DUCT SYMBOLS

DOUBLE LINE SYMBOL	DESCRIPTION	SINGLE LINE SYMBOL
20x16	DUCT- FIRST NUMBER IS VISIBLE DIMENSION.	20x16
R	RADIUS ELBOW W/VANE(S) (1.5=R/D STANDARD)	
	DUCT SECTION, POSITIVE PRESSURE	
	DUCT SECTION, NEGATIVE PRESSURE	
	DUCT & AIRFLOW UP(LEFT) POSITIVE PRESSURE DUCT & AIRFLOW DN(RIGHT) POSITIVE PRESSURE	
	DUCT & AIRFLOW UP(LEFT) NEGATIVE PRESSURE DUCT & AIRFLOW DN(RIGHT) NEGATIVE PRESSURE	
	DUCT & AIRFLOW UP(LEFT) NEG./POS. PRESSURE DUCT & AIRFLOW DN(RIGHT) NEG./POS. PRESSURE	
R	CHANGE OF ELEVATION=RISE (R), DROP (D)	R
20x16	DUCT W/INTERNAL LINING CLEAR INSIDE DIMENSIONS SHOWN	
AD	ACCESS DOOR=SIDE (L), BOTTOM (M), TOP (R)	AD
	FLEXIBLE CONNECTOR	
	FLEXIBLE DUCT	
FD	FD- FIRE DAMPER, SD-SMOKE DAMPER, FSD- FIRE/SMOKE DAMPER.	FSD
(TYPE)	MANUAL VOLUME DAMPER-SPECIFIC TYPE, NO LABEL-BUTTERFLY, OBD-OPPOSED BLADED DAMPER, PBD-PARALLEL BLADE DAMPER	(TYPE)
M	MOTORIZED DAMPER OR ZONE CONTROL DAMPER	M
	BRANCH TAP-W/45 DEG. ENTRY	
	BRANCH TAP-CONICAL SPIN-IN	
	BRANCH TAP-STRAIGHT SPIN-IN	
20x10 10x10	TRANSITION	20x10 10x10
	EXISTING DUCTWORK TO BE DEMOLISED	
	EXISTING DUCTWORK TO REMAIN	
RTU-# FCU-# XXX-#	HVAC - EQUIP AS NOTED	
	AIR DEVICE, SUPPLY- CEILING. CLEAR	
A X"Ø X CFM	AIR DEVICE TAG SPIN-IN DIMENSION AIRFLOW (CFM)	
	AIR DEVICE, RETURN- CEILING.	
	AIR DEVICE, EXHAUST- CEILING.	
	AIR DEVICE, SUPPLY- SIDEWALL.	
	AIR DEVICE, RETURN/EXHAUST- SIDEWALL.	

MECHANICAL DRAWING LIST

CODE COMPLIANCE

ALL WORK AND MATERIAL SHALL BE PERFORMED AND INSTALLED IN COMPLIANCE WITH THE FOLLOWING CODES AS ADOPTED AND AMENDED BY THE INSPECTING AUTHORITY. NOTHING IN THESE DRAWINGS IS TO BE CONSTRUCTED TO PERMIT WORK NOT CONFORMING TO THESE CODES OR OTHERS APPLICABLE TO THESE PROJECT:

A. 2021 INTERNATIONAL BUILDING CODE

B. 2021 INTERNATIONAL MECHANICAL CODE

C. 2021 INTERNATIONAL STANDARD PLUMBING CODE, NEW JERSEY EDITION

D. 2020 NATIONAL ELECTRICAL CODE

E. ENERGY CODE - ASHRAE 90.1-2019

MECHANICAL ABBREVIATIONS

GD	GRAVITY DAMPER
FD	FIRE DAMPER
CFM	CUBIC FEET OF AIR PER MINUTE
CD	CONDENSATE DRAIN PIPE
DN	DOWN
EER	ENERGY EFFICIENCY RATIO
IEER	INTEGRATED ENERGY EFFICIENCY RATIO
FC	FLEXIBLE CONNECTION
REF	REFRIGERANT PIPE
VD	VOLUME DAMPER
MD	MOTORIZED DAMPER
EF	EXHAUST FAN
CDS	CEILING DIFFUSER SUPPLY
CDR	CEILING DIFFUSER RETURN
CGE	CEILING GRILLE EXHAUST
CGS	CEILING GRILLE SUPPLY
HP	HEAT PUMP
EDH	ELECTRIC DUCT HEATER
COP	COEFFICIENT OF PERFORMANCE
HHS	HUMIDOR HUMIDITY SYSTEM
ESE	ELECTRONIC SMOKE EATER

CITY OF ENGLEWOOD, NJ BUILDING DEPARTMENT NOTES

ALL WORK SHALL COMPLY WITH APPLICABLE SECTIONS OF THE INTERNATIONAL BUILDING CODE 2021 [IBC 2018], AND ALL AMENDMENTS AND RULES AND REGULATIONS OF THE DEPARTMENT OF BUILDINGS TO DATE.

1. ALL HEATING AND COOLING LOADS CALCULATED PER ASHRAE/ACCA 183.
2. VENTILATION FOR ALL AREA SHALL COMPLY WITH INTERNATIONAL MECHANICAL CODE 2021 CHAPTER 4.
3. TESTS OF MECHANICAL SYSTEMS SHALL BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING SECTIONS OF THE INTERNATIONAL MECHANICAL CODE 2021 [IMC 2021]:
   A. VENTILATION SYSTEM BALANCING INTERNATIONAL MECHANICAL CODE 2021- 403.1
4. THE FOLLOWING WORK ITEMS, COMPONENTS, MATERIALS, CAPACITIES, ETC. SHALL COMPLY WITH THE REFERENCED CODE OR STANDARD:
   A. STANDARDS OF HEATING - INTERNATIONAL MECHANICAL CODE 2021 - 309.1
   B. DUCT CONSTRUCTION AND INSTALLATION- INTERNATIONAL MECHANICAL CODE 2021 - 603
   C. AIR INTAKES, EXHAUSTS AND RELIEF - INTERNATIONAL MECHANICAL CODE 2021 - 401.5
   D. AIR FILTERS - INTERNATIONAL MECHANICAL CODE 2021 - 605
   D. SMOKE DETECTORS AND FIRE AND SMOKE DAMPERS - INTERNATIONAL MECHANICAL CODE 2021 606 & 607.
   E. MANUAL AND AUTOMATIC FIRE AND SMOKE CONTROLS FOR AIR DISTRIBUTION SYSTEMS -INTERNATIONAL MECHANICAL CODE 2021 - 513
5. MINIMUM TEMPERATURE TO BE MAINTAINED IN OCCUPIED SPACES DURING HEATING SEASON: 68 DEG. FAHRENHEIT.
6. A STATEMENT SHALL BE FILED BY THE OWNER OR TENANT IN POSSESSION THAT THE VENTILATION SYSTEM WILL BE KEPT IN CONTINUOUS OPERATION AT ALL TIMES DURING THE NORMAL OCCUPANCY OF THE STRUCTURE AS REQUIRED BYINTERNATIONAL MECHANICAL CODE 2021 - 403.3
7. REFER TO ARCHITECTURAL DRAWINGS FOR REQUIRED FIRE-RATED WALL AND SMOKE WALL CONSTRUCTION AND LOCATION.
8. THESE PLANS ARE APPROVED ONLY FOR THE WORK INDICATED ON THE APPLICATION SPECIFICATION SHEET. ALL OTHER MATTERS SHOWN ARE NOT TO BE RELIED UPON OR TO BE CONSIDERED AS EITHER BEING APPROVED OR IN ACCORDANCE WITH APPLICABLE CODES.
9. THE LICENSED PROFESSIONAL ENGINEER, ARCHITECT OR OTHER PERSON HAVING NOT LESS THAN FIVE (5) YEARS EXPERIENCE SUPERVISING THE INSTALLATION OF SUCH MECHANICAL SYSTEMS AND CONDUCTING SUCH TESTS WILL FILE DOCUMENTATION AND REPORTS OF TESTS THAT THE SYSTEM COMPLIES WITH THE CONSTRUCTION DOCUMENTS AND APPLICABLE LAWS.
10. VENTILATION SYSTEMS SHALL BE BALANCED TO MAINTAIN THE MINIMUM VENTILATION AIRFLOW RATE AS SHOWN IN VENTILATION REQUIREMENT TABLE. THIS SYSTEM SHALL BE BALANCED BY APPROVED METHOD - INTERNATIONAL MECHANICAL CODE 2021 SECTION 403.3.1.5 CONTRACTOR TO SUBMIT THE AIR - BALANCE REPORT TO INSPECTOR OF RESPECTIVE BUILDING DEPARTMENT PRIOR TO FINAL INSPECTION.

