B. <u>PERMIT FEES</u>: . 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. <u>DEFINITIONS</u>: 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. <u>SCOPE OF WORK</u>:
- 1. PROVIDE ALL WORK INDICATED IN THE CONTRACT DOCUMENTS. E. <u>CONTRACT DOCUMENTS</u>:
- 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. <u>EQUIPMENT AND MATERIALS</u>:
- 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
- 3. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL REQUIRED AUXILIARY ITEMS FOR A COMPLETE. SYSTEM. 4. ALL EQUIPMENT SHALL BE MOUNTED VIBRATION FREE.
- COORDINATION:
- 1. THE CONTRACTOR SHALL INSTALL ALL DUCTWORK, PIPING, RACEWAYS, CIRCUITRY, CONDUIT, ETC., AS HIGH AS POSSIBLE TO MAXIMIZE HEADROOM. RUN PARALLEI 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 REPOUTE 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. <u>PARTITIONS AND DUCTWORK:</u> 1. THE CONTRACTOR SHALL REPAIR ALL OPENINGS IN WALLS, CEILINGS, FLOORS,

INSULATED METAL CURB—

NON - COMBUSTIBLE CANT -

APPROVED COVERBOARD

ROOF CURB DETAIL

COUNTERFLASHING-

- ROOF, FTC., 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 DIJCTWORK 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
- SITE CLEANUP:

<u>Guarantees</u>:

- 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.
- . 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.
- 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
- 3. THE CONTRACTOR'S GUARANTEE SHALL INCLUDE ALL EQUIPMENT SUPPLIED BY THE CONTRACTOR OR CLIENT. 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. BUILDING SMOKE/FIRE ALARM SYSTEM
- **EQUIPMENT SERVICE ACCESS:** . 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
- JOB RESPONSIBILITY:

- 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 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
- 7. BE RESPONSIBLE FOR ANY LOSS OR INJURY TO PERSONS OR PROPERTY RESULTING FROM NEGLECT OR ANY OTHER CAUSES ON THE PART OF THE

OF FINAL ACCEPTANCE BY THE OWNER.

- 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.

ROOFING MEMBRANE

- ROOFING MEMBRANE

ROOFING MEMBRANE

ROOFING MEMBRANE

and roof surfaces)

(fully adhere)

RIGID INSULATION—

(apply in approved flashing cement)

(fully adhere to underlying membrane, cant,

(dry on cant, fully adhere to roof surfaces)

MECHANICAL SPECIFICATIONS:

A. <u>GENERAL</u>

- 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.
- 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.

CONTRACTOR SHALL BE RESPONSIBLE FOR VISITING THE SITE AND VERIFYING EXISTING FIELD CONDITIONS PRIOR TO

- 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
- 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. <u>INSULATION</u>

- 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.
- 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.
- OF SIMILAR THICKNESS AND PERFORMANCE. h. INTERNAL LINING OF SIMILAR THICKNESS AND PERFORMANCE MAY BE USED IN LIEU OF WRAPPING THE DUCTWORK WITH INSULATION.

q. EXPOSED DUCTWORK SHALL BE EITHER INTERNALLY LINED OR COVERED W/ RIGID FIBERGLASS INSULATION

- 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. <u>DUCTWORK</u>
- 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. <u>TESTING AND BALANCING</u>

- - 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.
- 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

E. <u>AIR CLEANING SYSTEM</u>:

MEASURES HAVE BEEN COMPLETED.

- 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		Supply A											
Date: 8/17/21		Unit Tota	l Outdoor .	Air: 530 c	ofm	l								
Jnit Designation: RTU	J-1													
Α	В	С	D	E	F	G	Н	I	J	К	L	M	N	0
Room Number	Description	Area (ft²) (Az)	Area Outdoor Air Rate per VMC Table 403.3 (Ra)	Area Outdoor Air (RaAz)		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 Ai 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
08-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
roject Name: Hi Tor a ate: 8/17/21 nit Designation: RTU			Supply A Outdoor											
Α Ι	В	ГС	l D	Е	F	l G	Н		J	l ĸ		М	N	. o

Α	В	С	D	Е	F	G	Н		J	K	L	M	N	0
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 Ai Fraction (Zp = Voz / Vpz)
101A-Entry Vest.	Corridor	35	0.06	2	0	0	0	0	2	0.8	3	70		0.043
01B-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
3-Reception Area	Reception	120	0.06	7	30	4	5	20	27	0.8	34	200		0.170
06-Waiting Area	Reception	266	0.06	16	30	8	5	40	56	0.8	70	500		0.140
59-Dog Grooming	Pet Shop	80	0.18	14	10	1	7.5	7.5	21.5	0.8	27	160		0.169
60-Cat Food Stor.	Storage Rm	96	0.12	12	0	0	0	0	12	0.8	15	140		0.107
1-Food Prep Area	Pet Shop	90	0.18	16	10	1	7.5	7.5	23.5	0.8	30	180		0.167
62-Nursing Kitten1	Pet Shop	35	0.18	6	10	1	7.5	7.5	13.5	0.8	17	70		0.243
63-Nursing Kitten2	Pet Shop	35	0.18	6	10	1	7.5	7.5	13.5	0.8	17	70		0.243
64-Nursing Kitten3	Pet Shop	35	0.18	6	10	1	7.5	7.5	13.5	0.8	17	70		0.243
65-Temp. Cat Hldg	Pet Shop	105	0.18	19	10	2	7.5	15	34	0.8	43	210		0.205
66-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
69-Small Mammal	Pet Shop	110	0.18	20	10	2	7.5	15	35	0.8	44	220		0.200
70-Temp Dog Hdg	Pet Shop	110	0.18	20	10	2	7.5	15	35	0.8	44	220		0.200
71-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
3-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 To	or Animal Shelter		I Supply A			l								
Date: 8/19/21		Unit Tota	ا Outdoor	Air: 400 c	rfm	l								
Jnit Designation: RT	TU-3					l								
						_								
Α	В	С	D	E	F	G	Н		J	K	L	M	N	0
Room Number	Description	Area	Area	Area		Occupancy	Occupant	Occupant	Breathing Zone	Zone Air	Zone	Supply Air	Secondary	Outdoor Air
		(ft²)	Outdoor	Outdoor		C x F/1000	Outdoor	Outdoor	Outdoor Air	Distribution	Outdoor Air	Design (Vpz)		Fraction
		(Az)	Air Rate	Air	per VMC	(Pz)	Air Rate	Air	(Vbz = RpPz +	Effectiveness	(Voz = Vbz /		Air	(Zp = Voz /
			per VMC	(RaAz)	Table		per VMC	(RpPz)	RaAz)	(Ez)	Ez)			Vpz)
			Table		403.3		Table				1			
			403.3		(People/		403.3				1			
			(Ra)		1000 ft2)		(Rp)							
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

