. SHALL HAVE A MAXIMUM CONTINUOUS BHP RATING FOR CONTINUOUS DUTY OPERATION; NO SAFETY FACTORS ABOVE THAT RATING.
c. SHALL BE VARIABLE FREQUENCY DUTY AND 2-SPEED CONTROL.
d. SHALL CONTAIN MOTOR SHAFT GROUNDING RING TO PREVENT ELECTRICAL BEARING FLUTING DAMAGE BY SAFELY DIVERTING HARMFUL SHAFT VOLTAGES AND BEARING CURRENTS TO GROUND.
B. VARIABLE FREQUENCY DRIVE (VFD). ONLY AVAILABLE ON 2-SPEED INDOOR FAN MOTOR OPTION (SAV):
1. SHALL BE INSTALLED INSIDE THE UNIT CABINET, MOUNTED, WIRED AND TESTED.
2. SHALL CONTAIN ELECTROMAGNETIC INTERFERENCE (EMI) FREQUENCY PROTECTION.
3. INSULATED GATE BI-POLAR TRANSISTORS (IGBT) USED TO PRODUCE THE OUTPUT PULSE WIDTH MODULATED (PWM) WAVEFORM, ALLOWING FOR QUIET MOTOR OPERATION.
4. SELF-DIAGNOSTICS WITH FAULT AND POWER CODE LED INDICATOR. FIELD ACCESSORY DISPLAY KIT AVAILABLE FOR FURTHER DIAGNOSTICS AND SPECIAL SETUP APPLICATIONS.
5. RS485 CAPABILITY STANDARD.
6. ELECTRONIC THERMAL OVERLOAD PROTECTION.
7. 5% SWINGING CHOKES FOR HARMONIC REDUCTION AND IMPROVED POWER FACTOR.
8. ALL PRINTED CIRCUIT BOARDS SHALL BE CONFORMAL COATED.
C. STANDARD INTEGRATED ECONOMIZERS:
1. INTEGRATED, GEAR-DRIVEN OPPOSING MODULATING BLADE DESIGN TYPE CAPABLE OF SIMULTANEOUS ECONOMIZER AND COMPRESSOR OPERATION.
2. INDEPENDENT MODULES FOR VERTICAL OR HORIZONTAL RETURN CONFIGURATIONS SHALL BE AVAILABLE. VERTICAL RETURN MODULES SHALL BE AVAILABLE AS A FACTORY INSTALLED OPTION.
3. DAMPER BLADES SHALL BE GALVANIZED STEEL WITH COMPOSITE GEARS. PLASTIC OR COMPOSITE BLADES ON INTAKE OR RETURN SHALL NOT BE ACCEPTABLE.
4. SHALL INCLUDE ALL HARDWARE AND CONTROLS TO PROVIDE FREE COOLING WITH OUTDOOR AIR WHEN TEMPERATURE AND/OR HUMIDITY ARE BELOW SETPOINTS.
5. SHALL BE EQUIPPED WITH GEAR DRIVEN DAMPERS FOR BOTH THE OUTDOOR VENTILATION AIR AND THE RETURN AIR FOR POSITIVE AIR STREAM CONTROL.
6. STANDARD MODELS SHALL BE EQUIPPED WITH LOW-LEAKAGE DAMPERS, NOT TO EXCEED 2% LEAKAGE AT 1 IN. WG PRESSURE DIFFERENTIAL. ECONOMIZER CONTROLLER ON ELECTROMECHANICAL UNITS SHALL BE HONEYWELL W7212 THAT PROVIDES:
a. COMBINED MINIMUM AND DCV MAXIMUM DAMPER POSITION POTENTIOMETERS WITH COMPRESSOR STAGING RELAY.
b. FUNCTIONS WITH SOLID STATE ANALOG ENTHALPY OR DRY BULB CHANGEOVER CONTROL SENSING.
c. CONTAIN LED INDICATES FOR:
I) WHEN FREE COOLING IS AVAILABLE
II) WHEN MODULE IS IN DCV MODE
III) WHEN EXHAUST FAN CONTACT IS CLOSED
7. ULTRA LOW LEAK ECONOMI$ER X SYSTEM SHALL BE AVAILABLE ON MODELS WITH SAV 2-SPEED VARIABLE FREQUENCY DRIVE (VFD) SYSTEMS. ONLY AVAILABLE ON 2-SPEED INDOOR FAN MOTOR SYSTEMS WITH ELECTROMECHANICAL, COMFORTLINK OR RTU OPEN CONTROLS.
a. MAXIMUM DAMPER LEAKAGE RATE TO BE EQUAL TO OR LESS THAN 4.0 CFM/SQ. FT. AT 1.0 IN. W.G., MEETING OR EXCEEDING ASHRAE 90.1 REQUIREMENTS. ECONOMIZER CONTROLLER ON ELECTROMECHANICAL UNITS SHALL BE HONEYWELL W7220 THAT PROVIDES:
b. 2-LINE LCD INTERFACE SCREEN FOR SETUP, CONFIGURATION AND TROUBLESHOOTING
c. ON-BOARD FAULT DETECTION AND DIAGNOSTICS
d. SENSOR FAILURE LOSS OF COMMUNICATION IDENTIFICATION
e. AUTOMATIC SENSOR DETECTION
f. CAPABILITIES FOR USE WITH MULTIPLE-SPEED INDOOR FAN SYSTEMS
g. UTILIZE DIGITAL SENSORS: DRY BULB AND ENTHALPY
8. SHALL BE CAPABLE OF INTRODUCING UP TO 100% OUTDOOR AIR.
9. SHALL BE EQUIPPED WITH A BAROMETRIC RELIEF DAMPER CAPABLE OF RELIEVING UP TO 100% RETURN AIR.
10. SHALL BE DESIGNED TO CLOSE DAMPER(S) DURING LOSS-OF-POWER SITUATIONS WITH SPRING RETURN BUILT INTO MOTOR.
11. DRY BULB OUTDOOR AIR TEMPERATURE SENSOR SHALL BE PROVIDED AS STANDARD. OUTDOOR AIR SENSOR SETPOINT SHALL BE ADJUSTABLE AND SHALL RANGE FROM 40 TO 100°F / 4 TO 38°C. ADDITIONAL SENSOR OPTIONS SHALL BE AVAILABLE AS ACCESSORIES.
12. THE ECONOMIZER CONTROLLER SHALL ALSO PROVIDE CONTROL OF AN ACCESSORY POWER EXHAUST UNIT FUNCTION. FACTORY SET AT 100%, WITH A RANGE OF 0% TO 100%.
13. THE ECONOMIZER SHALL MAINTAIN MINIMUM AIRFLOW INTO THE BUILDING DURING OCCUPIED PERIOD AND PROVIDE DESIGN VENTILATION RATE FOR FULL OCCUPANCY. A REMOTE POTENTIOMETER MAY BE USED TO OVERRIDE THE DAMPER SETPOINT.
14. DAMPERS SHALL BE COMPLETELY CLOSED WHEN THE UNIT IS IN THE UNOCCUPIED MODE.
15. ECONOMIZER CONTROLLER SHALL ACCEPT A 2-10 VDC CO2 SENSOR INPUT FOR IAQ/DCV CONTROL. IN THIS MODE, DAMPERS SHALL MODULATE THE OUTDOOR AIR DAMPER TO PROVIDE VENTILATION BASED ON THE SENSOR INPUT.
16. COMPRESSOR LOCKOUT SENSOR SHALL OPEN AT 35°F (2°C) AND CLOSE CLOSES AT 50°F (10°C).
17. ACTUATOR SHALL BE DIRECT COUPLED TO ECONOMIZER GEAR. NO LINKAGE ARMS OR CONTROL RODS SHALL BE ACCEPTABLE.
18. ECONOMIZER CONTROLLER SHALL PROVIDE INDICATIONS WHEN IN FREE COOLING MODE, IN THE DCV MODE, OR THE EXHAUST FAN CONTACT IS CLOSED.
D. HACR BREAKER
1. THESE MANUAL RESET DEVICES PROVIDE OVERLOAD AND SHORT CIRCUIT PROTECTION FOR THE UNIT. FACTORY WIRED AND MOUNTED WITH THE UNITS, WITH ACCESS COVER TO HELP PROVIDE ENVIRONMENTAL PROTECTION. ON 575V APPLICATIONS, HACR BREAKER CAN ONLY BE USED WITH WYE POWER DISTRIBUTION SYSTEMS. USE ON DELTA POWER DISTRIBUTION SYSTEMS IS PROHIBITED.
E. CONVENIENCE OUTLET:
1. POWERED CONVENIENCE OUTLET:
a. OUTLET SHALL BE POWERED FROM MAIN LINE POWER TO THE ROOFTOP UNIT.
b. OUTLET SHALL BE POWERED FROM LINE SIDE OR LOAD SIDE OF DISCONNECT BY INSTALLING CONTRACTOR, AS REQUIRED BY CODE. IF OUTLET IS POWERED FROM LOAD SIDE OF DISCONNECT, UNIT ELECTRICAL RATINGS SHALL BE UL OR ETL CERTIFIED AND RATED FOR ADDITIONAL OUTLET AMPERAGE.
c. OUTLET SHALL BE FACTORY-INSTALLED AND INTERNALLY MOUNTED WITH EASILY ACCESSIBLE 115-V FEMALE RECEPTACLE.
d. OUTLET SHALL INCLUDE 15 AMP GFI RECEPTACLES WITH INDEPENDENT FUSE PROTECTION.
e. VOLTAGE REQUIRED TO OPERATE CONVENIENCE OUTLET SHALL BE PROVIDED BY A FACTORY-INSTALLED STEP-DOWN TRANSFORMER.
f. OUTLET SHALL BE ACCESSIBLE FROM OUTSIDE THE UNIT.
g. OUTLET SHALL INCLUDE A FIELD-INSTALLED "WET IN USE" COVER.
F. SMOKE DETECTORS:
1. SHALL BE A FOUR-WIRE CONTROLLER AND DETECTOR.
2. SHALL BE ENVIRONMENTAL COMPENSATED WITH DIFFERENTIAL SENSING FOR RELIABLE, STABLE, AND DRIFT-FREE SENSITIVITY.
3. SHALL USE MAGNET-ACTIVATED TEST/RESET SENSOR SWITCHES.
4. SHALL HAVE TOOL-LESS CONNECTION TERMINAL ACCESS.
5. SHALL HAVE A RECESSED MOMENTARY SWITCH FOR TESTING AND RESETTING THE DETECTOR.
6. CONTROLLER SHALL INCLUDE:
a. ONE SET OF NORMALLY OPEN ALARM INITIATION CONTACTS FOR CONNECTION TO AN INITIATING DEVICE CIRCUIT ON A FIRE ALARM CONTROL PANEL.
b. TWO FORM-C AUXILIARY ALARM RELAYS FOR INTERFACE WITH ROOFTOP UNIT OR OTHER EQUIPMENT.
c. ONE FORM-C SUPERVISION (TROUBLE) RELAY TO CONTROL THE OPERATION OF THE TROUBLE LED ON A REMOTE TEST/RESET STATION.
d. CAPABLE OF DIRECT CONNECTION TO TWO INDIVIDUAL DETECTOR MODULES.
e. CAN BE WIRED TO UP TO 14 OTHER DUCT SMOKE DETECTORS FOR MULTIPLE FAN SHUTDOWN APPLICATIONS