SCOPE OF WORK

1. THE WORK UNDER CONTRACT INCLUDES ALL LABOR, MATERIALS AND APPLIANCES NECESSARY FOR THE FURNISHING, INSTALLING AND TESTING, COMPLETE AND READY FOR SAFE OPERATION OF THE SYSTEMS AS DESCRIBED IN THE SPECIFICATIONS, FLOOR PLAN(S) DESIGN, DETAIL DRAWINGS, NOTES, RFI'S, ETC. FOR THIS PROJECT. WORK SHALL BE INSTALLED IN A NEAT, WORKMANLIKE MANNER.
2. THE CONTRACTOR SHALL GIVE NECESSARY NOTICE, FILE DRAWINGS AND SPECIFICATIONS WITH THE DEPARTMENT HAVING JURISDICTION, OBTAIN PERMITS OR LICENSES NECESSARY TO CARRY OUT THIS WORK AND PAY ALL FEES THEREFORE. THE CONTRACTOR SHALL ARRANGE FOR INSPECTION AND TESTS OF ANY OR ALL PARTS OF THE WORK IF SO REQUIRED BY AUTHORITIES AND PAY ALL CHARGES FOR SAME. THE CONTRACTOR SHALL PAY ALL COSTS FOR, AND FURNISH TO THE OWNER BEFORE FINAL BILLING, ALL CERTIFICATES NECESSARY AS EVIDENCE THAT THE WORK INSTALLED CONFORMS WITH ALL REGULATIONS WHERE THEY APPLY TO THIS WORK.
3. THE CONTRACTOR SHALL FURNISH A WRITTEN GUARANTEE TO REPLACE OR REPAIR PROMPTLY AND ASSUME RESPONSIBILITY FOR ALL EXPENSES INCURRED FOR ANY WORKMANSHIP AND EQUIPMENT IN WHICH DEFECTS DEVELOP WITHIN ONE YEAR FROM THE DATE OF FINAL CERTIFICATE FOR PAYMENT AND/OR FROM DATE OR ACTUAL USE OF EQUIPMENT OR OCCUPANCY OF SPACES, BY OWNER, INCLUDED UNDER THE VARIOUS PARTS OF THE WORK, WHICHEVER DATE IS EARLIER. THIS WORK SHALL BE DONE AS DIRECTED BY THE OWNER. THIS GUARANTEE SHALL ALSO PROVIDE THAT WHERE DEFECTS OCCUR, THE CONTRACTOR WILL ASSUME RESPONSIBILITY FOR ALL EXPENSES INCURRED IN REPAIRING AND REPLACING WORK OF OTHER TRADES AFFECTED BY DEFECTS, REPAIRS OR REPLACEMENTS IN EQUIPMENT SUPPLIED BY THE CONTRACTOR.

GENERAL NOTES

1. CONTRACTOR SHALL SURVEY THE AREA OF THIS WORK BEFORE SUBMITTING A BID AND SHALL BE RESPONSIBLE FOR NOTIFYING THE ARCHITECT OF ANY CONDITIONS WHICH WOULD PREVENT THE INSTALLATION OF THE WORK AS SHOWN ON DRAWINGS.
2. ALL APPLICABLE CODES, LAWS AND REGULATIONS GOVERNING OR RELATING TO ANY PORTION OF THIS WORK ARE HEREBY INCORPORATED INTO AND MADE A PART OF THESE SPECIFICATIONS, AND THEIR PROVISIONS SHALL BE CARRIED OUT BY THE CONTRACTOR WHO SHALL INFORM THE OWNER, PRIOR TO SUBMITTING A PROPOSAL, OF ANY WORK OR MATERIALS WHICH VIOLATE ANY OF THE ABOVE LAWS AND REGULATIONS. ANY WORK DONE BY THE CONTRACTOR CAUSING SUCH VIOLATION SHALL BE CORRECTED BY THE CONTRACTOR.
3. BEFORE PROCEEDING WITH ANY WORK IN OCCUPIED OR USED AREAS, THE CONTRACTOR SHALL APPLY TO OWNER FOR PERMISSION TO ENTER SUCH AREAS. THE CONTRACTOR IS OBLIGED TO PERFORM HIS WORK ONLY AT THE TIMES DESIGNATED BY OWNER. THERE WILL BE NO ADDITIONAL COMPENSATION FOR THE WORK PERFORMED AFTER HOURS OR ON OFF-DAYS WITHOUT PRIOR WRITTEN APPROVAL.
4. THE WORK IN THE BUILDING SHALL BE DONE WHEN AND AS DIRECTED, AND IN A MANNER SATISFACTORY TO THE OWNER. THE WORK SHALL BE PERFORMED SO AS TO CAUSE THE LEAST POSSIBLE INCONVENIENCE AND DISTURBANCE TO THE PRESENT OCCUPANTS.
5. THE CONTRACTOR'S PROPOSAL FOR ALL WORK SHALL BE PREDICATED ON THE PERFORMANCE OF THE WORK DURING REGULAR WORKING HOURS. WHEN SO DIRECTED, HOWEVER, THE CONTRACTOR SHALL INSTALL WORK IN OVERTIME AND THE ADDITIONAL COST TO BE CHARGED THEREFORE SHALL BE ONLY THE "PREMIUM" PORTION OF THE WAGES PAID.
6. CONTRACTOR SHALL ASCERTAIN THE APPROPRIATE METHOD FOR BRINGING THE UNITS INTO AND THROUGH THE BUILDING TO POSITION UNIT IN LOCATION SHOWN ON THE PLANS. WHERE NECESSARY, EQUIPMENT SHALL BE SHIPPED FROM MANUFACTURER IN SECTIONS OF SIZE SUITABLE FOR MOVING THROUGH RESTRICTIVE SPACES. COORDINATE WITH BUILDING OWNER APPROPRIATE TIMES OF DAY SUCH EQUIPMENT MAY BE MOVED THROUGH ALL AREAS.
7. DUCTWORK AND PIPING IS SHOWN DIAGRAMMATICALLY AND DOES NOT SHOW ALL OFFSETS, DROPS AND RISES OF RUNS. THE CONTRACTOR SHALL MAKE ALLOWANCE IN PRICING FOR ROUTING OF DUCTWORK AND PIPING TO AVOID OBSTRUCTIONS. EXACT LOCATIONS ARE SUBJECT TO APPROVAL OF ARCHITECT. COORDINATION WITH THE EXISTING SERVICES, INCLUDING THOSE OF OTHER TRADES IS REQUIRED.
8. SUPPORT ALL DUCTWORK AND PIPING FROM BUILDING STRUCTURE AND/OR FRAMING IN AN APPROVED MANNER. WHERE OVERHEAD CONSTRUCTION DOES NOT PERMIT FASTENING OR SUPPORTS FOR EQUIPMENT, FURNISH ADDITIONAL FRAMING. INSERTS SHALL BE STEEL, SLOTTED TYPE AND FACTORY PAINTED. SINGLE ROD SHALL BE SIMILAR TO GRINNELL FIG. 281. MULTI-ROD SHALL BE SIMILAR TO FEE & MASON SERIES 9000 WITH END CAPS AND CLOSURE STRIPS. MAXIMUM LOADING INCLUDING PIPES, DUCTWORK CONTENTS AND COVERING SHALL NOT EXCEED 75% OF RATED INSERT CAPABILITY. WHEN SUPPORTING FROM BUILDING USE BEAM CLAMPS IN APPROVED MANNER.
9. PROVIDE ALL NECESSARY FLASHING AND COUNTER FLASHING TO MAINTAIN THE WATERPROOFING INTEGRITY OF THIS BUILDING AS REQUIRED BY THE INSTALLATION OR REMOVAL OF PIPES, DUCTS, LOUVERS, CONDUIT, AND EQUIPMENT. PROVIDE EQUIPMENT CURBS AND DUNNAGE STEEL AS REQUIRED.
10. SEAL OPENINGS AROUND DUCTS AND PIPING THROUGH PARTITIONS, WALLS AND FLOORS (NOT IN SHAFTS) WITH MINERAL WOOL OR OTHER NONCOMBUSTIBLE MATERIAL (FIBERGLASS INSULATION IS NOT ACCEPTABLE).
11. WHERE PENETRATIONS THROUGH FIRE RATED WALLS ARE NOT FIRE PROOFED THIS CONTRACTOR SHALL BE RESPONSIBLE TO SEAL SAME TO MAINTAIN THE RATED INTEGRITY.
12. INSTALL WORK SO AS TO BE READILY ACCESSIBLE FOR OPERATION, MAINTENANCE AND REPAIR. MINOR DEVIATIONS FROM DRAWINGS MAY BE MADE TO ACCOMPLISH THIS, BUT CHANGES WHICH INVOLVE EXTRA COST SHALL NOT BE MADE WITHOUT APPROVAL.
13. ACCESS DOORS ARE REQUIRED FOR ALL BUILDING SERVICE VALVES THAT RUN THROUGH THE SPACE, AND ACCESS DOOR SHALL HAVE THE EQUAL RATED CAPACITY (1HR, 2HR, ETC.) AS WALL. COORDINATE ALL LOCATIONS OF ACCESS DOORS WITH THE ARCHITECT.
14. REMOVABLE ACCESS TILE AND/OR ACCESS DOOR ARE REQUIRED IN HUNG CEILINGS, SHAFTS AND WALLS FOR ALL VOLUME AND FIRE DAMPERS, AUTOMATIC DAMPERS AND ALL OTHER MECHANICAL EQUIPMENT AND DEVICES. HVAC CONTRACTOR TO FURNISH ACCESS LOCATION REQUIREMENTS TO GENERAL CONTRACTOR. ACCESS TILE IDENTIFICATION: PROVIDE BUTTONS, TABS, AND MARKERS TO IDENTIFY LOCATION OF CONCEALED VALVES, DAMPERS AND EQUIPMENT.
15. THE CONTRACTOR SHALL KEEP ALL EQUIPMENT AND MATERIALS, AND ALL PARTS OF THE BUILDING, EXTERIOR SPACES AND ADJACENT STREETS, SIDEWALKS AND PAVEMENTS, FREE FROM MATERIAL AND DEBRIS RESULTING FROM THE EXECUTION OF THIS WORK. EXCESS MATERIALS WILL NOT BE PERMITTED TO ACCUMULATE EITHER ON THE INTERIOR OR THE EXTERIOR.
16. UNLESS OTHERWISE SPECIFICALLY SPECIFIED, INCLUDE ALL CUTTING AND PATCHING OF EXISTING FLOORS, WALLS, PARTITIONS AND OTHER MATERIALS IN THE EXISTING BUILDING. THE CONTRACTOR SHALL RESTORE THESE AREAS TO ORIGINAL CONDITION.
17. MATERIALS AND WORKMANSHIP, UNLESS OTHERWISE NOTED, SHALL BE IN ACCORDANCE WITH BUILDING STANDARDS.
18. ALL EQUIPMENT SHALL BE PROVIDED WITH ONE YEAR WARRANTY PARTS AND LABOR AND FIVE YEARS ON COMPRESSORS. WARRANTY PERIOD BEGINS UPON PROJECT ACCEPTANCE
19. ALL MATERIAL AND EQUIPMENT TO BE NEW UNLESS OTHERWISE NOTED AND SHALL BE IN ACCORDANCE WITH BUILDING STANDARDS.
20. THE CONTRACTOR SHALL BE RESPONSIBLE FOR HIS WORK WITH ITS COMPLETION AND FINAL ACCEPTANCE AND SHALL REPLACE ANY OF THE SAME WHICH MAY BE DAMAGED, LOST, OR STOLEN WITHOUT ADDITIONAL COST TO THE OWNER.
21. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE FAILURE OF ANY DUCTWORK SYSTEM OR EQUIPMENT TO FUNCTION PROPERLY UPON COMPLETION OF HIS WORK UPON SAID SYSTEM OR EQUIPMENT.
22. SUBMIT SHOP DRAWING OF ALL WORK WHICH MUST BE APPROVED BY THE ARCHITECT AND ENGINEER BEFORE WORK COMMENCES.
23. ALL MATERIAL AND EQUIPMENT TO BE NEW UNLESS OTHERWISE NOTED AND SHALL BE IN ACCORDANCE WITH BUILDING STANDARDS.
24. INSURANCE: IN ACCORDANCE WITH BUILDING REQUIREMENTS THE CONTRACTOR SHALL INCLUDE A HOLD HARMLESS CLAUSE FOR OWNER AND ENGINEER.
25. THE FINAL ACCEPTANCE WILL BE MADE AFTER THE CONTRACTOR HAS ADJUSTED HIS EQUIPMENT, BALANCED THE VARIOUS SYSTEMS, DEMONSTRATED THAT IT FULFILLS THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS AND HAS FURNISHED ALL THE REQUIRED CERTIFICATES OF INSPECTION AND APPROVAL.
26. SPECIFICATIONS ARE OF SIMPLIFIED FORM AND INCLUDE INCOMPLETE SENTENCES. WORDS OR PHRASES SUCH AS "THE CONTRACTOR SHALL," "SHALL BE," "FURNISH," "PROVIDE," "A," "THE," AND "ALL" HAVE BEEN OMITTED FOR BREVITY.
27. WHERE A CONFLICT EXISTS BETWEEN THE DRAWINGS, THE SPECIFICATIONS OR ANY OTHER CONSTRUCTION DOCUMENT, THE ONE WITH THE MOST STRINGENT REQUIREMENT(S) SHALL APPLY.