153-Unisex Staff Rr	Restroom	56	0	0	0	0	0	0	0	0.8	0	
154-Unisex Staff Rr	Restroom	56		0		0		0	0	0.8	0	
Totals		2262		194		10		97.5	291.5		372	
												_
Project Name: Hi To	or Animal Shelter	Unit Total	Supply A	ir: 3000 c	fm							
Date: 8/17/21		Unit Total	Outdoor	Air: 450 c	fm							
Jnit Designation: R	TU-4											
Α	В	C	D	E	F	G	Н		J	K	L	
Room Number	Description	Area	Area	Area	Occupant	Occupancy	Occupant	Occupant	Breathing Zone	Zone Air	Zone	S
		(ft2)	Outdoor	Outdoor	Load Rate	C v F/1000	Outdoor	Outdoor	Outdoor Air	Distribution	Outdoor Air	De

		(ft²) (Az)	Outdoor Air Rate per VMC Table 403.3 (Ra)	Outdoor Air (RaAz)	Load Rate per VMC Table 403.3 (People/ 1000 ft2)	C x F/1000 (Pz)	Outdoor Air Rate per VMC Table 403.3 (Rp)	Outdoor Air (RpPz)	Outdoor Air (Vbz = RpPz + RaAz)	Distribution Effectiveness (Ez)			Recirculated Air	Fraction (Zp = Voz / Vpz)	
	Medical Procedure Room		0	0	20	4	15	60	60	0.8	75	300		0.250	
139-Pre-op/Rcvr/ICL	Medical Procedure Room	90	0	0	20	2	15	30	30	8.0	38	180		0.211	
140-Puppy Welping	Pet Shop	48	0.18	9	10	1	7.5	7.5	16.5	8.0	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		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	
	·														٦

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

Α	В	С	D	Е	F	G	Н	1	J	K	L	M	N	0
Room Number	Description	Area (ft²) (Az)	Area Outdoor Air Rate per VMC Table 403.3 (Ra)	Area Outdoor Air (RaAz)		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
37-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
75-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 <u>PLAN SYMBOLS</u> MECHANICAL EQUIPMENT IDENTIFICATION a. EACH PIECE OF EQUIPMENT SHALL BE IDENTIFIED WITH LOCATION, SERVICE MANUFACTURER, MODEL NUMBER, DETAIL IDENTIFICATION DETAIL NUMBER AND DRAWING NUMBER AS INDICATED. NEW WORK NOTE IDENTIFICATION MECHANICAL SYMBOLS SUPPLY DIFFUSER/TYPE IDENTIFICATION 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 \longrightarrow DUCTWORK TRANSITION ACCESS DOOR, SIZED AS INDICATED \longrightarrow FIRE DAMPER WITH ACCESS DOOR SMOKE DAMPER WITH ACCESS DOOR VOLUME DAMPER WITH LOCKING QUADRANTS MODULATING MOTORIZED DAMPER ____T DUCT MOUNTED TEMPERATURE SENSOR AHU-# WALL THERMOSTAT →AHU−; WALL HUMIDISTAT DUCT SMOKE DETECTOR **─**(U)**→** 3/4" DOOR UNDERCUT CARBON DIOXIDE WALL SENSOR _____ D ____ CONDENSATE DRAIN PIPE TURNED DOWN PIPE TURNED UP

MECHANICAL SYMBOLS **ABBREVIATIONS**

ABOVE AIR CONDITIONING UNIT ACCESS DOOR ABOVE FINISHED FLOOR AIR HANDLING UNIT BUILDING AUTOMATION SYSTEM BRAKE HORSEPOWER BOTTOM OF DUCT BACK DRAFT DAMPER BELOW FINISHED CEILING CEILING CONDENSATE PUMP CONDENSATE DRAIN DOWN **EXISTING**