GUIDE SPECIFICATIONS

RTU CONTROL OPERATOR INTERFACE

1.1 BOOFOO

A. DESCRIPTION. THE CONTROL SYSTEM SHALL BE AS SHOWN AND CONSIST OF A HIGH-SPEED, PEER-TO-PEER NETWORK OF DDC CONTROLLERS AND A STANDALONE WEB SERVER OPERATOR INTERFACE. DEPICT EACH MECHANICAL SYSTEM AND BUILDING FLOOR PLAN BY A POINT-AND-CLICK GRAPHIC. A WEB SERVER SHALL GATHER DATA FROM THIS SYSTEM AND GENERATE WEB PAGES ACCESSIBLE THROUGH A CONVENTIONAL WEB BROWSER ON EACH PC CONNECTED TO THE NETWORK. OPERATORS SHALL BE ABLE TO PERFORM ALL NORMAL OPERATOR FUNCTIONS THROUGH THE WEB BROWSER INTERFACE. OPERATORS WITH SUFFICIENT ACCESS LEVEL SHALL HAVE AN ABILITY TO MAKE CHANGES TO ALL SYSTEM AND EQUIPMENT GRAPHICS IN THE WEB SERVER IN ADDITION TO HAVING FULL DDC SYSTEM ACCESS TO MAKE CONFIGURATION CHANGES TO THE CONTROL SYSTEM. ANY TOOLS REQUIRED FOR MAKING GRAPHIC CHANGES SHALL BE PROVIDED WITH WEB SERVER.

B. OPERATOR INTERFACE. FURNISH ONE WEB SERVER INTERFACE AS SHOWN ON THE SYSTEM DRAWINGS. OPERATORS SHALL BE ABLE TO ACCESS ALL NECESSARY OPERATIONAL INFORMATION IN THE DDC SYSTEM VIA CLIENT COMPUTER UTILIZING WEB BROWSER.
1. WEB SERVER SHALL CONNECT VIA THE LAN AND BE ABLE TO SIMULTANEOUSLY SERVE UP CONTROLLER INFORMATION TO MULTIPLE OPERATORS CONNECTED VIA LAN WITH WEB BROWSERS. EACH CLIENT WEB BROWSER CONNECTED TO SERVER SHALL BE ABLE TO ACCESS ALL SYSTEM INFORMATION.
2. WITH THE USE OF A REMOTE SMTP EMAIL SERVER THE OPERATORS INTERFACE WEB SERVER SHALL BE ABLE TO NOTIFY PERSONNEL OF AN ALARM OR RECORD INFORMATION ABOUT AN ALARM IN THE DDC SYSTEM.
3. SECONDARY INTERFACE, IN ADDITION TO THE PRIMARY OPERATOR INTERFACE, THE SYSTEM SHALL INCLUDE A SECONDARY INTERFACE COMPATIBLE WITH A LOCALLY AVAILABLE COMMERCIAL WIRELESS NETWORK AND VIEWABLE ON A COMMERCIALLY AVAILABLE WIRELESS DEVICE SUCH AS A WIRELESS ACCESS PROTOCOL (WAP) ENABLED CELLULAR TELEPHONE AND TABLET DEVICES. AS A MINIMUM, THE FOLLOWING CAPABILITIES SHALL BE PROVIDED THROUGH THIS INTERFACE:
a. SECONDARY INTERFACE WITH SCREEN RESOLUTION 1024X768 AND ABOVE SHALL BE ABLE TO PROVIDE A FULL GRAPHICAL ENVIRONMENT AS THE PRIMARY INTERFACE.
b. SECONDARY INTERFACE WITH SCREEN RESOLUTION LOWER THAN 1024X768 MAY BE TEXT-BASED AND SHALL PROVIDE A SUMMARY OF THE MOST IMPORTANT DATA. AS A MINIMUM, THE FOLLOWING CAPABILITIES SHALL BE PROVIDED THROUGH THIS INTERFACE:
1) AN OPERATOR AUTHENTICATION SYSTEM THAT REQUIRES AN OPERATOR TO LOG IN BEFORE VIEWING OR EDITING ANY DATA, AND WHICH CAN BE CONFIGURED TO LIMIT THE PRIVILEGES OF AN INDIVIDUAL OPERATOR.
2) THE ABILITY TO VIEW AND ACKNOWLEDGE ANY ALARM IN THE SYSTEM. ALARMS OR LINKS TO ALARMS SHALL BE PROVIDED ON A CONTIGUOUS LIST SO THE OPERATOR CAN QUICKLY VIEW ALL ALARMS.
3) A SUMMARY PAGE OR PAGES FOR EACH PIECE OF EQUIPMENT IN THE SYSTEM. THIS PAGE SHALL INCLUDE THE CURRENT VALUES OF ALL CRITICAL I/O POINTS AND SHALL ALLOW THE OPERATOR TO LOCK BINARY POINTS ON OR OFF AND TO LOCK ANALOG POINTS TO ANY VALUE WITHIN THEIR RANGE.
4) NAVIGATION LINKS THAT ALLOW THE OPERATOR TO QUICKLY NAVIGATE FROM THE HOME SCREEN TO ANY PIECE OF EQUIPMENT IN THE SYSTEM, AND THEN RETURN TO THE HOME SCREEN. THESE LINKS MAY BE ARRANGED IN A HIERARCHICAL FASHION, SUCH AS NAVIGATING FROM THE HOME SCREEN TO A PARTICULAR BUILDING, THEN TO A SPECIFIC FLOOR IN THE BUILDING, AND THEN TO A SPECIFIC ROOM OR PIECE OF EQUIPMENT.