DEFINITIONS:

1. "PROVIDE": TO SUPPLY, INSTALL AND CONNECT UP COMPLETE AND READY FOR SAFE AND REGULAR OPERATION THE PARTICULAR WORK REFERRED TO UNLESS SPECIFICALLY OTHERWISE NOTED.
2. "INSTALL": TO ERECT, MOUNT AND CONNECT COMPLETE WITH RELATED ACCESSORIES.
3. "FURNISH" OR "SUPPLY": TO PURCHASE, PROCURE, ACQUIRE AND DELIVER COMPLETE WITH RELATED ACCESSORIES.

GENERAL HVAC NOTES

1. PROVIDE ALL MATERIAL AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE MECHANICAL SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
2. CONTRACT DOCUMENT DRAWINGS FOR MECHANICAL WORK (HVAC, PLUMBING, AND FIRE PROTECTION) ARE DIAGRAMMATIC AND ARE INTENDED TO CONVEY SCOPE AND GENERAL ARRANGEMENT ONLY.
3. THE LOCATIONS OF ALL ITEMS SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS THAT ARE NOT FIXED BY DIMENSIONS ARE APPROXIMATE ONLY. THE EXACT LOCATIONS NECESSARY TO SECURE THE BEST CONDITIONS AND RESULTS MUST BE DETERMINED BY THE PROJECT SITE CONDITIONS AND SHALL HAVE THE APPROVAL OF THE ENGINEER BEFORE BEING INSTALLED. DO NOT SCALE DRAWINGS.
4. WHEN MECHANICAL WORK (HVAC, PLUMBING, SHEET METAL, FIRE PROTECTION, ETC.) IS SUBCONTRACTED, IT SHALL BE THE MECHANICAL CONTRACTOR'S RESPONSIBILITY TO COORDINATE SUBCONTRACTORS AND THE ASSOCIATED CONTRACTS. WHEN DISCREPANCIES ARISE PERTAINING TO WHICH CONTRACTOR PROVIDES A PARTICULAR ITEM OF THE MECHANICAL CONTRACT OR WHICH CONTRACTOR PROVIDES FINAL CONNECTIONS FOR A PARTICULAR ITEM OF THE MECHANICAL CONTRACT, IT SHALL BE BROUGHT TO THE ATTENTION OF THE MECHANICAL CONTRACTOR, WHOSE DECISION SHALL BE FINAL.
5. COORDINATE CONSTRUCTION OF ALL MECHANICAL WORK WITH ARCHITECTURAL, STRUCTURAL, CIVIL, ELECTRICAL WORK, ETC., SHOWN ON OTHER CONTRACT DOCUMENT DRAWINGS.
6. INSTALL ALL MECHANICAL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS.
7. WHERE TWO OR MORE ITEMS OF THE SAME TYPE OF EQUIPMENT ARE REQUIRED, THE PRODUCT OF ONE MANUFACTURER SHALL BE USED.
8. COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURERS' CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATION.
9. ALL CONTROL WIRE AND CONDUIT SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE AND ELECTRICAL DIVISION OF THE SPECIFICATION.
10. PROVIDE VIBRATION ISOLATION FOR ALL MECHANICAL EQUIPMENT TO PREVENT TRANSMISSION OF VIBRATION TO BUILDING STRUCTURE.
11. PROVIDE VIBRATION ISOLATORS FOR ALL PIPING SUPPORTS CONNECTED TO, AND WITHIN 50 FT. OF, ISOLATED EQUIPMENT (EXCEPT AT BASE ELBOW SUPPORTS AND ANCHOR POINTS) THROUGHOUT MECHANICAL EQUIPMENT ROOMS. DO THE SAME FOR SUPPORTS OF STEAM MAINS WITHIN 50 FT. OF BOILER OR PRESSURE-REDUCING VALVES.
12. LOCATE ALL TEMPERATURE, PRESSURE, AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH THE STRAIGHT SECTION OF PIPE OR DUCT UP- AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER FOR GOOD ACCURACY.

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13. WHERE BEAMS ARE INDICATED TO BE PENETRATED WITH DUCTWORK OR PIPING, COORDINATE DUCTWORK AND PIPING LAYOUT WITH BEAM OPENING SIZE AND OPENING LOCATIONS. COORDINATION SHALL BE DONE PRIOR TO THE FABRICATION OF DUCTWORK, CUTTING OF PIPING, OR FABRICATION OF BEAMS.

14. ALL MISCELLANEOUS STEEL REQUIRED TO ENSURE PROPER INSTALLATION AND AS SHOWN IN THE DETAILS FOR PIPING, DUCTWORK, AND EQUIPMENT (UNLESS OTHERWISE NOTED) SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR.