EXHAUST AIR ELECTRIC HEATING COIL EXHAUST FAN EXISTING RELOCATED

FRESH AIR FAN POWERED BOX MAKE-UP AIR MOTORIZED DAMPER MOTOR HORSEPOWER NFW

NORMALLY CLOSED NORMALLY OPEN OUTSIDE AIR RETURN AIR ROOFTOP UNIT SUPPLY AIR

SOUND LINED DUCT STAINLESS STEEL TRANSFER AIR TOP OF DUCT VARIABLE AIR VOLUME VARIABLE FREQUENCY DRIVE

WALL OPENING ABOVE CEILING

WATER SOURCE HEAT PUMP

620 Pennsylvania Ave

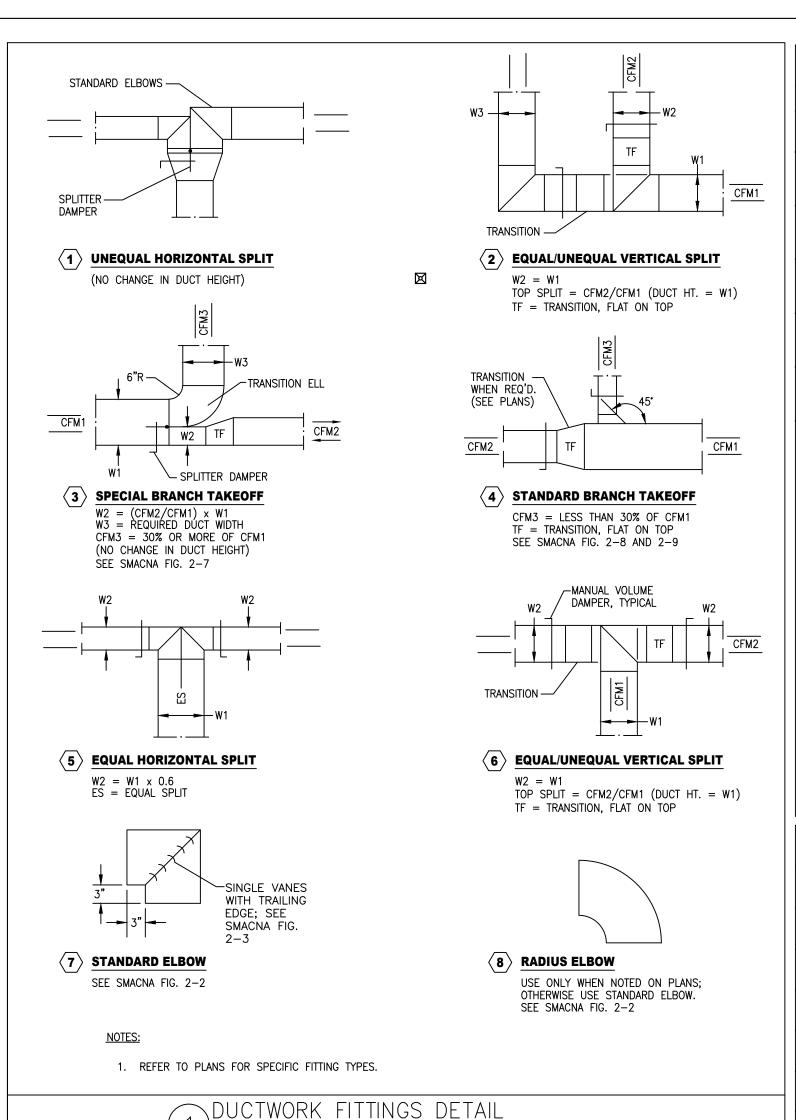
Phone 540-665-2846

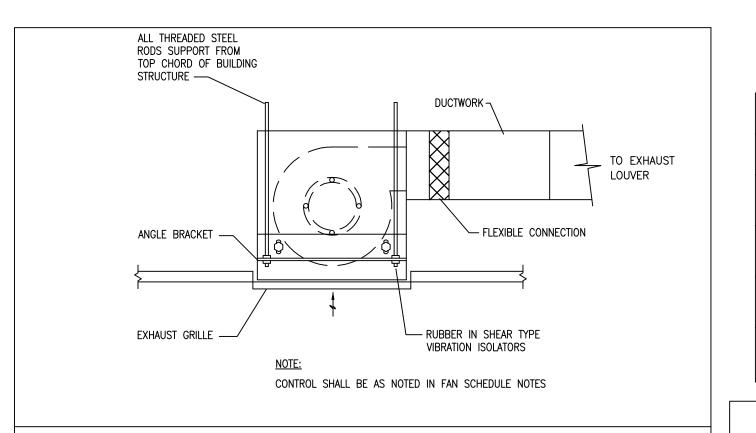
Fax 540-667-3284

Comfort Design Inc. Mechanical & Electrical

Winchester, VA 22601 Job # E2119

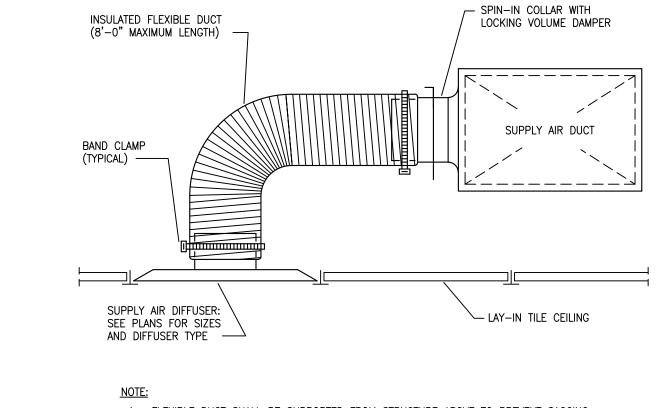
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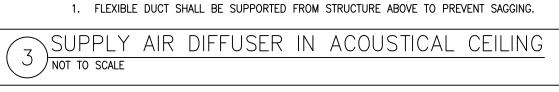


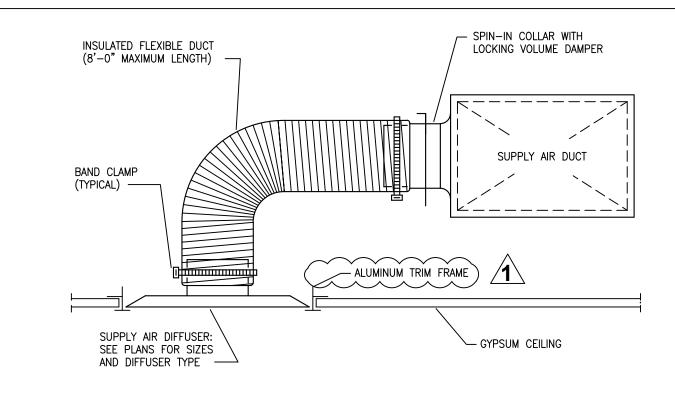


/ NOT TO SCALE









1. FLEXIBLE DUCT SHALL BE SUPPORTED FROM STRUCTURE ABOVE TO PREVENT SAGGING. SUPPLY AIR DIFFUSER IN GYPSUM CEILING

								GA	S PACK	AGE F	ROOFT	AU AC	IIT SC	HEDUL	_E					
			_																	
	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 ARI	IEER AT ARI	V/PH/HZ	MCA	MOCP	WEIGHT LBS	BASIS OF DESIGN	NOTES
<u>M1</u>	(RTU)	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 48HCFE08K2AA5DWH	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 48HCFE14K2AA5DWH	3,4,7,8,9,10,13,14,15,16,17
	RTU 3	4,000	400	10.0	2.6	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 48HCFE12K2AA5DWH	3,4,7,8,9,10,13,14,15,16,17
	(RTU)	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 48HCFE08K2AA5DWH	3,4,7,8,9,10,13,14,15,16,17
	∕RTU \	4.000	ERV	40.0	7.7	1.0	00.00	050.000	005 000	447.0	70.5	٥٢	44.5	40.7	000 /7 /00			0.700	CARRIER	7.4.7.0.0.40.40.44.45.40.47

16. PROVIDE POWERED CONVENIENCE OUTLET.

f. MODULATING GAS HEATING (10:1 TURNDOWN)

SUPPLY AND EXHAUST AIR PATH

k.a. AUTO-RESTART AFTER A POWER FAILURE

I. STANDARD MANUFACTURER KNOCKDOWN CURB

a.COMPARATIVE ENTHALPY ECONOMIZER CONTROL

j. NON-FUSED DISCONNECT SWITCH W/CONVENIENCE OUTLET

AS REQUIRED FOR CONSTANT VOLUME SPACE CONTROL

7. PROVIDE 24 INCH TALL ROOF CURB.

SERVICEABILITY

h.c. MERV 8 FILTRATION

PARTS ONLY WARRANTY

	9. PROVIDE LOW AMBIENT COOLING TO 40°F MINIMUM OR 0°F (WHERE A
-THE-BASE GAS CONNECTION	10. HINGED ACCESS DOOR & SIDE FILTER ACCESS DOOR KIT.
2) STAGE COOLING	11. HORIZONTAL AIRFLOW DISCHARGE.
E (1) STAGE COOLING	12. ENTHALPY LOW LEAK ECONOMIZER W/ ERV & HOODS.
2) STAGE GAS HEATING	13. ENTHALPY LOW LEAK ECONOMIZER W/ BAROMETRIC RELIEF & HOODS
	14. PROVIDE DEHUMIDIFICATION OPTION Ŵ∕ HUMIDITY SENSOR
	15. PROVIDE CARRIER 7-DAY PROGRAMMÁBLE THERMOSTAT OR EQUAL.
E (1) STAGE GAS HEATING STATIC BELT DRIVE BLOWER	,