C. WEB SERVER HARDWARE. FURNISH ONE WEB SERVER WITH ETHERNET PORT FOR LAN OR DIRECT OPERATOR CLIENT COMPUTER ACCESS. THE WEB SERVER SHALL BE CAPABLE OF COMMUNICATING TO THE PEER TO PEER DDC CONTROLLER NETWORK. ANY REQUIRED INSTALLATION OR COMMISSIONING SOFTWARE SHALL BE PRE-INSTALLED ON THE WEB SERVER. INSTALLATION OR COMMISSIONING OF THE WEB SERVER SHALL BE DONE THROUGH A CLIENT COMPUTER WITH A STANDARD WEB BROWSER.

D. COMMUNICATION. WEB SERVER OR WORKSTATION AND CONTROLLERS SHALL COMMUNICATE USING BACNET PROTOCOL. WEB SERVER OR WORKSTATION AND CONTROL NETWORK BACKBONE SHALL COMMUNICATE USING ISO 8802-3 (ETHERNET) DATA LINK/PHYSICAL LAYER PROTOCOL AND BACNET/IP ADDRESSING AS SPECIFIED IN ANSI/ASHRAE 135, BACNET ANNEX J.

E. OPERATOR FUNCTIONS. OPERATOR INTERFACE SHALL ALLOW EACH AUTHORIZED OPERATOR TO EXECUTE THE FOLLOWING FUNCTIONS AS A MINIMUM:
1. LOG IN AND LOG OUT. SYSTEM SHALL REQUIRE USER NAME AND PASSWORD TO LOG IN TO OPERATOR INTERFACE.
2. POINT-AND-CLICK NAVIGATION. OPERATOR INTERFACE SHALL BE GRAPHICALLY BASED AND SHALL ALLOW OPERATORS TO ACCESS GRAPHICS FOR EQUIPMENT AND GEOGRAPHIC AREAS USING POINT-AND-CLICK NAVIGATION.
3. VIEW AND ADJUST EQUIPMENT PROPERTIES. OPERATORS SHALL BE ABLE TO VIEW CONTROLLED EQUIPMENT STATUS AND TO ADJUST OPERATING PARAMETERS SUCH AS SET POINTS, PID GAINS, ON AND OFF CONTROLS, AND SENSOR CALIBRATION.
4. VIEW AND ADJUST OPERATING SCHEDULES. OPERATORS SHALL BE ABLE TO VIEW SCHEDULED OPERATING HOURS OF EACH SCHEDULABLE PIECE OF EQUIPMENT ON A WEEKLY OR MONTHLY CALENDAR-BASED GRAPHICAL SCHEDULE DISPLAY, TO SELECT AND ADJUST EACH SCHEDULE AND TIME PERIOD, AND TO SIMULTANEOUSLY SCHEDULE RELATED EQUIPMENT. SYSTEM SHALL CLEARLY SHOW EXCEPTION SCHEDULES AND HOLIDAYS ON THE SCHEDULE DISPLAY.
5. VIEW AND RESPOND TO ALARMS. OPERATORS SHALL BE ABLE TO VIEW A LIST OF CURRENTLY ACTIVE SYSTEM ALARMS, TO ACKNOWLEDGE EACH ALARM, AND TO CLEAR (DELETE) UNNEEDED ALARMS. REMOTE USERS SHALL BE ABLE TO RECEIVE ALARMS VIA EMAILS OR CELL PHONE TEXT MESSAGES.
6. VIEW AND CONFIGURE TRENDS. OPERATORS SHALL BE ABLE TO VIEW A TREND GRAPH OF EACH TRENDED POINT AND TO EDIT GRAPH CONFIGURATION TO DISPLAY A SPECIFIC TIME PERIOD OR DATA RANGE. OPERATOR SHALL BE ABLE TO CREATE CUSTOM TREND GRAPHS TO DISPLAY ON THE SAME PAGE DATA FROM MULTIPLE TRENDED POINTS.
7. VIEW AND CONFIGURE REPORTS. OPERATORS SHALL BE ABLE TO RUN PRECONFIGURED REPORTS, TO VIEW REPORT RESULTS, AND TO CUSTOMIZE REPORT CONFIGURATION TO SHOW DATA OF INTEREST.
8. MANAGE CONTROL SYSTEM HARDWARE. OPERATORS SHALL BE ABLE TO VIEW CONTROLLER STATUS, TO RESTART (REBOOT) EACH CONTROLLER, AND TO DOWNLOAD NEW CONTROL SOFTWARE TO EACH CONTROLLER.
9. MANAGE OPERATOR ACCESS. TYPICALLY, ONLY A FEW OPERATORS ARE AUTHORIZED TO MANAGE OPERATOR ACCESS. AUTHORIZED OPERATORS SHALL BE ABLE TO VIEW A LIST OF OPERATORS WITH SYSTEM ACCESS AND OF FUNCTIONS THEY CAN PERFORM WHILE LOGGED IN. OPERATORS SHALL BE ABLE TO ADD OPERATORS, TO DELETE OPERATORS, AND TO EDIT OPERATOR FUNCTION AUTHORIZATION. OPERATOR SHALL BE ABLE TO AUTHORIZE EACH OPERATOR FUNCTION SEPARATELY.

F. SYSTEM SOFTWARE.
1. OPERATING SYSTEM AND REQUIRED SOFTWARE. WEB SERVER OPERATOR INTERFACE SHALL BE A SELF-CONTAINED WEB SERVER WITHOUT THE NEED FOR ANY TYPE OF MAINTENANCE.
2. SYSTEM GRAPHICS. OPERATOR INTERFACE SHALL BE GRAPHICAL AND SHALL INCLUDE AT LEAST ONE GRAPHIC PER PIECE OF EQUIPMENT OR OCCUPIED ZONE, GRAPHICS FOR EACH CHILLED WATER AND HOT WATER SYSTEM, AND GRAPHICS THAT SUMMARIZE CONDITIONS ON EACH FLOOR OF EACH BUILDING INCLUDED IN THIS CONTRACT. INDICATE THERMAL COMFORT ON FLOOR PLAN SUMMARY GRAPHICS USING DYNAMIC COLORS TO REPRESENT ZONE TEMPERATURE RELATIVE TO ZONE SETPOINT.
a. FUNCTIONALITY. GRAPHICS SHALL ALLOW OPERATOR TO MONITOR SYSTEM STATUS, TO VIEW A SUMMARY OF THE MOST IMPORTANT DATA FOR EACH CONTROLLED ZONE OR PIECE OF EQUIPMENT, TO USE POINT-AND-CLICK NAVIGATION BETWEEN ZONES OR EQUIPMENT, AND TO EDIT SETPOINTS AND OTHER SPECIFIED PARAMETERS.
b. ANIMATION. GRAPHICS SHALL BE ABLE TO ANIMATE BY DISPLAYING DIFFERENT IMAGE FILES FOR CHANGED OBJECT STATUS.
c. ALARM INDICATION. INDICATE AREAS OR EQUIPMENT IN AN ALARM CONDITION USING COLOR OR OTHER VISUAL INDICATOR.
d. FORMAT. GRAPHICS SHALL BE SAVED IN AN INDUSTRY-STANDARD FORMAT SUCH AS BMP, JPEG, PNG, OR GIF. WEB-BASED SYSTEM GRAPHICS SHALL BE VIEWABLE ON BROWSERS COMPATIBLE WITH WORLD WIDE WEB CONSORTIUM BROWSER STANDARDS. WEB GRAPHIC FORMAT SHALL REQUIRE NO PLUG-IN (SUCH AS HTML AND JAVASCRIPT) OR SHALL ONLY REQUIRE WIDELY AVAILABLE NO-COST PLUG-INS.