15. PROVIDE ACCESS PANELS FOR INSTALLATION IN WALLS AND CEILINGS, WHERE REQUIRED, TO SERVICE DAMPERS, VALVES, SMOKE DETECTORS, AND OTHER CONCEALED MECHANICAL EQUIPMENT. ACCESS PANELS SHALL BE TURNED OVER TO THE GENERAL CONTRACTOR FOR INSTALLATION. ACCESS PANELS SHALL HAVE THE EQUAL RATED CAPACITY (1HR, 2HR, ETC.) AS WALL.

16. MECHANICAL EQUIPMENT, DUCTWORK, AND PIPING SHALL NOT BE SUPPORTED FROM A METAL DECK.

17. ALL EQUIPMENT, PIPING, DUCTWORK, ETC., SHALL BE SUPPORTED AS DETAILED, SPECIFIED AND REQUIRED TO PROVIDE A VIBRATION-FREE INSTALLATION.

18. ALL DUCTWORK, PIPING, AND EQUIPMENT SUPPORTED FROM STRUCTURAL STEEL SHALL BE COORDINATED WITH THE GENERAL CONTRACTOR. ALL ATTACHMENTS TO STEEL BAR JOISTS, TRUSSES, OR JOIST GIRDERS SHALL BE AT PANEL POINTS. PROVIDE BEAM CLAMPS MEETING MSS STANDARDS. WELDING TO STRUCTURAL MEMBERS SHALL NOT BE PERMITTED. THE USE OF C-CLAMPS SHALL NOT BE PERMITTED.

19. LOCATIONS AND SIZES OF ALL FLOOR, WALL, AND ROOF OPENINGS SHALL BE COORDINATED WITH ALL OTHER TRADES INVOLVED.

20. ALL OPENINGS IN FIRE WALLS DUE TO DUCTWORK, PIPING, CONDUIT, ETC., SHALL BE FIRE STOPPED WITH A PRODUCT SIMILAR TO 3M OR APPROVED EQUAL.

21. ALL AIR CONDITIONING CONDENSATE DRAIN LINES FROM EACH AIR HANDLING UNIT AND ROOFTOP UNIT SHALL BE PIPED FULL SIZE OF THE UNIT DRAIN OUTLET, WITH "P" TRAP, AND PIPED TO THE NEAREST DRAIN. SEE THE DETAILS SHOWN IN THE DRAWINGS OR THE CONTRACT SPECIFICATIONS FOR THE DEPTH OF THE AIR CONDITIONING CONDENSATE TRAP.

22. REFER TO TYPICAL DETAILS FOR DUCTWORK, PIPING, AND EQUIPMENT INSTALLATION.

23. REINFORCEMENT, DETAILING, AND PLACEMENT OF CONCRETE SHALL CONFORM TO ASTM 315 AND ACI 318. CONCRETE SHALL CONFORM TO ASTM C94. CONCRETE WORK SHALL CONFORM TO ACI 318 PART ENTITLED "CONSTRUCTION REQUIREMENTS".COMPRESSIVE STRENGTH IN 28 DAYS SHALL BE 3,000 PSI. TOTAL AIR CONTENT OR EXTERIOR CONCRETE SHALL BE BETWEEN 5 AND 7 PERCENT BY VOLUME. SLUMP SHALL BE BETWEEN 3 AND 4 IN. CONCRETE SHALL BE CURED FOR 7 DAY AFTER PLACEMENT.

24. CONCRETE HOUSEKEEPING PADS TO SUIT MECHANICAL EQUIPMENT SHALL BE SIZED AND LOCATED BY THE MECHANICAL CONTRACTOR. MINIMUM CONCRETE PAD THICKNESS SHALL BE 6 IN. PAD SHALL EXTEND BEYOND THE EQUIPMENT A MINIMUM OF 6 IN. ON EACH SIDE. CONCRETE HOUSEKEEPING PADS SHALL BE PROVIDED BY THE GENERAL CONTRACTOR. IT SHALL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR TO COORDINATE THE SIZE AND LOCATION OF CONCRETE HOUSEKEEPING PADS WITH THE GENERAL CONTRACTOR.

25. ALL TESTS SHALL BE COMPLETED BEFORE ANY MECHANICAL EQUIPMENT OR PIPING INSULATION IS APPLIED.

26. TESTING, ADJUSTING, AND BALANCING AGENCY SHALL BE A MEMBER OF THE ASSOCIATED AIR BALANCE COUNCIL (AABC) OR THE NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB). TESTING, ADJUSTING, AND BALANCING SHALL BE PERFORMED IN ACCORDANCE WITH THE AABC STANDARDS.

SPECIFICATIONS

SECTION 0001 - NOTICE TO BIDDERS

1.1 BIDDERS REPRESENTATIONS

A. THE BIDDER BY MAKING A BID REPRESENTS THAT:

THE BIDDER HAS READ AND UNDERSTANDS THE BIDDING DOCUMENTS, TO THE EXTENT THAT SUCH DOCUMENTATION RELATES TO THE WORK FOR WHICH THE BID IS SUBMITTED, AND FOR OTHER PORTIONS OF THE PROJECT, IF ANY, BEING BID CONCURRENTLY OR PRESENTLY UNDER CONSTRUCTION.

B. THE BID IS MADE IN COMPLIANCE WITH THE BIDDING DOCUMENTS.

C. THE SPECIFICATIONS AND DRAWINGS ARE INTENDED TO SERVE JOINTLY AS A BASIS FOR THE BIDDER TO SUBMIT A CONTRACT PRICE FOR THE MATERIAL AND LABOR.

D. SHOULD CONFLICTS OR DISCREPANCIES OCCUR WITHIN THE BIDDING DOCUMENTS, THE ITEM OR ITEMS IN DISPUTE THAT REPRESENT THE GREATER COST SHALL PREVAIL IN THE FINAL BID.

E. THE BID IS BASED UPON THE MATERIALS, EQUIPMENT AND SYSTEMS REQUIRED BY THE BIDDING DOCUMENTS WITHOUT EXCEPTION.

1.2 EXISTING CONDITIONS AND COORDINATION

A. THE BIDDER HAS VISITED THE SITE, BECOME FAMILIAR WITH LOCAL CONDITIONS UNDER WHICH THE WORK IS TO BE PERFORMED AND HAS CORRELATED THE BIDDER'S PERSONAL OBSERVATIONS WITH THE REQUIREMENTS OF THE PROPOSED BIDDING DOCUMENTS.

B. THE BIDDER SHALL PROPOSE COORDINATION OF WORK SUCH THAT CONFLICTS WITH OTHER TRADES AND SPACE ALLOCATIONS ARE AVOIDED.

1.3 RESPONSIBILITIES

A. THE BIDDER UNDERSTANDS THAT ANY CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR THE TIMELY COMPLETION AND ACCEPTANCE OF THEIR WORK AND THAT ANY ITEMS DAMAGED, LOST OR STOLEN DURING TIME OF CONSTRUCTION SHALL BE REPAIRED OR REPLACED WITHOUT ANY ADDITIONAL COST TO THE OWNER.

B. THE BIDDER UNDERSTANDS THAT ANY PROPOSED WORK IN OCCUPIED TENANT SPACES SHALL BE PERFORMED DURING TIMES OF NON-TENANT OCCUPANCY OR AS SCHEDULED OR DIRECTED BY THE BUILDING MANAGER.

C. THE BIDDER UNDERSTANDS THAT ANY PROPOSED SHUT-DOWN OF EXISTING SYSTEMS DURING CONSTRUCTION SHALL BE PRE-ARRANGED WITH THE BUILDING MANAGER AND THAT SUCH SHUT-DOWNS ARE TO BE KEPT TO A MINIMUM.

END OF SECTION 0001

SECTION 0101 - QUALITY OF WORK

1.1 WORKMANSHIP

A. ALL WORK SHALL BE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL ACCEPTANCE.

B. ALL DEFECTS WHICH DEVELOP OR ARE DISCOVERED WITHIN THIS PERIOD SHALL BE REPAIRED BY THE CONTRACTOR TO THE SATISFACTION OF THE ARCHITECT OR BUILDING MANAGER AT NO ADDITIONAL COST TO THE OWNER.

C. UPON COMPLETION OF THE WORK THE CONTRACTOR SHALL REMOVE FROM THE SITE, ALL TOOLS, DEMOLISHED APPLIANCES AND ANY SURPLUS MATERIAL.

1.2 CODE COMPLIANCE

A. ALL WORK SHALL MEET ALL STATE AND LOCAL CODES HAVING JURISDICTION.

END OF SECTION 0101

SECTION 0102 -REQUIRED DOCUMENTS

1.1 SHOP DRAWINGS

A. A SET OF PRINTS FOR ANY MECHANICAL WORK INCLUDING BUT NOT LIMITED TO, DUCTWORK AND PIPING LAYOUT SHALL BE SUBMITTED FOR APPROVAL TO THE ENGINEER PRIOR TO CONSTRUCTION OR PURCHASE OF MATERIALS.