6. HIGH STÀTÍC BELT DRIVE BLOWER 7. MEDIUM STATIC BELT DRIVE BLOWER 8. 2-SPEED INDOOR FAN MOTOR CONTROLLED BY VFD 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

NOTES:

3. SINGLE

4. TWO (2

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 (DP<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

NOMINAL TONS	FAN BHP	E.S.P. IN. W.C.	GAS HEATER	GAS HEATER INPUT(BTUH)	GAS HEATER OUTPUT(BTUH)	TOTAL MBH	SENSIBLE MBH	OA DB (°F)	EER AT ARI	IEER AT ARI	V/PH/HZ	MCA	MOCP	WEIGHT LBS	BASIS OF DESIGN	NOTES		Α	IR CLEA						
			Err.	,	, ,			. ,									MARK	MFR*	MODEL	MAX AIR TEMP (F)	Tube Qty.	CURRENT AMP	POWER WATTS	VOLTAGE	W
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 48HCFE08K2AA5DWH	3,4,7,8,9,10,13,14,15,16,17	ACU	ATMOS AIR	500EC	200	5	0.6	52	115/1/60	
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 48HCFE14K2AA5DWH	3,4,7,8,9,10,13,14,15,16,17	3. UNI 4. UNI	NUFACTURER O TS SHALL BE I T SHALL INTER OVIDE NEMA 5-	INSTALLED IN RLOCK TO ENE	THE SUPPL RGIZE WITH	RTU I	FAN OR AII		RE SWITCH	
10.0	2.6	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 48HCFE12K2AA5DWH	3,4,7,8,9,10,13,14,15,16,17		DRDINATE WITH				HON BOX			
10.0	2.0		00.0%	200,000	200,000	110.0	7 0.0		11.0	12.7	200, 0, 00		, ,	1,000	46HCFETZKZAASDWH				ELECT	DIC HI		FR SC	HEDIII		
											000 /7 /00				CARRIER	7.700.00.71.15.40.47			LLLU I		_	_1\		_L 	
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	148HCFF08K2AA5DWH	3,4,7,8,9,10,13,14,15,16,17					1				

h. ALL ALUMINUM ENERGY RECOVERY WHEEL WITH BYPASS DAMPERS AND SLIDE OUT FOR

h.b. ALL OUTDOOR AIR SHALL PASS THRU THE WHEEL WHEN UNIT IS NO ECONOMIZING

h.a. WHEEL SHALL HAVE A PURGE RATED FOR NO MORE THAN 0.04% CROSSOVER BETWEEN

k. BACNET COMPATIBLE DDC CONTROLLER INCLUDING PROGRAMMING/SEQUENCING AND SENSORS

m. STARTUP & 1-YEAR WARRANTY LABOR BY MANUFACTURER; EXTENDED 5 YEAR COMPRESSOR

					I CARRIER I											
13.8	208/3/60	50	60	1,600	48HCFE08K2AA5DWH	3,4,7,8,9,10,13,14,15,16,17					CONSTRUCTION	EL	ECTRICAL D	ATA		
											DATA					
12.7	208/3/60	81	90	2,700	CARRIER 48HCFE12K2AA5DTH	3,4,7,8,9,10,12,14,15,16,17	N	MARK	AREA / SERVICE	CFM	TYPE	KW	VOLT	PH	AMPS	MANUFACT
	OOLING TO 40°F MIN SIDE FILTER ACCES			ERE AVAILAI	BLE).		\langle	EH 1	ENTRY/EXIT	100	WALL MOUNTED	2	208/230	1	8.3	MARKEL F3052T2DV
	NOMIZER W/ ERV &	+ HOODS						1. ELE	ECTRICAL CORD	SHALL B	E CONCEALED W/ CA	SING.				
	NOMIZER W/ BARON			100DS.					ILT IN CONTROL							
	J OPTION Ŵ/ HIIMIF															

. MAXIMUM MOUNTING HEIGHT = 10 FT.

BUILT IN CONTROLLABLE THERMOSTAT

TUTTLE & BAILEY: PR

TUTTLE & BAILEY: DXFR

3 PROVIDE VENT FOR COMBUSTION AIR & EXHAUST VENTING

4. PROVIDE HANGERS AND STRUCTURAL SUPPORT PER MFR.

1,2,6,7

1,2

			GAS UNIT	HEA	TER S	SCHED	ULE				
			CONSTRUCTION DATA			ELE	CTRICA	L 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
<u>NOTE</u>	<u>S:</u>				'				•		

EXHAUST FAN SCHEDULE										DIFFUSER, REGISTER AND GRILLE SCHEDULE									
PERFORMANCE DATA CONSTRUCTION DATA ELECTRICAL DATA					TYPE	SERVICE	CFM RANGE	FACE DIMENSION	NECK DIMENSION	FINISH	BASIS OF DESIGN	NOTES							
MARK CFI	M SP (IN. W.G.)	RPM	TYPE	DRIVE	MOTOR H.P. (WATTS)	VOLT	PH	MAX WEIGHT (LB)	MANUFACTUI OR EQUAI		NOTES			0 - 125		6"ø			
(EF) 70	0.375	838	CEILING MOUNTED	DIRECT	(24.1)	115	1	12	GREENHEC SP-A50-90-		1,2,6,7	1 1	SUPPLY AIR DIFFUSER	126 - 250	24"x24"	8"ø	WHITE	TUTTLE & BAILEY: T1100	1,2,3,4,5,7
					+ ,	—	\perp			-۷6						10 " ø			
(EF) 138	0.500	1385	ROOF MOUNTED	DIRECT	1/2	115	1	65	GREENHEC G-120-V		4,5,6,7		② SUPPLY AIR DIFFUSER		12"x12"	6"ø	WHITE	TUTTLE & BAILEY: T1100	1,2,3,4,5,7
-			ROOF		+	+			GREENHEC	`K			SOFFEI AIN DITTOSEN	126 – 250	12 112	8"ø	1	TOTTLE & BALLET. TITOO	1,2,0,4,0,/
(EF) 100	0.500	1650	MOUNTED	DIRECT	1/4	115	1	56	G-099-V(3,4,5,6,7	3	SUPPLY AIR DIFFUSER	126 - 250	48"x2.5"	8 " ø	WHITE	TUTTLE & BAILEY: 4000	1,2,4,5,7,9
EF 22	0.250	1664	INLINE MOUNTED	DIRECT	1/15	115	1	41	GREENHEC SQ-70-V		4,6,7	4	SUPPLY AIR DIFFUSER	251 – 400	48"x3"	10 " ø	WHITE	TUTTLE & BAILEY: 4000	1,2,4,5,7,9
NOTES: 1. FANS IN RESTROOMS SHALL SWITCH WITH LIGHT.										0 - 125		6"ø 8"ø	WHITE	TUTTLE & BAILEY: PR					
								1	RETURN AIR DIFFUSER	126 – 250	24"x24"				1,2,6,7				
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.								A RETURN AIR DIFFUSER	251 - 400	24 824	10 " ø	1,2,0,7							
									401 - 600		12 " ø								
) PREWIRED DISC I ISOLATORS AND		CH.									(2)	DETUDNI AID DIECUGED	0 - 125		6"ø	MI 1175	THIT I A DANGE DO	1007
7. TIDIVITOR ISSUITORS FIRE BIVIONEIS.							RETURN AIR	RETURN AIR DIFFUSER	126 - 250	12"x12"	8"ø	- WHITE	TUTTLE & BAILEY: PR	1,2,6,7					
									3	RETURN AIR DIFFUSER	851 - 1000	24"x8"	N/A	WHITE	TUTTLE & BAILEY: 4000	1,2,5,8,9			
LOUVER SCHEDULE										101 - 250		8"ø			4007				
			DIMENSIONS	TEDEE ADE								1	EXHAUST AIR GRILLE	251 - 400	- 24"x24"	10 " ø	WHITE	TUTTLE & BAILEY: PR	1,2,6,7
TYPE	SERVICE	CFM	WxLxH	FREE ARE FT2	.А	FINISH		BASIS OF	DESIGN	NOTES		2	EXHAUST AIR GRILLE	0 - 125	12"x12"	6"ø	WHITE	TUTTLE & BAILEY: PR	1,2,6,7