G. SYSTEM TOOLS. SYSTEM SHALL PROVIDE THE FOLLOWING FUNCTIONALITY TO AUTHORIZED OPERATORS AS AN INTEGRAL PART OF THE OPERATOR INTERFACE OR AS STAND-ALONE SOFTWARE PROGRAMS. IF FURNISHED AS PART OF THE INTERFACE, THE TOOL SHALL BE AVAILABLE FROM EACH WORKSTATION OR WEB BROWSER INTERFACE. IF FURNISHED AS A STAND-ALONE PROGRAM, SOFTWARE SHALL BE INSTALLABLE ON STANDARD WINDOWS COMPATIBLE PCS WITH NO LIMIT ON THE NUMBER OF COPIES THAT CAN BE INSTALLED UNDER THE SYSTEM LICENSE.
1. AUTOMATIC SYSTEM DATABASE CONFIGURATION. EACH WEB SERVER SHALL STORE INTERNALLY STORE A COPY OF THE CURRENT SYSTEM DATABASE, INCLUDING CONTROLLER FIRMWARE AND SOFTWARE. STORED DATABASE SHALL BE AUTOMATICALLY UPDATED WITH EACH SYSTEM CONFIGURATION OR CONTROLLER FIRMWARE OR SOFTWARE CHANGE.
2. CONTROLLER MEMORY DOWNLOAD. OPERATORS SHALL BE ABLE TO DOWNLOAD MEMORY FROM THE SYSTEM DATABASE TO EACH CONTROLLER.
3. SYSTEM CONFIGURATION. OPERATORS SHALL BE ABLE TO CONFIGURE THE SYSTEM.
4. ONLINE HELP. CONTEXT-SENSITIVE ONLINE HELP FOR EACH TOOL SHALL ASSIST OPERATORS IN OPERATING AND EDITING THE SYSTEM.
5. SECURITY. SYSTEM SHALL REQUIRE A USER NAME AND PASSWORD TO VIEW, EDIT, ADD, OR DELETE DATA.
a. OPERATOR ACCESS. EACH USER NAME AND PASSWORD COMBINATION SHALL DEFINE ACCESSIBLE VIEWING, EDITING, ADDING, AND DELETING FUNCTIONS IN EACH SYSTEM APPLICATION, EDITOR, AND OBJECT.
b. AUTOMATIC LOG OUT. AUTOMATICALLY LOG OUT EACH OPERATOR IF NO KEYBOARD OR MOUSE ACTIVITY IS DETECTED. OPERATORS SHALL BE ABLE TO ADJUST AUTOMATIC LOG OUT DELAY.
c. ENCRYPTED SECURITY DATA. STORE SYSTEM SECURITY DATA INCLUDING OPERATOR PASSWORDS IN AN ENCRYPTED FORMAT. SYSTEM SHALL NOT DISPLAY OPERATOR PASSWORDS.
6. SYSTEM DIAGNOSTICS. SYSTEM SHALL AUTOMATICALLY MONITOR CONTROLLER AND I/O POINT OPERATION. SYSTEM SHALL ANNUNCIATE CONTROLLER FAILURE AND I/O POINT LOCKING (MANUAL OVERRIDING TO A FIXED VALUE).
7. ALARM PROCESSING. SYSTEM INPUT AND STATUS OBJECTS SHALL BE CONFIGURABLE TO ALARM ON DEPARTING FROM AND ON RETURNING TO NORMAL STATE. OPERATOR SHALL BE ABLE TO ENABLE OR DISABLE EACH ALARM AND TO CONFIGURE ALARM LIMITS, ALARM LIMIT DIFFERENTIALS, ALARM STATES, AND ALARM REACTIONS FOR EACH SYSTEM OBJECT. CONFIGURE AND ENABLE ALARM POINTS AS SPECIFIED IN POINTS LIST. ALARMS SHALL BE BACNET ALARM OBJECTS AND SHALL USE BACNET ALARM SERVICES.
8. ALARM MESSAGES. ALARM MESSAGES SHALL USE AN ENGLISH LANGUAGE DESCRIPTOR WITHOUT ACRONYMS OR MNEMONICS TO DESCRIBE ALARM SOURCE, LOCATION, AND NATURE.
9. ALARM REACTIONS. OPERATOR SHALL BE ABLE TO CONFIGURE (BY OBJECT) ACTIONS WORKSTATION OR WEB SERVER SHALL INITIATE ON RECEIPT OF EACH ALARM. AS A MINIMUM, WORKSTATION OR WEB SERVER SHALL BE ABLE TO LOG, PRINT, START PROGRAMS, DISPLAY MESSAGES, SEND E-MAIL, SEND PAGE, AND AUDIBLY ANNUNCIATE.
10. ALARM MAINTENANCE. OPERATORS SHALL BE ABLE TO VIEW SYSTEM ALARMS AND CHANGES OF STATE CHRONOLOGICALLY, TO ACKNOWLEDGE AND DELETE ALARMS, AND TO ARCHIVE CLOSED ALARMS TO THE WORKSTATION OR WEB SERVER FROM EACH WORKSTATION OR WEB BROWSER INTERFACE.
11. TREND CONFIGURATION. OPERATOR SHALL BE ABLE TO CONFIGURE TREND SAMPLE OR CHANGE OF VALUE (COV) INTERVAL, START TIME, AND STOP TIME FOR EACH SYSTEM DATA OBJECT AND SHALL BE ABLE TO RETRIEVE DATA FOR USE IN SPREADSHEETS AND STANDARD DATABASE PROGRAMS. CONTROLLER SHALL SAMPLE AND STORE TREND DATA AND SHALL BE ABLE TO ARCHIVE DATA TO THE HARD DISK. CONFIGURE TRENDS AS SPECIFIED IN POINTS LIST. TRENDS SHALL BE BACNET TREND OBJECTS.
12. OBJECT AND PROPERTY STATUS AND CONTROL. OPERATOR SHALL BE ABLE TO VIEW, AND TO EDIT IF APPLICABLE, THE STATUS OF EACH SYSTEM OBJECT AND PROPERTY BY MENU, ON GRAPHICS.
13. REPORTS AND LOGS. OPERATOR SHALL BE ABLE TO SELECT, TO MODIFY, TO CREATE, AND TO PRINT REPORTS AND LOGS. OPERATOR SHALL BE ABLE TO STORE REPORT DATA IN A FORMAT ACCESSIBLE BY STANDARD SPREADSHEET AND WORD PROCESSING PROGRAMS.
a. STANDARD REPORTS. FURNISH THE FOLLOWING STANDARD SYSTEM REPORTS:
1) REPORTS SHALL BE FILTERED BASED UPON THE SELECTED EQUIPMENT
2) ALARM REPORTS
a) ALARM SUMMARY – CURRENT ALARMS
b) ALARM SOURCES – LIST OF EQUIPMENT AND ASSOCIATED ALARM CONDITIONS
c) ALARM ACTIONS – CONFIGURED ALARM ACTIONS SUCH AS E-MAIL AND ALARM POP-UP
3) SCHEDULE REPORTS
a) EFFECTIVE SCHEDULES – DISPLAYS EFFECTIVE SCHEDULES FOR EACH EQUIPMENT
b) SCHEDULE INSTANCES – DISPLAYS ALL SCHEDULES ENTERED
4) SECURITY REPORTS – MAINTAINS AUDIT OF ALL ACTIONS TAKEN THROUGH USER INTERFACE
5) COMMISSIONING REPORTS – PROVIDE EQUIPMENT CHECKOUT STATUS AND NOTES
6) EQUIPMENT REPORTS – PROVIDE REPORTS SHOWING TRENDED POINTS AND AVAILABLE NETWORK POINTS
b. CUSTOM REPORTS. OPERATOR SHALL BE ABLE TO CREATE CUSTOM REPORTS THAT RETRIEVE DATA, INCLUDING ARCHIVED TREND DATA, FROM THE SYSTEM, THAT ANALYZE DATA USING COMMON ALGEBRAIC CALCULATIONS, AND THAT PRESENT RESULTS IN TABULAR OR GRAPHICAL FORMAT. REPORTS SHALL BE LAUNCHED FROM THE OPERATOR INTERFACE.
14. GRAPHICS GENERATION. GRAPHICALLY BASED TOOLS AND DOCUMENTATION SHALL ALLOW OPERATOR TO EDIT SYSTEM GRAPHICS, TO CREATE GRAPHICS, AND TO INTEGRATE GRAPHICS INTO THE SYSTEM. OPERATOR SHALL BE ABLE TO ADD ANALOG AND BINARY VALUES, DYNAMIC TEXT, STATIC TEXT, AND ANIMATION FILES TO A BACKGROUND GRAPHIC USING A MOUSE.
15. GRAPHICS LIBRARY. COMPLETE LIBRARY OF STANDARD HVAC EQUIPMENT GRAPHICS SHALL INCLUDE EQUIPMENT SUCH AS CHILLERS, BOILERS, AIR HANDLERS, TERMINALS, FAN COILS, AND UNIT VENTILATORS. LIBRARY SHALL INCLUDE STANDARD SYMBOLS FOR OTHER EQUIPMENT INCLUDING FANS, PUMPS, COILS, VALVES, PIPING, DAMPERS, AND DUCTWORK. LIBRARY GRAPHIC FILE FORMAT SHALL BE COMPATIBLE WITH GRAPHICS GENERATION TOOLS.

H. PORTABLE OPERATOR'S TERMINAL. PROVIDE ALL NECESSARY SOFTWARE TO CONFIGURE AN IBM-COMPATIBLE LAPTOP COMPUTER FOR USE AS A PORTABLE OPERATOR'S TERMINAL. OPERATOR SHALL BE ABLE TO CONNECT CONFIGURED TERMINAL TO THE SYSTEM NETWORK OR DIRECTLY TO EACH CONTROLLER FOR PROGRAMMING, SETTING UP, AND TROUBLESHOOTING.