1.2 SUBMITTALS

A. EQUIPMENT SUBMITTALS OF ALL PROPOSED MECHANICAL AND ANCILLARY EQUIPMENT INCLUDING ALL ACCESSORIES SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW. ALL PERTINENT MODELS, SIZES, ACCESSORIES AND CHOICES SHALL BE CLEARLY CHECKED, PRINTED OR OTHERWISE INDICATED ON THE SUBMITTALS.

1.3 RECORD DRAWINGS

A. UPON COMPLETION OF THE WORK, A RECORD DRAWING SHALL BE SUBMITTED TO THE OWNER DEPICTING ALL SUBSEQUENT CHANGES, ADDITIONS AND OR CORRECTIONS TO THE CONTRACT DRAWINGS AND OR CONTRACT SCOPE MADE DURING CONSTRUCTION. THIS DRAWING SHALL REPRESENT A COMPLETE RECORD OF THE WORK INSTALLED.

1.4 EQUIPMENT OPERATING INSTRUCTIONS

A. ON COMPLETION AND ACCEPTANCE OF WORK, THIS CONTRACTOR SHALL FURNISH WRITTEN INSTRUCTIONS,EQUIPMENT MANUALS AND DEMONSTRATE TO THE OWNER THE PROPER OPERATION AND MAINTENANCE OF ALL EQUIPMENT AND APPARATUS FURNISHED UNDER THIS CONTRACT.

B. THESE INSTRUCTIONS SHALL BE TYPED ON 8-1/2 IN. X 11 IN. PAPER AND BOUND IN THREE-RING BINDERS WITH CLEAR ACETATE COVERS. THE CONTRACTOR SHALL GIVE THREE COPIES OF THE INSTRUCTIONS TO THE OWNER AND ONE ELECTRONIC COPY TO THE ENGINEER.

C. THE INSTRUCTION BOOKLET SHALL BE ORGANIZED IN SECTIONS, WITH ONE SECTION PER SYSTEM. THE COVER OF THE INSTRUCTION BOOKLET SHALL BEAR THE NAME, ADDRESS AND PHONE NUMBER OF THE PROJECT, ARCHITECT, ENGINEER, MECHANICAL CONTRACTOR AND SUBCONTRACTORS.

END OF SECTION 0102

SECTION 078413-PENETRATION FIRE-STOPPING

1.1 QUALITY ASSURANCE

A. INSTALLER QUALIFICATIONS: AN FM GLOBAL-APPROVED FIRE-STOP CONTRACTOR OR A UL-QUALIFIED FIRE-STOP CONTRACTOR.

B. FIRE-TEST-RESPONSE CHARACTERISTICS: UL, INTERTEK ETL SEMKO OR FM GLOBAL

1.2 PENETRATION FIRESTOPPING

A. PENETRATIONS IN FIRE-RESISTANCE-RATED WALLS: F-RATINGS PER ASTM E 814 OR UL 1479.

B. PENETRATIONS IN HORIZONTAL ASSEMBLIES: F- AND T-RATINGS PER ASTM E 814 OR UL 1479:

C. PENETRATIONS IN SMOKE BARRIERS: L-RATINGS PER UL 1479.

D. W-RATINGS: PER UL 1479.

1.3 INSTALLATION

A. IDENTIFICATION: PREPRINTED METAL OR PLASTIC LABELS.

1.4 FIELD QUALITY CONTROL

A. INSPECTION OF INSTALLED FIRE-STOPPING: BY OWNER-ENGAGED AGENCY ACCORDING TO ASTM E 2174.

1.5 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

WHERE UL-CLASSIFIED SYSTEMS ARE INDICATED, THEY REFER TO SYSTEM NUMBERS IN UL'S "FIRE RESISTANCE DIRECTORY" UNDER PRODUCT CATEGORY XHEZ.

FOR THE FOLLOWING SYSTEMS:

METALLIC AND NON-METALLIC PIPES, CONDUIT, OR TUBING, ELECTRICAL CABLES, CABLE TRAYS WITH ELECTRIC CABLES, MISCELLANEOUS ELECTRICAL PENETRANTS, INSULATED PIPES, GROUPINGS OF PENETRANTS, USE ON OR MORE THE FOLLOWING MATERIALS:

a. LATEX SEALANT
b. SILICONE SEALANT
c. INTUMESCENT PUTTY
d. MORTAR
h. SILICONE FOAM
i. PILLOWS/BAGS
j. INTUMESCENT WRAP STRIPS
k. INTUMESCENT COMPOSITE SHEET

1.6 MANUFACTURERS

1. HILTI CONSTRUCTION CHEMICAL, INC
2. TREMCO INC.
3. 3M FIRE PROTECTION PRODUCTS

END OF SECTION 078413

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

1.1 PERFORMANCE REQUIREMENTS

A. DELEGATED DESIGN: DESIGN TRAPEZE PIPE HANGERS AND EQUIPMENT SUPPORTS, INCLUDING COMPREHENSIVE ENGINEERING ANALYSIS BY A QUALIFIED PROFESSIONAL ENGINEER, USING PERFORMANCE REQUIREMENTS AND DESIGN CRITERIA INDICATED.

B. STRUCTURAL PERFORMANCE: HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT SHALL WITHSTAND THE EFFECTS OF GRAVITY LOADS AND STRESSES WITHIN LIMITS AND UNDER CONDITIONS INDICATED ACCORDING TO ASCE/SEI 7.

1. DESIGN SUPPORTS FOR MULTIPLE PIPES CAPABLE OF SUPPORTING COMBINED WEIGHT OF SUPPORTED SYSTEMS, SYSTEM CONTENTS, AND TEST WATER.
2. DESIGN EQUIPMENT SUPPORTS CAPABLE OF SUPPORTING COMBINED OPERATING WEIGHT OF SUPPORTED EQUIPMENT AND CONNECTED SYSTEMS AND COMPONENTS.

1.2 SUBMITTALS

A. SHOP DRAWINGS: SIGNED AND SEALED BY A PROFESSIONAL ENGINEER

1.3 QUALITY ASSURANCE

A. AWS D1.1/D1.1M, "STRUCTURAL WELDING CODE - STEEL."

1.4 COMPONENTS

A. METAL PIPE HANGERS AND SUPPORTS: CARBON OR STAINLESS STEEL

B. TRAPEZE PIPE HANGERS: CARBON OR STAINLESS STEEL

C. FIBERGLASS PIPE HANGERS: -CLEVIS, CENTURY COMPOSITES, COOPER B-LINE

D. METAL FRAMING SYSTEMS: MFMA MANUFACTURER

E. FIBERGLASS STRUT SYSTEMS: COOPER B-LINE

F. THERMAL-HANGER SHIELD INSERTS:

G. FASTENER SYSTEMS: POWDER-ACTUATED FASTENERS OR MECHANICAL-EXPANSION ANCHORS

H. PIPE STANDS: COMPACT, LOW TYPE, SINGLE PIPE, HIGH TYPE, SINGLE PIPE, HIGH TYPE, MULTIPLE PIPES, CURB-MOUNTED TYPE

I. EQUIPMENT SUPPORTS.

END OF SECTION 230529

SECTION 230548 - VIBRATION CONTROLS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 PERFORMANCE REQUIREMENTS

A. SEISMIC-RESTRAINT LOADING:

1. SITE CLASS AS DEFINED IN THE IBC: A, B
2. ASSIGNED SEISMIC USE GROUP OR BUILDING CATEGORY AS DEFINED IN THE IBC: I II III
   a. COMPONENT IMPORTANCE FACTOR: 1.0
   b. COMPONENT RESPONSE MODIFICATION FACTOR: 2.5
   c. COMPONENT AMPLIFICATION FACTOR: 2.5.
3. DESIGN SPECTRAL RESPONSE ACCELERATION AT SHORT PERIODS (0.2 SECOND) 18%
4. DESIGN SPECTRAL RESPONSE ACCELERATION AT 1-SECOND PERIOD: 8%

1.2 COMPONENTS

A. VIBRATION ISOLATORS:

1. ISOLATOR PADS: NEOPRENE, RUBBER, HERMETICALLY AND/OR SEALED COMPRESSED FIBERGLASS
2. MOUNTS: DOUBLE-DEFLECTION TYPE.
3. RESTRAINED MOUNTS: ALL DIRECTIONAL MOUNTINGS WITH SEISMIC RESTRAINT; CAST-DUCTILE-IRON HOUSING.
4. SPRING ISOLATORS: FREESTANDING, LATERALLY STABLE, OPEN-SPRING TYPE.
5. RESTRAINED SPRING ISOLATORS: FREESTANDING, STEEL, OPEN-SPRING TYPE WITH SEISMIC RESTRAINT.
6. HOUSED SPRING MOUNTS: DUCTILE-IRON OR STEEL HOUSING, WITH INTEGRAL, VERTICALLY ADJUSTABLE SEISMIC SNUBBERS.
7. ELASTOMERIC HANGERS: DOUBLE-DEFLECTION TYPE.
8. SPRING HANGERS: COMBINATION COIL-SPRING AND ELASTOMERIC-INSERT HANGERS WITH SPRING AND INSERT IN COMPRESSION.
9. SPRING HANGERS WITH VERTICAL-LIMIT STOP: COMBINATION COIL-SPRING AND ELASTOMERIC-INSERT HANGERS WITH SPRING AND INSERT IN COMPRESSION AND WITH VERTICAL-LIMIT STOP.
10. PIPE RISER RESILIENT SUPPORT: ALL-DIRECTIONAL, ACOUSTICAL PIPE ANCHOR.
11. RESILIENT PIPE GUIDES.