INTAKE AIR GRILLE | 126 - 250 | 20"x20" | 18"x18"

DOOR TRANSFER GRILLE 251 - 400 | 16"x16" |

COORDINATE WITH OWNER COLOR & FINISH.

4. PROVIDE WITH OPPOSED BLADE DAMPER.

9. AO CORE, STANDARD UNIT, & 1/2" MARGINS

4 WAY THROW PATTERN.

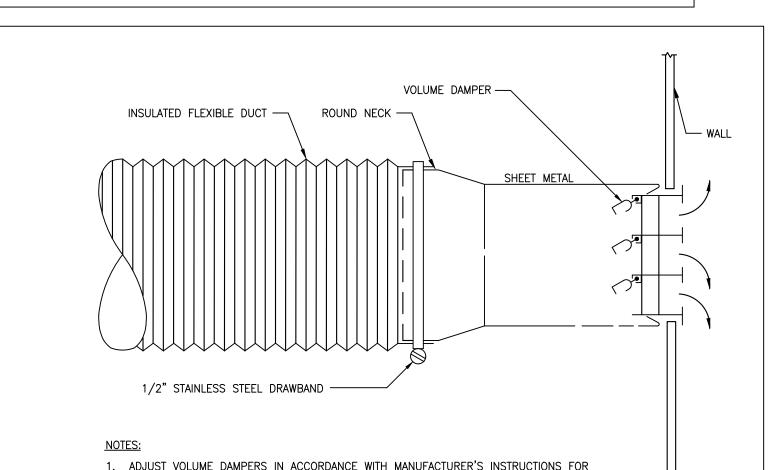
6. PERFORATED PATTERN

7. CEILING MOUNTED

WALL MOUNTED

LOUVER SCHEDULE								
TYPE	SERVICE	CFM	DIMENSIONS WxLxH	FREE AREA FT2	FINISH	BASIS OF DESIGN	NOTES	
$\left\langle \frac{L}{1} \right\rangle$	EXHAUST	220	15"x10"x2"	0.28	ALUMINUM	GREENHECK: ESJ-202	1-2	
$\left\langle \frac{L}{2} \right\rangle$	EXHAUST	140	13"x10"x2"	0.23	ALUMINUM	GREENHECK: ESJ-202	1-2	
$\left\langle \frac{L}{3} \right\rangle$	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								

TYPE	SERVICE	CFM	DIMENSIONS WxLxH	FREE AREA FT2	FINISH	BASIS OF DESIGN	NOTES	
L 1	EXHAUST	220	15"x10"x2"	0.28	ALUMINUM	GREENHECK: ESJ-202	1-2	
$\left\langle \frac{L}{2} \right\rangle$	EXHAUST	140	13"x10"x2"	0.23	ALUMINUM	GREENHECK: ESJ-202	1–2	
$\left\langle \frac{L}{3} \right\rangle$	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.								



<u>NOTES:</u> 1. ADJUST VOLUME SPECIFIED AIR FL	DAMPERS IN ACCORDANCE WITH MAN OW. SER SCHEDULE FOR QUANTITY AND S		FOR	
	EWALL DIFFUSER/G	RILLE DETAIL		
ACCESS DOOR IN DUCT	1" MIN STRU (4 SIDES) 16 GAUGE SI 36"x24",14 (ANCE TOP & SIDES R HORIZONTAL MTG.) CTURE CONTACT LEEVE UP TO GAUGE ABOVE GAUGE SLEEVE S "S" JOINT		D CONSTRUCTION RATING OF STRUCTURE DUCT

1 1/2"x1 1/2"x1/8" CONT. GALVANIZED STEEL ANGLE. FASTEN TO SLEEVE WITH 1/4" MACHINE BOLTS AND NUTS 8" O.C.

(MINIMUM OF 2 BOLTS PER FACE)