I. CCN (CARRIER COMFORT NETWORK) COMMUNICATION. WEB SERVER OR WORKSTATION SHALL ALSO SUPPORT COMMUNICATION USING CCN PROTOCOL.

J. TIMED OVERRIDE REPORTING (I-VU PLUS OR PRO ONLY)
1. THE DDC SYSTEM SHALL TRACK ALL PUSH BUTTON TIMED OVERRIDE EVENTS DURING UNOCCUPIED PERIODS. THE SYSTEM SHALL STORE TIME OF THE OVERRIDE EVENT AND TIME DURATION FOR EACH OVERRIDE EVENT.
2. WEB SERVER SHALL ALLOW OPERATORS TO CREATE CUSTOM REPORTS DETAILING TIMED OVERRIDE EVENTS. TIMED OVERRIDE REPORTS SHALL ALLOW THE FOLLOWING OPTIONS:
3. MINIMUM BILLING TIME. A MINIMUM AMOUNT OF TIME THAT EACH OVERRIDE EVENT WILL LAST.
4. BILLING RATE. A MONETARY RATE PER HOUR OR PER MINUTE OF THE OVERRIDE DURATION.
5. EXEMPTION TIMES. A DEFINED BLOCK OF TIME DURING EACH WEEK THAT IS EXEMPT FROM DETECTING OVERRIDE EVENTS.
6. ALLOWANCES. A DOLLAR AMOUNT OF OVERRIDE USAGE THAT IS ALLOWED PER TENANT AND IS GIVEN AT NO CHARGE. THIS ALLOWANCE WILL BE SUBTRACTED FROM THE TENANT'S TOTAL OVERRIDE USAGE.

K. WEB SERVICES DATA EXCHANGE (I-VU PLUS OR PRO ONLY)
SYSTEM SHALL SUPPORT WEB SERVICES DATA EXCHANGE WITH ANY OTHER SYSTEM THAT COMPLIES WITH XML (EXTENSIBLE MARKUP LANGUAGE) AND SOAP (SIMPLE OBJECT ACCESS PROTOCOL) STANDARDS SPECIFIED BY THE WEB SERVICES INTEROPERABILITY ORGANIZATION (WS-I) BASIC PROFILE 1.0 OR HIGHER. WEB SERVICES SUPPORT SHALL AS A MINIMUM BE PROVIDED AT THE WORKSTATION OR WEB SERVER LEVEL AND SHALL ENABLE DATA TO BE READ FROM OR WRITTEN TO THE DDC SYSTEM.
1. SYSTEM SHALL SUPPORT WEB SERVICES READ DATA REQUESTS BY RETRIEVING REQUESTED TREND DATA OR POINT VALUES (I/O HARDWARE POINTS, ANALOG VALUE SOFTWARE POINTS, OR BINARY VALUE SOFTWARE POINTS) FROM ANY SYSTEM CONTROLLER OR FROM THE TREND HISTORY DATABASE.
2. SYSTEM SHALL SUPPORT WEB SERVICES WRITE DATA REQUEST TO EACH ANALOG AND BINARY OBJECT THAT CAN BE EDITED THROUGH THE SYSTEM OPERATOR INTERFACE BY DOWNLOADING A NUMERIC VALUE TO THE SPECIFIED OBJECT.
3. FOR READ OR WRITE REQUESTS, THE SYSTEM SHALL REQUIRE USER NAME AND PASSWORD AUTHENTICATION AND SHALL SUPPORT SSL (SECURE SOCKET LAYER) OR EQUIVALENT DATA ENCRYPTION.
4. SYSTEM SHALL SUPPORT DISCOVERY THROUGH A WEB SERVICES CONNECTION OR SHALL PROVIDE A TOOL AVAILABLE THROUGH THE OPERATOR INTERFACE THAT WILL REVEAL THE PATH/IDENTIFIER NEEDED TO ALLOW A THIRD PARTY WEB SERVICES DEVICE TO READ DATA FROM OR WRITE DATA TO ANY OBJECT IN THE SYSTEM WHICH SUPPORTS THIS SERVICE.

L. OPEN PROTOCOL COMMUNICATIONS (I-VU PLUS OR PRO ONLY)
DDC SYSTEM SHALL ALLOW COMMUNICATION TO ANCILLARY SYSTEMS OR CONTROLLERS, SUCH AS LIGHTING SYSTEM OR VFD CONTROLLERS THAT UTILIZE BACNET, MODBUS, OR LONWORKS COMMUNICATION PROTOCOLS. THE QUANTITY OF DATA POINTS AVAILABLE PER PROTOCOL SHALL BE BASED UPON SYSTEM MEMORY AND CAPACITY AND WILL NOT REQUIRE THE PURCHASE OF ADDITIONAL LICENSES OR FEES.
1. BACNET COMMUNICATION
a. DDC SYSTEM SHALL SUPPORT BACNET/IP ADDRESSING AS SPECIFIED IN ASHRAE/ANSI 135, BACNET ANNEX J USING ISO 8802-3 (ETHERNET) DATA LINK/PHYSICAL LAYER PROTOCOL.
b. DDC SYSTEM SHALL SUPPORT BACNET MS/TP COMMUNICATIONS USING EIA-485 TWISTED PAIR TOPOLOGY RUNNING AT 9600, 19200, 38400, AND 76800 BAUD.
2. MODBUS COMMUNICATION
a. DDC SYSTEM SHALL SUPPORT MODBUS RTU/ASCII COMMUNICATIONS OVER EIA-485/EIA-232 TYPE NETWORK AT 9600, 19200, 38400, AND 76800 BAUD.
b. DDC SYSTEM SHALL SUPPORT MODBUS TCP/IP COMMUNICATIONS OVER ISO 8802-3 (ETHERNET) DATA LINK/PHYSICAL LAYER PROTOCOL.
3. LONWORKS COMMUNICATION
a. DDC SYSTEM SHALL SUPPORT LONWORKS COMMUNICATION UTILIZING ANSI/EIA-709.1 COMMUNICATIONS OVER FT-10A NETWORK.
b. COMMUNICATION BETWEEN DEVICES SHALL BE VIA STANDARD NETWORK VARIABLE TYPES (SNVTS)

RTU SEQUENCE OF OPERATIONS

BUILDING AUTOMATION SYSTEM INTERFACE (AS APPLICABLE):

THE BUILDING AUTOMATION SYSTEM (BAS) SHALL SEND THE CONTROLLER OCCUPIED / UNOCCUPIED AND HEAT / COOL MODES. IF A BAS IS NOT PRESENT, OR COMMUNICATION IS LOST WITH THE BAS THE CONTROLLER SHALL OPERATE USING DEFAULT MODES AND SETPOINTS.

OCCUPIED MODE:

DURING OCCUPIED PERIODS, THE SUPPLY FAN SHALL RUN CONTINUOUSLY AND THE OUTSIDE AIR DAMPER SHALL OPEN TO MAINTAIN MINIMUM VENTILATION REQUIREMENTS. THE DX COOLING AND GAS HEAT SHALL STAGE TO MAINTAIN THE OCCUPIED SPACE TEMPERATURE SETPOINT. IF ECONOMIZING IS ENABLED THE OUTSIDE AIR DAMPER SHALL MODULATE TO MAINTAIN THE OCCUPIED SPACE TEMPERATURE SETPOINT.

UNOCCUPIED MODE:

WHEN THE SPACE TEMPERATURE IS BELOW THE UNOCCUPIED HEATING SETPOINT OF 60.0 DEG. F (ADJ.) THE SUPPLY FAN SHALL START, THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED AND THE GAS HEAT SHALL BE ENABLED. WHEN THE SPACE TEMPERATURE RISES ABOVE THE UNOCCUPIED HEATING SETPOINT OF 60.0 DEG. F (ADJ.) PLUS THE UNOCCUPIED DIFFERENTIAL OF 4.0 DEG. F (ADJ.) THE SUPPLY FAN SHALL STOP AND THE GAS HEAT SHALL BE DISABLED.