B. AIR-MOUNTING SYSTEMS:

1. AIR MOUNTS: FREESTANDING, SINGLE OR MULTIPLE, COMPRESSED-AIR BELLOWS.
2. RESTRAINED AIR MOUNTS: HOUSED COMPRESSED-AIR BELLOWS.

C. RESTRAINED VIBRATION ISOLATION ROOF-CURB RAILS: FACTORY-ASSEMBLED, FULLY ENCLOSED, INSULATED, AIR- AND WATERTIGHT CURB RAIL; WITH SPRING ISOLATORS MOUNTED ON ELASTOMERIC ISOLATION PADS, AND SNUBBER BUSHINGS.

D. VIBRATION ISOLATION EQUIPMENT BASES:

1. STEEL BASE: FACTORY-FABRICATED, WELDED, STRUCTURAL-STEEL BASES AND RAILS.
2. INERTIA BASE: FACTORY-FABRICATED, WELDED, STRUCTURAL-STEEL BASES AND RAILS READY FOR FIELD-APPLIED, CAST-IN-PLACE CONCRETE

1.3 FIELD QUALITY CONTROL

A. TESTING: BY EITHER: OWNER-ENGAGED AGENCY, CONTRACTOR-ENGAGED AGENCY, OR CONTRACTOR.

PART-2 PRODUCTS

1.4 VIBRATION ISOLATORS & SEISMIC-RESTRAINT DEVICES

A. AVAILABLE MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, MANUFACTURERS OFFERING PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

B. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:

1. ACE MOUNTINGS CO., INC.
2. AMBER/BOOTH COMPANY, INC.
3. CALIFORNIA DYNAMICS CORPORATION.
4. COOPER B-LINE, INC.; A DIVISION OF COOPER INDUSTRIES.
5. HILTI, INC.
6. ISOLATION TECHNOLOGY, INC.
7. KINETICS NOISE CONTROL.
8. LOOS & CO.; CABLEWARE DIVISION.
9. MASON INDUSTRIES.
10. TOLCO INCORPORATED; A BRAND OF NIBCO INC.
11. UNISTRUT; TYCO INTERNATIONAL, LTD.
12. VIBRATION ELIMINATOR CO., INC.
13. VIBRATION ISOLATION.
14. VIBRATION MOUNTINGS & CONTROLS, INC.

END OF SECTION 230548

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

1.1 SUMMARY

A. TESTING, ADJUSTING, AND BALANCING FOR THE FOLLOWING:

1. AIR SYSTEMS: CONSTANT-VOLUME.

1.2 QUALITY ASSURANCE

A. THE CONTRACTOR SHALL PROCURE THE SERVICES OF A TESTING, ADJUSTING AND BALANCING (TAB) SPECIALIST WHO SPECIALIZES IN HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS. THE TAB AGENT SHALL HAVE THE FOLLOWING QUALIFICATIONS: AABC, NEBB OR TABB CERTIFIED.

1.3 EXECUTION

A. THE TAB SPECIALIST SHALL PERFORM FLOW MEASUREMENTS OF ALL EXISTING AIR AND HYDRONIC SYSTEMS THAT ARE TO REMAIN OR TO BE INCORPORATED INTO NEW WORK PRIOR TO THE STARTING OF WORK IN THE PROJECT SCOPE. A REPORT OF THESE MEASUREMENTS, INDICATING ANY AND ALL DEFICIENCIES SHALL BE SUBMITTED FOR OWNER REVIEW.

B. THE TAB SPECIALIST SHALL PERFORM FLOW MEASUREMENTS OF ALL NEW AIR AND HYDRONIC SYSTEMS AS LISTED ABOVE IN THE PROJECT SCOPE. A REPORT OF THESE MEASUREMENTS, INDICATING ANY AND ALL DEFICIENCIES SHALL BE SUBMITTED FOR OWNER REVIEW.

C. THE REPORT SHALL INDICATE A SCHEMATIC DIAGRAM INDICATING LOCATIONS OF ALL EQUIPMENT TESTED AND MEASUREMENT LOCATIONS.

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D. PRIOR TO FINAL INSPECTION OF THE WORK, THE TAB SPECIALIST SHALL BALANCE ALL SYSTEMS AS INDICATED ABOVE TO THE REQUIREMENTS OF THE DESIGN.

E. THE CONTRACTOR SHALL HAVE FURNISH AND INSTALL ALL ADDITIONAL BALANCING EQUIPMENT, PRESSURE TAPS, GAUGES AND OTHER EQUIPMENT AS REQUIRED FOR A PROPERLY BALANCED SYSTEM AT NO ADDITIONAL COST TO THE OWNER. SUCH ADDITIONAL EQUIPMENT SHALL ADHERE IN STRICT ACCORDANCE WITH THE RESPECTIVE EQUIPMENT MANUFACTURER'S RECOMMENDATIONS.

F. THE CONTRACTOR SHALL HAVE THE TESTING AND BALANCING SPECIALIST COORDINATE ALL WORK OF THIS S3ECTION WITH THE BUILDING MANAGER. BALANCING WORK SHALL NOT CONFLICT WITH OTHER WORK SO AS TO MAINTAIN COMPLETION WITHIN THE SPECIFIED TIME.

G. ALL INSTRUMENTS USED FOR TAB SHALL BE MAINTAINED IN GOOD WORKING CONDITION AND ACCURATELY CALIBRATED.

H. TOLERANCES: PLUS OR MINUS 5 PERCENT OF DESIGN VALUES.

I. INSPECTIONS: RANDOM CHECKS BY OWNER OR ARCHITECT TO VERIFY FINAL TESTING, ADJUSTING, AND BALANCING REPORT.

J. ADDITIONAL TESTS: RANDOM TESTS WITHIN 90 DAYS OF COMPLETING TAB TO VERIFY BALANCE CONDITIONS AND SEASONAL TESTS.

END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

1.1 QUALITY ASSURANCE

SURFACE-BURNING CHARACTERISTICS: ALL INSULATION SHALL HAVE COMPOSITE (INSULATION JACKET OR FACING AND ADHESIVE USED TO ADHERE THE FACING OR JACKET TO THE INSULATION) A FLAME-SPREAD INDEX OF 25, AND SMOKE-DEVELOPED INDEX OF 50 FOR INSULATION INSTALLED INDOOR, 75, AND SMOKE-DEVELOPED INDEX OF 150 FOR INSULATION INSTALLED OUTDOORS; ACCORDING TO ASTME 84.

1.2 FIELD QUALITY CONTROL

A. FIELD INSPECTIONS: BY OWNER-ENGAGED AGENCY.

1.3 INDOOR DUCT AND PLENUM INSULATION SCHEDULE;

A. CONCEALED, RECTANGULAR, ROUND AND FLAT-OVAL, SUPPLY-RETURN, OUTDOOR-AND EXHAUST-AIR DUCT AND AIR PLENUM INSULATION:

B. FLEXIBLE ELASTOMERIC, MINERAL-FIBER BLANKET,
MINERAL-FIBER BOARD OR POLYOLEFIN WITH MINIMUM
INSTALLED THERMAL RESISTANCE AS FOLLOWS:
UNCONDITIONED SPACES WITHIN BUILDING: R-6
INDIRECTLY CONDITIONED SPACE: R-8
OUTSIDE OF BUILDING: R-8

1.4 ITEMS NOT INSULATED:

1. FIBROUS-GLASS DUCTS.
2. METAL DUCTS WITH DUCT LINER OR SUFFICIENT THICKNESS TO COMPLY WITH ENERGY CODE AND ASHRAE/IESNA 90.1.
3. FACTORY-INSILATED FLEXIBLE DUCTS.
4. FACTORY-INSULATED PLENUMS AND CASINGS.
5. FLEXIBLE CONNECTORS.
6. VIBRATION-CONTROL DEVICES.
7. 'FACTORY-INSULATED ACCESS PANELS AND DOORS.
8. DUCTS THAT HAVE INTERNAL ACOUSTICAL LINING.