RATED WALL OPENING FIRE DAMPER

FIRE DAMPER MOUNTING

STANDARD INSTALLATION

NOT TO SCALE

FASTEN DAMPER TO SLEEVE

NOTE: PROVIDE ACCESS DOOR FOR FINISHED SURFACE

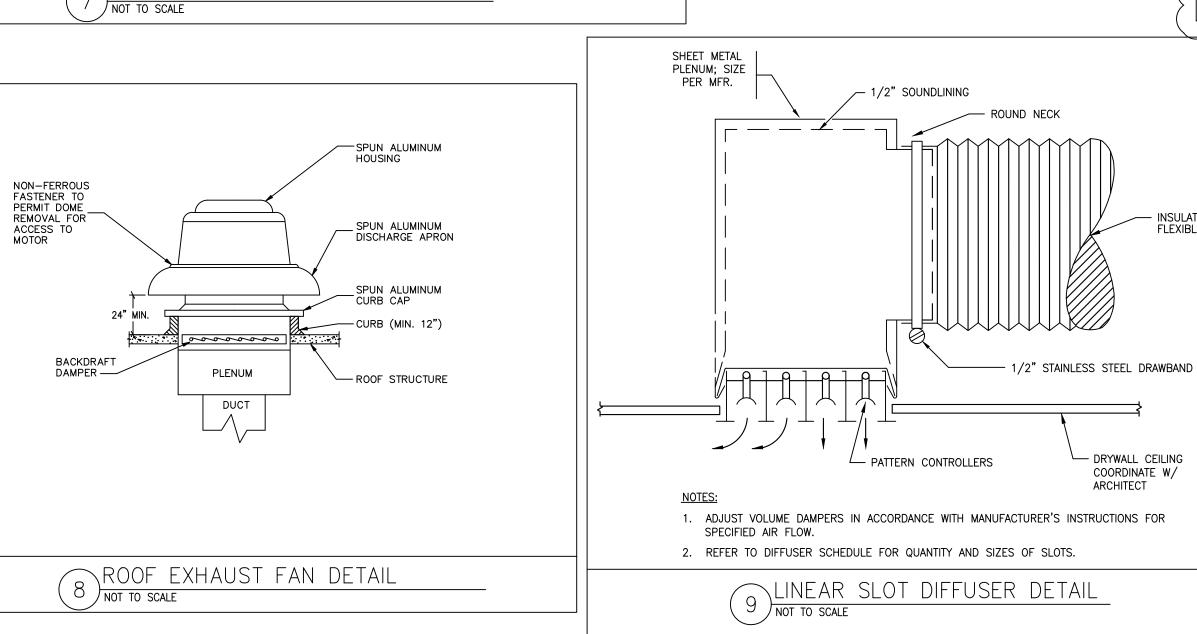
W/ BOLTS, SCREWS, OR TACKWELDS MAX. 8" O.C.

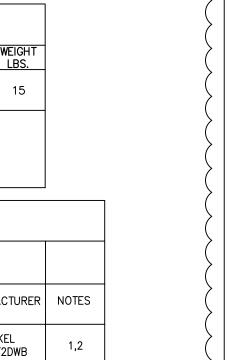
INSTALLATION OUTSIDE STRUCTURE
DUE TO PHYSICAL OBSTRUCTIONS

1/8" X 1" GALV METAL STRAP SHEET METAL SCR " O.C. MINIMUM (EWS					— GALVANIZED THREADED ROD THREADED ROD
	l = 2 MiNik		<u> </u>	<u>25" OR WIDE</u>	<u>.</u>	— GALVANIZED SUPPORT ANGLE
	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"	8'-0" O.C.	4 SQ. FT.	
	31" TO 42"	3/8"	1 1/2" X 1 1/2" X 1/8"	6'-0" O.C.	10 SQ. FT.	
	43" TO 60"	1/2"	1 1/2" X 1 1/2" X 1/8"	6'-0" O.C.	10 SQ. FT.	
	61" TO 84"	1/2"	2" X 2" X 1/4"	4'-0" O.C.		
	85" AND UP	1/2"	2" X 2" X 1/4"	4'-0" O.C.		
	* REDUCE SPACIN	G TO NEXT SMALLER II	NTERVAL IF DUCT AREA EXCEEDS MAXIMUM			

CONTRACTOR SHALL CONFIRM ACTUAL FINAL DIFFUSER DIMENSIONS WITH VENDOR, AND COORDINATE W/ CEILING/WALL/DOOR TYPE AS NECESSARY.

5. PROVIDE INSULATED BACKPANS WHEN INSTALLED ABOVE CEILINGS, UNCONDITIONED, AND/OR PARTIALLY CONDITIONED SPACE.





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Fan System: FAN SYSTEM 1 -- Compliance (Motor nameplate HP method): Passes FAN 1 Supply, Constant Volume, 3000 CFM, 2.8 motor nameplate hp, 0.0 fan efficiency grade 1 RTU-2 (Single Zone): Heating: 1 each - Central Furnace, Gas, Capacity = 240 kBtu/h Proposed Efficiency = 81.00% Et, Required Efficiency: 80.00 % Et

Proposed Efficiency = 12.20 EER, Required Efficiency: 10.80 EER + 12.2 IEER Fan System: FAN SYSTEM 2 -- Compliance (Motor nameplate HP method): Passes

1 RTU-3 (Single Zone): Heating: 1 each - Central Furnace, Gas, Capacity = 250 kBtu/h

Cooling: 1 each - Single Package DX Unit, Capacity = 114 kBtu/h, Air-Cooled Condenser, Air Economizer Proposed Efficiency = 11.50 EER, Required Efficiency: 11.00 EER + 12.7 IEER Fan System: FAN SYSTEM 3 -- Compliance (Motor nameplate HP method): Passes

FAN 4 Supply, Constant Volume, 4000 CFM, 2.8 motor nameplate hp, 0.0 fan efficiency grade

Proposed Efficiency = 82.00% Et, Required Efficiency: 80.00 % Et (or 78% AFUE) Cooling: 1 each - Single Package DX Unit, Capacity = 87 kBtu/h, Air-Cooled Condenser, Air Economizer Proposed Efficiency = 12.00 EER, Required Efficiency: 11.00 EER + 12.7 IEER Fan System: FAN SYSTEM 4 -- Compliance (Motor nameplate HP method) : Passes

FAN 5 Supply, Constant Volume, 3000 CFM, 2.8 motor nameplate hp, 0.0 fan efficiency grade 1 RTU-5 (Single Zone):

Project Title: Capital Project #1483 Report date: 10/25/21 Data filename: C:\Users\jc_cd\OneDrive\Projects\cdi19\E1961-Washington Landing\comcheck\2021\Capital Page 1 of 20 Project 1483.cck

Quantity System Type & Description Cooling: 1 each - Single Package DX Unit, Capacity = 114 kBtu/h, Air-Cooled Condenser, Air Economizer Proposed Efficiency = 11.50 EER, Required Efficiency: 11.00 EER + 12.7 IEER

Fan System: FAN SYSTEM 5 -- Compliance (Motor nameplate HP method) : Passes

FAN 6 Supply, Constant Volume, 4000 CFM, 2.8 motor nameplate hp, 0.0 fan efficiency grade 1 GH-1 (Single Zone):

Heating: 1 each - Unit Heater, Gas, Capacity = 45 kBtu/h Proposed Efficiency = 82.00% Ec, Required Efficiency: 80.00 % Ec Fan System: FAN SYSTEM 6 -- Compliance (Motor nameplate HP method): Passes

FAN 7 Supply, Constant Volume, 720 CFM, 0.1 motor nameplate hp, 0.0 fan efficiency grade

4 EH-1 (Single Zone): Heating: 1 each - Other, Electric, Capacity = 7 kBtu/h No minimum efficiency requirement applies

Fan System: FAN SYSTEM 7 -- Compliance (Motor nameplate HP method): Passes

FAN 8 Supply, Constant Volume, 100 CFM, 0.0 motor nameplate hp, 0.0 fan efficiency grade

Gas Storage Water Heater, Capacity: 100 gallons, Input Rating: 200 kBtu/h w/ Circulation Pump

Proposed Efficiency: 97.00 % Et, Required Efficiency: 80.00 % Et

Mechanical Compliance Statement

- INSULATED

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 90.1 (2016) Standard requirements in COM*check* Version 4.1.5.3 and to comply with any applicable mandatory requirements listed in the Inspection Checklist. Joshua L. Catlett, P.E.