WHEN THE SPACE TEMPERATURE IS ABOVE THE UNOCCUPIED COOLING SETPOINT OF 85.0 DEG. F (ADJ.) THE SUPPLY FAN SHALL START, THE OUTSIDE AIR DAMPER SHALL OPEN IF ECONOMIZING IS ENABLED AND REMAIN CLOSED IF ECONOMIZING IS DISABLED AND THE DX COOLING SHALL BE ENABLED. WHEN THE SPACE TEMPERATURE FALLS BELOW THE UNOCCUPIED COOLING SETPOINT OF 85.0 DEG. F (ADJ.) MINUS THE UNOCCUPIED DIFFERENTIAL OF 4.0 DEG. F (ADJ.) THE SUPPLY FAN SHALL STOP, THE DX COOLING SHALL BE DISABLED AND THE OUTSIDE AIR DAMPER SHALL CLOSE.

UNOCCUPIED MODE (RTU-5 ONLY):

DURING UNOCCUPIED PERIODS, THE SUPPLY FAN SHALL RUN CONTINUOUSLY AND THE OUTSIDE AIR DAMPER SHALL OPEN TO MAINTAIN MINIMUM VENTILATION REQUIREMENTS. THE DX COOLING AND GAS HEAT SHALL STAGE TO MAINTAIN THE SPACE TEMPERATURE SETPOINT. IF ECONOMIZING IS ENABLED THE OUTSIDE AIR DAMPER SHALL MODULATE TO MAINTAIN THE SPACE TEMPERATURE SETPOINT.

COOLING MODE:

THE UNIT CONTROLLER SHALL USE SPACE TEMPERATURE AND SPACE TEMPERATURE SETPOINT TO DETERMINE WHEN TO INITIATE REQUESTS FOR COOLING. WHEN THE SPACE TEMPERATURE RISES ABOVE THE SETPOINT, THE UNIT CONTROLLER SHALL MODULATE THE ECONOMIZER OR STAGE THE DX COOLING AS REQUIRED TO MAINTAIN THE SPACE TEMPERATURE SETPOINT. THE FIRST COMPRESSOR SHALL ENERGIZE AFTER ITS MINIMUM 3-MINUTE OFF TIME HAS EXPIRED. IF ADDITIONAL COOLING CAPACITY IS REQUIRED THE SECOND STAGE OF COOLING SHALL BE ENABLED. ONCE THE SPACE TEMPERATURE FALLS BELOW THE SETPOINT THE COMPRESSORS SHALL BE DEACTIVATED AND THE ECONOMIZER SHALL RETURN TO MINIMUM POSITION.

HEATING MODE:

THE UNIT CONTROLLER SHALL USE THE SPACE TEMPERATURE AND SPACE TEMPERATURE SETPOINT TO DETERMINE WHEN TO INITIATE REQUESTS FOR HEAT. WHEN THE SPACE TEMPERATURE DROPS BELOW THE SETPOINT, THE UNIT CONTROLLER SHALL ENABLE GAS HEATING STAGES TO MAINTAIN THE SPACE TEMPERATURE SETPOINT. ONCE THE SPACE TEMPERATURE RISES ABOVE THE SETPOINT THE GAS HEATING STAGES SHALL BE DISABLED.

DEHUMIDIFICATION (RTU ONLY):

FACTORY INSTALLED HOT GAS REHEAT SHALL ALLOW APPLICATION OF DEHUMIDIFICATION. DEHUMIDIFICATION SHALL BE ALLOWED ONLY WHEN THE OUTSIDE AIR TEMPERATURE IS ABOVE 40.0 DEG. F AND BELOW 100.0 DEG. F. THE ECONOMIZER OUTSIDE AIR DAMPER SHALL DRIVE TO MINIMUM POSITION DURING DEHUMIDIFICATION.

SINGLE COMPRESSOR UNITS;

ON A CALL FOR DEHUMIDIFICATION, THE REHEAT VALVE SHALL ENERGIZE AND THE COMPRESSOR SHALL ENABLE. WHEN THE HUMIDITY CONTROL SETPOINT IS SATISFIED, THE VALVE SHALL BE DE-ENERGIZED AND THE COMPRESSOR SHALL BE DISABLED. IF THERE IS A CALL FOR COOLING FROM THE SPACE TEMPERATURE CONTROLLER, WHILE IN REHEAT, THE REHEAT VALVE SHALL BE DE-ENERGIZED AND THE COMPRESSOR SHALL CONTINUE TO RUN.

DUAL COMPRESSOR UNITS:

ON A CALL FOR DEHUMIDIFICATION, THE REHEAT VALVE SHALL ENERGIZE AND BOTH COMPRESSORS SHALL ENABLE. WHEN THE HUMIDITY CONTROL SETPOINT IS SATISFIED, THE VALVE SHALL BE DE-ENERGIZED AND BOTH COMPRESSORS SHALL BE DISABLED. IF THERE IS A CALL FOR 1ST STAGE COOLING WHILE IN THE DEHUMIDIFICATION MODE, NO ACTION SHALL TAKE PLACE. IF THERE IS A CALL FOR 2ND STAGE COOLING, THE REHEAT VALVE SHALL BE DE-ENERGIZED, AND THE UNIT SHALL REVERT TO THE COOLING MODE. IF 2ND STAGE COOLING IS SATISFIED AND THERE IS STILL A CALL FOR DEHUMIDIFICATION, THE REHEAT VALVE SHALL ONCE AGAIN BE ENERGIZED.

ECONOMIZER (RTU ONLY):

THE MIXED AIR SENSOR SHALL MEASURE THE DRY BULB TEMPERATURE OF THE AIR LEAVING THE EVAPORATOR COIL WHILE ECONOMIZING. WHEN ECONOMIZING IS ENABLED AND THE UNIT IS OPERATING IN THE COOLING MODE, THE ECONOMIZER DAMPER SHALL BE MODULATED BETWEEN ITS MINIMUM POSITION AND 100% TO MAINTAIN THE SPACE TEMPERATURE SETPOINT. THE ECONOMIZER DAMPER SHALL MODULATE TOWARD MINIMUM POSITION IN THE EVENT THE MIXED AIR TEMPERATURE FALLS BELOW THE LOW LIMIT TEMPERATURE SETTING. COMPRESSORS SHALL BE DELAYED FROM OPERATING UNTIL THE ECONOMIZER HAS OPENED TO 100%.

COMPARATIVE ENTHALPY:

OUTSIDE AIR (OA) ENTHALPY SHALL BE COMPARED WITH RETURN AIR (RA) ENTHALPY POINT. THE ECONOMIZER SHALL ENABLE WHEN OA ENTHALPY IS LESS THAN RA ENTHALPY – 3.0 BTU/LB. THE ECONOMIZER SHALL DISABLE WHEN OA ENTHALPY IS GREATER THAN RA ENTHALPY.

VENTILATION:

THE OUTDOOR AIR DAMPER SHALL DEFAULT TO THE MINIMUM SETPOINT.

WHEN OUTSIDE AIR VENTILATION MODE IS ENABLED THE DAMPER SHALL OPEN TO O/A PER CODE. SEE O/A TABLES.

COORDINATE WITH OWNER FOR VENTILATION SCHEDULES.

SUPPLY FAN:

THE SUPPLY FAN SHALL BE ENABLED WHILE IN THE OCCUPIED MODE AND CYCLED ON DURING THE UNOCCUPIED MODE. A DIFFERENTIAL PRESSURE SWITCH SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FAN. IF THE SWITCH DOES NOT OPEN WITHIN 40 SECONDS AFTER A REQUEST FOR FAN OPERATION A FAN FAILURE ALARM SHALL BE ANNUNCIATED AT THE BAS, THE UNIT SHALL STOP, REQUIRING A MANUAL RESET.

BUILDING PRESSURE CONTROL (RTU ONLY):

THE POWER EXHAUST FAN WILL BE INDEXED ON WHENEVER THE UNIT GOES INTO ECONOMIZER MODE TO HELP MAINTAIN BUILDING PRESSURE CONTROL. WHEN THE UNIT TRANSITIONS BACK TO STANDARD MECHANICAL COOLING, THE EXHAUST FAN WILL BE INDEXED OFF.

THE BAROMETRIC RELIEF DAMPERS SHALL OPEN WITH INCREASED BUILDING PRESSURE. AS THE BUILDING PRESSURE INCREASES, THE PRESSURE IN THE UNIT RETURN SECTION ALSO INCREASES, OPENING THE DAMPERS AND RELIEVING AIR.