1.5 PRODUCTS

A. THE FOLLOWING INSULATION MANUFACTURERS WILL BE ACCEPTABLE:
1. JOHNS-MANVILLE
2. OWENS-CORNING

1.6 ACOUSTICAL TREATMENT

1. WHERE SHOWN ON THE DRAWINGS, LOW PRESSURE DUCTWORK SHALL BE LINED WITH 1.5" THICK R-6 AS MANUFACTURED BY DUCTMATE, 1-1/2 POUND MINIMUM DENSITY, NEOPRENE COATED, FLEXIBLE FIBERGLASS DUCT LINER. LINING SHALL COMPLY WITH NFPA 90A AND SHALL HAVE A FLAME SPREAD CLASSIFICATION OF NOT MORE THAN 25 AND A SMOKE DEVELOPED RATING NOT MORE THAN 50. DUCT SIZES WHERE LINING IS INDICATED ON PLANS ARE MINIMUM INSIDE CLEAR DIMENSIONS REQUIRED,

END OF SECTION 230713

SECTION 233113 - METAL DUCTS

1.1 CONSTRUCTION

A. EACH DUCT SYSTEM SHALL BE CONSTRUCTED FOR THE SPECIFIC SMACNA DUCT PRESSURE CLASSIFICATIONS SHOWN ON THE CONTRACT DRAWINGS. WHERE NO PRESSURE CLASSES ARE SPECIFIED BY THE DESIGNER, THE SMACNA 1 INCH WG PRESSURE, SEAL CLASS "A".

B. ALL DUCTWORK SHALL BE CONSTRUCTED TO SMACNA 1" WG DESIGN AND NOT LESS THAN THE FOLLOWING STANDARDS:

1. CONSTRUCT SO THAT ALL INTERIOR SURFACES ARE SMOOTH. USE SLIP AND DRIVE OR FLANGED AND BOLTED CONSTRUCTION WHEN FABRICATING RECTANGULAR DUCTWORK. USE SPIRAL LOCK SEAM CONSTRUCTION WHEN FABRICATING ROUND SPIRAL DUCTWORK. SHEET METAL SCREWS MAY BE USED ON DUCT HANGERS, TRANSVERSE JOINTS AND OTHER SMACNA APPROVED LOCATIONS IF THE SCREW DOES NOT EXTEND MORE THAN 1/2 INCH INTO THE DUCT.
2. SHEET STEEL SHALL COMPLY WITH ASTMA653 STANDARD SPECIFICATION FOR STEEL SHEET METAL, ZINC COATED (GALVANIZED) OR ZINC IRON ALLOY-COATED (GALVANINEALED) BY HOT DIP PROCESS, AND A924 STANDARD SPECIFICATION FOR GENERAL REQUIREMENT FOR SHEET METALLIC COATED BY HOT DIP PROCESS. ALL ANGLE IRON USED FOR SUPPORT SHALL BE GALVANIZED. CONNECTIONS TO WALLS OR FLOOR SHALL BE AIR TIGHT WITH ANGLE IRON AND CAULKING. SEAL ALL DUCT SEAMS, TRANSVERSE AND LONGITUDINAL, AIR TIGHT. PROVIDE TURNING VANES ALL 90° ELBOWS.
3. LONGITUDINAL SEAMS FOR RECTANGULAR DUCTWORK SHALL BE PITTSBURGH LOCK SEAMS WITH SEALING COMPOUND, EQUAL TO BENJAMIN FOSTER NO. 30-03 INSERTED INTO SEAM. ALL SEAMS SHALL BE BRUSHED WITH NO. 30-02 AND COVERED WITH APPROVED SEALING TAPE.
4. RECTANGULAR DUCTWORK 18 GAUGE AND HEAVIER, FILLER RODS SHALL BE IN ACCORDANCE WITH SPECIFICATIONS FOR IRON AND STEEL GAS WELDING RODS, ASTM 215; AWS A5.2.

C. WHERE LATEST EDITION OF SMACNA DOES NOT CLEARLY STATE GAUGES AND/OR STIFFENERS TO BE USED OR, WHERE SMACNA STANDARDS REQUIRE INTERPRETATION, THE FOLLOWING MINIMUM METAL GAUGES AND BRACING SHALL BE USED:

USG	MAX. SIDE INCHES	TRANSVERSE JOINTS AND	BRACING
22	UP TO 12	S SLIP, DRIVE SLIP, ONE INCH	POCKET LOCK ON 8 FOOT CENTERS
22 13 TO 24	1"X1"X1/8" ANGLES ON 4		FOOT CENTERS
20 25 TO 35	1"X1"X1/8" ANGLES ON 2		FOOT CENTERS

D. PROVIDE TAPPING IN DUCTS FOR THERMOMETERS WHERE SPECIFIED. IN ADDITION, PROVIDE AN AIRTIGHT PLUGGED TAPPING LOCATED AS FOLLOWS:

1. UPSTREAM OF EACH REHEAT COIL AND VAV BOX.
2. DOWNSTREAM OF EACH REHEAT COIL AND VAV BOX.

FLAT OVAL OR ROUND DUCTWORK MAY BE PROVIDED IN LIEU RECTANGULAR DUCTWORK WITH THE REINFORCEMENT FOR FLAT SIDES SAME AS SPECIFIED FOR THE RECTANGULAR DUCTWORK, AND AS PER SMACNA FLAT OVAL DUCT CONSTRUCTION STANDARDS

E. ALL DUCTWORK SHALL BE SEALED TO CLASS "A" AND LEAK TESTED TO MEAT SMACNA CLASS 6 FOR RECTANGULAR AND CLASS 3 FOR ROUND DUCTS.

1.2 MATERIALS

A. SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS.
B. DOUBLE-WALL RECTANGULAR DUCTS AND FITTINGS.
1. FIBROUS-GLASS OR FLEXIBLE ELASTOMERIC DUCT LINER FOR INTERSTITIAL INSULATION.
2. PERFORATED INNER DUCT.
C. SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS.
D. DOUBLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS.
1. FIBROUS-GLASS OR FLEXIBLE ELASTOMERIC DUCT LINER FOR INTERSTITIAL INSULATION.
2. PERFORATED INNER DUCT.
E. SHEET METAL MATERIALS:
1. GALVANIZED SHEET STEEL.
2. PVC-COATED, GALVANIZED SHEET STEEL.
3. CARBON-STEEL SHEETS.
4. STAINLESS-STEEL SHEETS.
5. ALUMINUM SHEETS.
6. FACTORY-APPLIED ANTI-MICROBIAL COATING.

F. DUCT LINER:
1. FIBROUS GLASS, TYPE I, FLEXIBLE.
a. WITH ANTI-MICROBIAL EROSION-RESISTANT COATING.
2. FLEXIBLE ELASTOMERIC.
3. NATURAL FIBER.
G. SEALANT MATERIALS:
1. TWO-PART TAPE SEALING SYSTEM.
2. WATER-BASED JOINT AND SEAM SEALANT.
3. SOLVENT-BASED JOINT AND SEAM SEALANT.
4. FLANGED JOINT SEALANT.
5. FLANGE GASKETS.
6. ROUND DUCT JOINT O-RING SEALS.

1.3 SEISMIC-RESTRAINT DEVICES
A. CHANNEL SUPPORT SYSTEM.
B. STAINLESS-STEEL RESTRAINT CABLES.
C. HANGER ROD STIFFENER: STEEL TUBE OR STEEL SLOTTED-SUPPORT-SYSTEM SLEEVE WITH INTERNALLY BOLTED CONNECTIONS OR REINFORCING STEEL ANGLE CLAMPED TO HANGER ROD.

1.4 DUCT CLEANING
A. CLEAN EXISTING DUCT SYSTEM(S) BEFORE TESTING, ADJUSTING, AND BALANCING.
B. CLEAN THE FOLLOWING ITEMS:
1. AIR OUTLETS AND INLETS.
2. SUPPLY, RETURN, AND EXHAUST FANS.
3. AIR-HANDLING UNITS.
4. COILS AND RELATED COMPONENTS.
5. RETURN-AIR DUCTS, DAMPERS, ACTUATORS, AND TURNING VANES.
6. SUPPLY-AIR DUCTS, DAMPERS, ACTUATORS, AND TURNING VANES.

1.5 DUCT SCHEDULE
A. ALL DUCTS SHALL BE GALVANIZED STEEL EXCEPT AS FOLLOWS:
1. MOIST ENVIRONMENT DUCT MATERIAL: ALUMINUM.

END OF SECTION 233113

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

1.1 PRODUCTS
A. DIFFUSERS, REGISTERS AND GRILLES SHALL BE FURNISHED AND INSTALLED FOR CAPACITIES AND IN LOCATIONS INDICATED ON DRAWINGS. ALL REGISTERS AND DIFFUSERS SHALL BE PRIME COATED STEEL OR EXTRUDED ALUMINUM FINISHED UNLESS OTHERWISE NOTED IN BAKED WHITE ENAMEL.
B. MANUFACTURERS: TITUS
1. SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCT BY ONE OF THE FOLLOWING:
a. CARNES.
b. HART & COOLEY INC.
c. KRUEGER.
d. METALAIRE, INC.
e. NAILOR INDUSTRIES INC.
f. RUSKIN

C. ALL DIFFUSERS SHALL HAVE CONTROLLING/EQUALIZING GRID AND OPPOSED BLADE DAMPER UNLESS OTHERWISE NOTED.
D. ALL DUCTED RETURN REGISTERS SHALL HAVE AN OPPOSED BLADE DAMPER UNLESS OTHERWISE NOTED.
END OF SECTION 233713

PIPING INSULATION
A. INSULATE ALL PIPING IN ACCORDANCE WITH INSULATION SCHEDULE EXCEPT AS OTHERWISE NOTED.