Project Title: Capital Project #1483 Report date: 10/25/21 Data filename: C:\Users\jc_cd\OneDrive\Projects\cdi19\E1961-Washington Landing\comcheck\2021\Capital Page 2 of 20

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Comfort Design Inc. Mechanical & Electrical

620 Pennsylvania Ave

Winchester, VA 22601

Phone 540-665-2846

Fax 540-667-3284

Job # E2119

90.1 (2016) Standard Capital Project #1483 Pomona, New York

New Construction Designer/Contractor: Owner/Agent:

COM*check* **Software Version 4.1.5.3**

struction Site: Firemens Memorial Drive

chanical Systems List antity System Type & Description

Project Information

Energy Code:

Climate Zone:

Project Type:

Project Title:

Location:

1 RTU-1 (Single Zone): Heating: 1 each - Central Furnace, Gas, Capacity = 224 kBtu/h Proposed Efficiency = 82.00% Et, Required Efficiency: 80.00 % Et (or 78% AFUE) Cooling: 1 each - Single Package DX Unit, Capacity = 87 kBtu/h, Air-Cooled Condenser, Air Economizer Proposed Efficiency = 12.00 EER, Required Efficiency: 11.00 EER + 12.7 IEER

Cooling: 1 each - Single Package DX Unit, Capacity = 142 kBtu/h, Air-Cooled Condenser, Air Economizer

FAN 2 Supply, Constant Volume, 4750 CFM, 5.0 motor nameplate hp, 0.0 fan efficiency grade

Proposed Efficiency = 80.00% Et, Required Efficiency: 80.00 % Et

RTU-4' (Single Zone): Heating: 1 each - Central Furnace, Gas, Capacity = 224 kBtu/h

Heating: 1 each - Central Furnace, Gas, Capacity = 250 kBtu/h Proposed Efficiency = 80.00% Et, Required Efficiency: 80.00 % Et

R FACILITY NY 10970 48

M1.01

A. FOUR BUTTON DETAILED ENGLISH SCROLLING MARQUEE DISPLAY.

A. SCHEDULE IS PER THE PROJECT SPECIFICATION REQUIREMENTS. PART 2: HVAC EQUIPMENT INSULATION

B. CCN (CARRIER COMFORT NETWORK) CAPABLE.

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:

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

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 O'F LOW AMBIENT COOLING OPERATION.

PART 3: ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC DECENTRALIZED, ROOFTOP UNITS:

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.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. 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

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, PURONÂ REFRIGERAN'

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 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

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 \pm 10% VOLTAGE.

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.

B. COMPRESSOR WITH STANDARD CONTROLS SHALL BE CAPABLE OF OPERATION DOWN TO 35°F (2°C), AMBIENT OUTDOOR

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.

1. SHALL BE A SINGLE PIECE TOP PANEL.

E. BASE RAIL

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 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

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:

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

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 RASFPAN

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 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.

COMPRESSOR/2-STAGE COOLING MODELS ON 08 - 14 SIZES.

TEST AT 1980 PSIG.

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 3. CONDENSER COILS SHALL BE LEAK TESTED TO 150 PSIG; PRESSURE TESTED TO 650 PSIG, AND QUALIFIED TO UL 1995 BURST

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 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.

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

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 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.

6.1. CONDENSER FANS AND MOTORS

4. SHALL USE A SHAFT-DOWN DESIGN.

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.

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.

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. FVAPORATOR 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 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

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 ECONOMISER 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 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

q. 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

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. 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. : OUTLET SHALL BE FACTORY—INSTALLED AND INTERNALLY MOUNTED WITH FASILY 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

f. OUTLET SHALL BE ACCESSIBLE FROM OUTSIDE THE UNIT. g. OUTLET SHALL INCLUDE A FIELD-INSTALLED "WET IN USE" COVER. F. SMOKE DETECTORS:

TRANSFORMER.

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 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

PROVIDED WITH WEB SERVER.

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

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 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

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

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

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 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

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

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

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

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.

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. 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

WEB-BASED SYSTEM GRAPHICS SHALL BE VIEWABLE ON BROWSERS COMPATIBLE WITH WORLD WIDE WEB CONSORTIUM

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

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 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,

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

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. 1. TREND CONFIGURATION. OPERATOR SHALL BE ABLE TO CONFIGURE TREND SAMPLE OR CHANGE OF VALUE (CO

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

a. STANDARD REPORTS. FURNISH THE FOLLOWING STANDARD SYSTEM REPORTS: REPORTS SHALL BE FILTERED BASED UPON THE SELECTED EQUIPMENT

ALARM REPORTS a) ALARM SUMMARY — CURRENT ALARMS

AND WORD PROCESSING PROGRAMS.

SCHEDULE REPORTS

TO EACH CONTROLLER.

b) ALARM SOURCES — LIST OF EQUIPMENT AND ASSOCIATED ALARM CONDITIONS c) ALARM ACTIONS — CONFIGURED ALARM ACTIONS SUCH AS E-MAIL AND ALARM POP-UP

b) SCHEDULE INSTANCES - DISPLAYS ALL SCHEDULES ENTERED SECURITY REPORTS - MAINTAINS AUDIT OF ALL ACTIONS TAKEN THROUGH USER INTERFACE COMMISSIONING REPORTS - PROVIDE EQUIPMENT CHECKOUT STATUS AND NOTES

a) EFFECTIVE SCHEDULES - DISPLAYS EFFECTIVE SCHEDULES FOR EACH EQUIPMENT

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

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

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.

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

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

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.

THIS ALLOWANCE WILL BE SUBTRACTED FROM THE TENANT'S TOTAL OVERRIDE USAGE.

5. EXEMPTION TIMES. A DEFINED BLOCK OF TIME DURING EACH WEEK THAT IS EXEMPT FROM DETECTING OVERRIDE 6. ALLOWANCES. A DOLLAR AMOUNT OF OVERRIDE USAGE THAT IS ALLOWED PER TENANT AND IS GIVEN AT NO CHARGE.

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.