FILTER STATUS:

A DIFFERENTIAL PRESSURE SWITCH SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FILTER WHEN THE FAN IS RUNNING. IF THE SWITCH CLOSES FOR 2 MINUTES AFTER A REQUEST FOR FAN OPERATION A DIRTY FILTER ALARM SHALL BE ANNUNCIATED AT THE BAS

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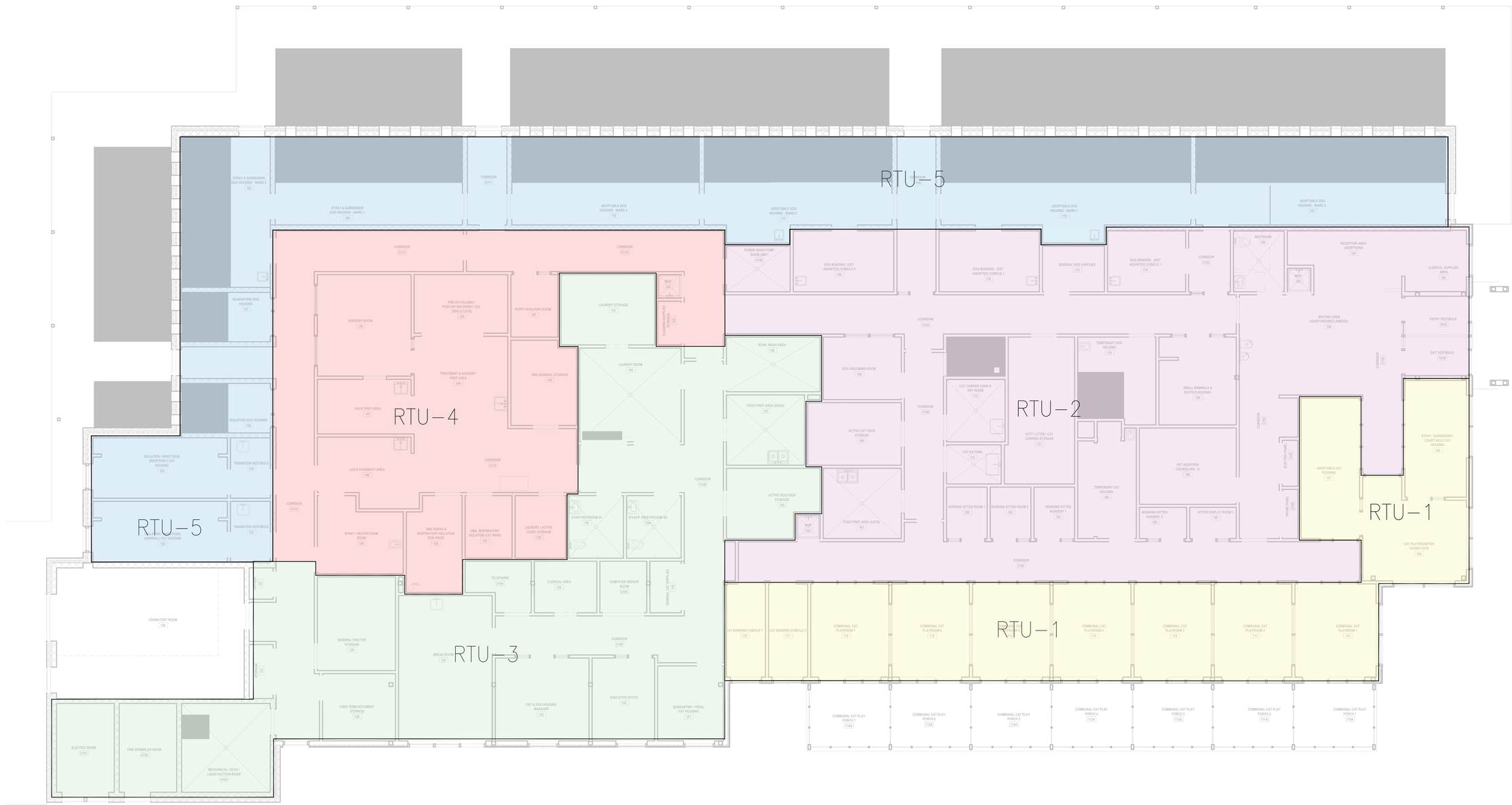
CAPITOL PROJECT 1483
CONSTRUCTION OF A NEW ANIMAL SHELTER FACILITY
65 FIREMANS MEMORIAL DRIVE, POMONA, NY 10970

MECHANICAL SPECIFICATIONS

PROGRESS SET ☐ BID SET ■ PERMIT SET ☐ CONSTRUCTION SET ☐

DRAWN BY:	JLC
CHECKED BY:	CRS
SCALE:	AS NOTED
DATE:	20 OCT. 2021
PROJECT NO:	2019

M1.02



1 MECHANICAL ZONING PLAN
3/16" = 1'-0"

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MECHANICAL ZONING PLAN

PROGRESS SET ☐ | BID SET ■ | PERMIT SET ☐ | CONSTRUCTION SET ☐

M1.03

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MECHANICAL FLOOR PLAN

M2.00

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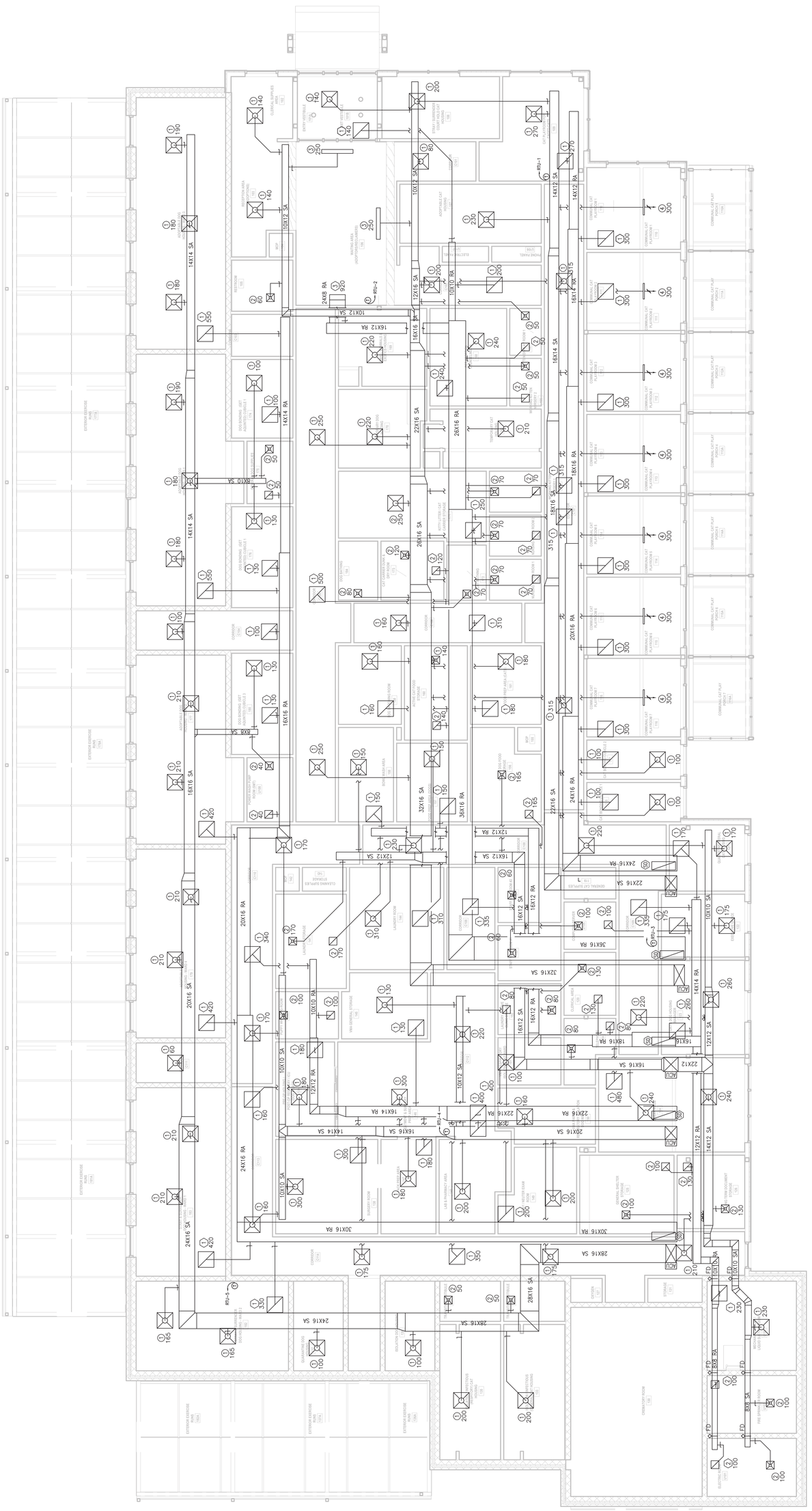
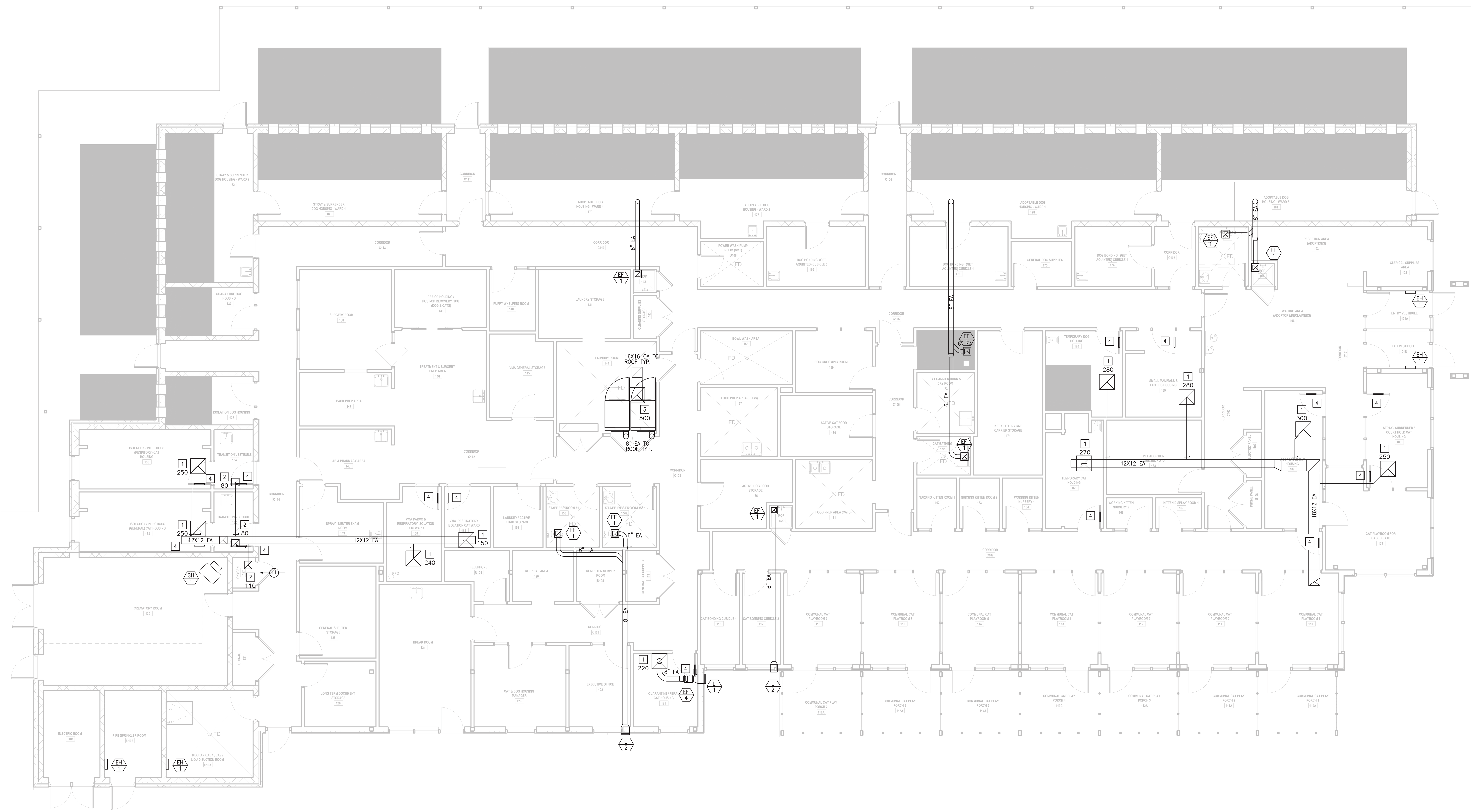