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

2. SYSTEM SHALL SUPPORT WEB SERVICES WRITE DATA REQUEST TO EACH ANALOG AND BINARY OBJECT THAT CAN BE

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

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. LONWORKS COMMUNICATION

a. DDC SYSTEM SHALL SUPPORT LONWORKS COMMUNICATION UTILIZING ANSI/EIA—709.1 COMMUNICATIONS OVER FT—10A

b. COMMUNICATION BETWEEN DEVICES SHALL BE VIA STANDARD NETWORK VARIABLE TYPES (SNVTS)

RTU SEQUENCE OF OPERATIONS

BUILDING AUTOMATION SYSTEM INTERFACE (AS APPLICABLE):

AT 9600, 19200, 38400, AND 76800 BAUD.

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. 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

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

ECONOMIZING IS ENABLED THE OUTSIDE AIR DAMPER SHALL MODULATE TO MAINTAIN THE OCCUPIED SPACE TEMPERATURE SETPOINT.

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):

DUAL COMPRESSOR UNITS:

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.

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 **DEHUMIDIFICATION (RTU ONLY):**

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.

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

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.

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 SÉTPOINT. 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%. 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 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:

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

A DIFFERENTIAL PRESSURE SWITCH SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FILTER WHEN THE FAN IS RUNNING, IF THE

THE SUPPLY FAN SHALL BE ENABLED WHILE IN THE OCCUPIED MODE AND CYCLED ON DURING THE UNOCCUPIED MODE. A DIFFERENTIAL

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.

SWITCH CLOSES FOR 2 MINUTES AFTER A REQUEST FOR FAN OPERATION A DIRTY FILTER ALARM SHALL BE ANNUNCIATED AT THE BAS

CONTROL. WHEN THE UNIT TRANSITIONS BACK TO STANDARD MECHANICAL COOLING, THE EXHAUST FAN WILL BE INDEXED OFF.

Winchester, VA 22601 Phone 540-665-2846 Fax 540-667-3284

Comfort Design Inc.

Job # E2119

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

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

Mechanical & Electrical

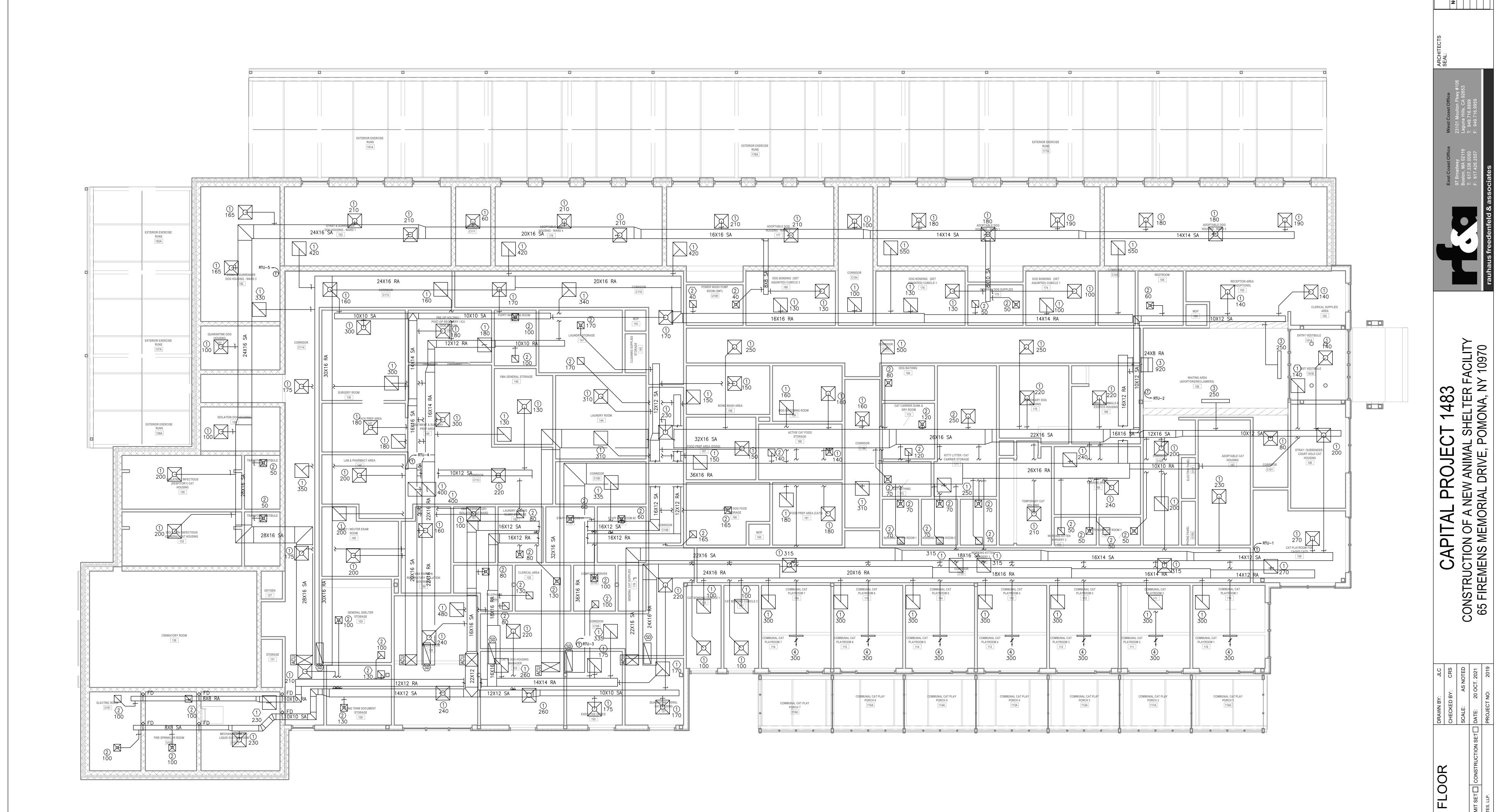
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Comfort Design Inc.



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

620 Pennsylvania Ave

Phone 540-665-2846

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Mechanical & Electrical

M2.00

Comfort Design Inc.

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

DRAWN BY: JLC
CHECKED BY: CRS
SCALE: AS NOTED

SET□ DATE: 20 OCT. 2021

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Comfort Design Inc.

MECHANICAL

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Mechanical & Electrical

Phone 540-665-2846

Fax 540-667-3284

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

1 MECHANICAL ROOF PLAN 3/16" = 1'-0" CAPITAL PROJECT 1483
CONSTRUCTION OF A NEW ANIMAL SHELTER FACILITY
65 FIREMENS MEMORIAL DRIVE, POMONA, NY 10970

DRAWN BY: JLC
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MECHANICAL
ROOF PLAN

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The Mechanical & Electrical Engineers

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Job # E2119

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