1 MECHANICAL FLOOR PLAN
3/16" = 1'-0"



1 MECHANICAL VENTILATION/HEATING PLAN
3/16" = 1'-0"

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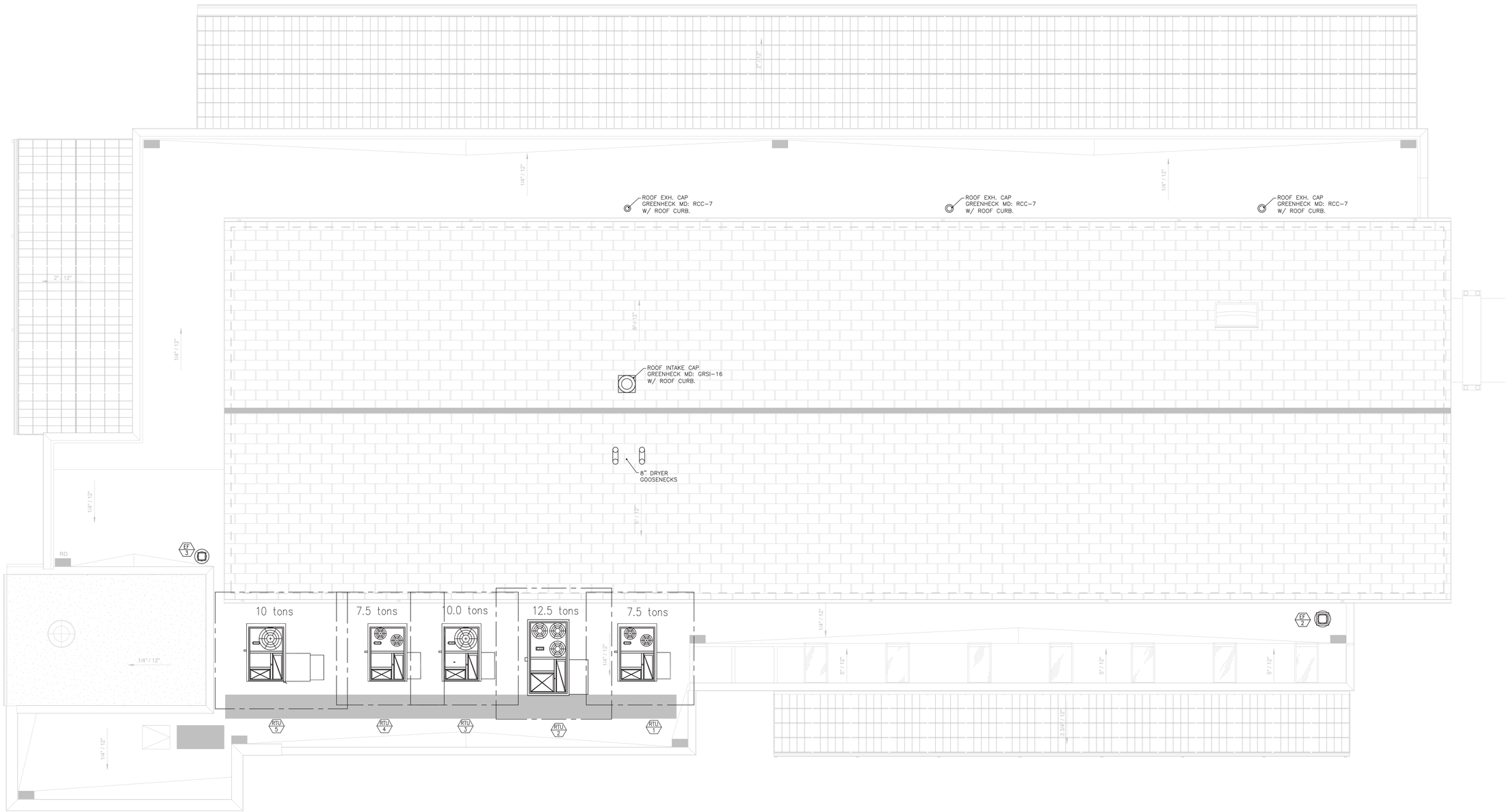
MECHANICAL ZONING PLAN

PROGRESS SET ☐ BID SET ■ PERMIT SET ☐ CONSTRUCTION SET ☐

M2.01



1 MECHANICAL ROOF PLAN
3/16" = 1'-0"

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Engineers

Job # E2119

REVISION		
NO.	DESCRIPTION	DATE

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rauhaus freedenfeld & associates

CAPITOL PROJECT 1483

CONSTRUCTION OF A NEW ANIMAL SHELTER FACILITY
65 FIREMANS MEMORIAL DRIVE, POMONA, NY 10970

DRAWN BY:	JLC
CHECKED BY:	CRS
SCALE:	AS NOTED
DATE:	20 OCT. 2021
PROJECT NO:	2019

PROGRESS SET ☐ BID SET ■ PERMIT SET ☐ CONSTRUCTION SET ☐

MECHANICAL ROOF PLAN

M2.02