B. PIPING, VALVES AND FITTINGS TO BE INSULATED:
1) LOW TEMPERATURE PIPING SYSTEMS - 0 TO 60 DEG F INCLUDING:

INSULATION SCHEDULE - PIPING

SERVICE	SIZE	MATERIAL FINISH
REFRIGERANT PIPING	1.5"	P-6
CONDENSER DRAIN PIPING (IF RUNNING THROUGH EXTERIOR WALL)	1.0"	P-6

2)PROTECTIVE COVERINGS SHALL BE INSTALLED ON AREAS OF INSULATION THAT ARE EXPOSED TO WEATHER OR SUBJECT TO MECHANICAL DAMAGE. THE PROTECTIVE COVERING SHALL
BE:
a. ARMA-CHEK SILVER" MULTI-LAYER LAMINATE OF ALUMINUM, COATED WITH A UV PROTECTIVE FILM AND BACKED WITH A FLEXIBLE PVC FILM. THE MATERIAL SHOULD BE ADHERED WITH ARMAFLEX 520 ADHESIVE OR EQUIVALENT, AND ALL JOINS AND SEAMS SECURED WITH "ARMA-CHEK SILVER TAPE". INSTALLATION SHALL BE IN ALL CASES TO THE MANUFACTURER'S RECOMMENDATIONS.
OR
b. HIGH DENSITY RUBBER CLADDING OF THE "ARMA-CHECK R" TYPE BONDED USING AN APPROPRIATE FULL CONTACT ADHESIVE WITH A MINIMUM 50 MM OVERLAP AT ALL BUTT JOINTS AND LONGITUDINAL SEAMS. A WEATHER-PROOF MASTIC SEALANT SHALL BE APPLIED OVER ALL SEAMS AND JOINTS. ALL MATERIAL SHALL BE OVERLAPPED AND STAGGERED IN SUCH A WAY AS TO ENSURE A WATERSHED IS ALWAYS PROVIDED. INSTALLATION SHALL BE IN ALL CASES TO THE MANUFACTURER'S RECOMMENDATIONS. ALL EXCESS ADHESIVE VISIBLE ON THE SURFACE OF THE COMPLETED ASSEMBLY SHALL BE REMOVED USING AN APPROPRIATE CLEANING MATERIAL.
OR
c. METAL CLADDING, COMPRISED OF COATED SHEET METAL, WITH ALL EXTERNAL JOINTS AND FIXING MADE WEATHER-PROOF WITH SILICONE SEALANT.

C. MATERIAL:
1) TYPE P-1: MINIMUM 4 LB DENSITY MOLDED FIBERGLASS, MAXIMUM 0.24 K-FACTOR AT 75 DEG F MEAN TEMPERATURE WITH FACTORY-APPLIED FIRE-RETARDANT FOIL-SKRIM-KRAFT FACING, ALL SERVICE JACKET. SIMILAR TO OWENS-CORNING 650 ASJ.
2) TYPE P-3: MINIMUM 4 LB DENSITY MOLDED FIBERGLASS FITTING, MAXIMUM 0.23 K-FACTOR AT 75 DEG F MEAN TEMPERATURE SIMILAR TO EPOLUX HAMFAB MOLDED FITTINGS.
3) TYPE P-4: MINIMUM 1 LB DENSITY FIBERGLASS FITTING INSERTS, MAXIMUM 0.27 K-FACTOR AT 75 DEG F MEAN TEMPERATURE SIMILAR TO MANVILLE HI-LO TEMP INSULATION INSERTS.
4) TYPE P-6: MINIMUM 6 LB MOLDED FOAMED PLASTIC. MAXIMUM 0.27 K-FACTOR AT 75 DEG F MEAN TEMPERATURE. MAXIMUM 0.17 PERMEANCE. SIMILAR TO ARMSTRONG ARMAFLEX II.

D. FINISH:
1) TYPE F-1: FITTING COVER, MOLDED WHITE PVC JACKET, UL CLASS 1, MAXIMUM PERMEANCE 0.05 SIMILAR TO MANVILLE ZESTRON.
2) TYPE F-2: WHITE VAPOR BARRIER COATING WITH 10X10 OR 20X20 MESH WHITE GLASS, POLYESTER OR NYLON CLOTH REINFORCING MEMBRANE, MINIMUM 31 MIL DRY FILM THICKNESS, SIMILAR TO FOSTER TITE-FIT, UL LABEL.
3) TYPE F-4: ALUMINUM JACKETING WITH MINIMUM 0.016 IN. WALL THICKNESS AND LONGITUDINAL JOINTS WITH LOCK SEAMS.
4) TYPE F-6: WHITE FINISHING AND INSULATING CEMENT APPLIED OVER HEXAGONAL WIRE MESH. CEMENT SIMILAR TO KEENE SUPERSLICK.

E. INSTALLATION:
1) BEFORE APPLYING INSULATION ALL PRESSURE AND LEAK TESTS SHALL BE COMPLETED AND APPROVED.
2) ALL INSULATION SHALL BE BUTTED FIRMLY TOGETHER. PROVIDE 2 IN. LAMP STRIPS AT ALL SEAMS SECURED WITH ADHESIVE. USE VAPOR BARRIER TAPE AND VAPORSEAL ADHESIVE WHERE REQUIRED. STAPLES NOT PERMITTED. REFRIGERANT PIPING INSULATION SHALL HAVE MITERED FITTINGS.
3) ALL INSULATION AND VAPOR BARRIERS SHALL BE CONTINUOUS PASSING THROUGH SLEEVES, HANGERS, ETC., OR OTHER OPENINGS. PROVIDE SADDLES OR SHIELDS FOR PROTECTION AT ALL HANGINGS.
4) INSULATION FOR STRAINERS OR OTHER FITTINGS OR ACCESSORIES REQUIRING SERVICING OR INSPECTION SHALL HAVE INSULATION REMOVABLE AND REPLACEABLE WITHOUT DAMAGE.

THERMOSTATIC CONTROL NOTES

6.4.3.1 ZONE THERMOSTATIC CONTROLS

6.4.3.1.1 GENERAL

THE SUPPLY OF HEATING AND COOLING ENERGY TO EACH ZONE SHALL BE INDIVIDUALLY CONTROLLED BY THERMOSTATIC CONTROLS RESPONDING TO TEMPERATURE WITHIN THE ZONE. FOR THE PURPOSES OF THIS SECTION, A DWELLING UNIT SHALL BE PERMITTED TO BE CONSIDERED A SINGLE ZONE.

EXCEPTIONS TO 6.4.3.1.1

INDEPENDENT PERIMETER SYSTEMS THAT ARE DESIGNED TO OFFSET ONLY BUILDING ENVELOPE LOADS SHALL BE PERMITTED TO SERVE ONE OR MORE ZONES ALSO SERVED BY AN INTERIOR SYSTEM, PROVIDED THAT

THE PERIMETER SYSTEM INCLUDES AT LEAST ONE THERMOSTATIC CONTROL ZONE FOR EACH BUILDING EXPOSURE HAVING WALLS FACING ONLY ONE ORIENTATION FOR 50 CONTIGUOUS FEET OR MORE AND

THE PERIMETER SYSTEM HEATING AND COOLING SUPPLY IS CONTROLLED BY THERMOSTATIC CONTROLS LOCATED WITHIN THE ZONES SERVED BY THE SYSTEM.

EXTERIOR WALLS AND SEMIEXTERIOR WALLS ARE CONSIDERED TO HAVE DIFFERENT ORIENTATIONS IF THE EXPOSURES THEY FACE DIFFER BY MORE THAN 45 DEGREES.

6.4.3.1.2 DEAD BAND

WHERE USED TO CONTROL BOTH HEATING AND COOLING, ZONE THERMOSTATIC CONTROLS SHALL BE CAPABLE OF AND CONFIGURED TO PROVIDE A TEMPERATURE RANGE OR DEAD BAND OF AT LEAST 5°F WITHIN WHICH THE SUPPLY OF HEATING AND COOLING ENERGY TO THE ZONE IS SHUT OFF OR REDUCED TO A MINIMUM.

EXCEPTIONS TO 6.4.3.1.2

THERMOSTATS THAT REQUIRE MANUAL CHANGEOVER BETWEEN HEATING AND COOLING MODES.

SPECIAL OCCUPANCY OR SPECIAL APPLICATIONS WHERE WIDE TEMPERATURE RANGES ARE NOT ACCEPTABLE (SUCH AS RETIREMENT HOMES, PROCESS APPLICATIONS, MUSEUMS, SOME AREAS OF HOSPITALS) AND ARE APPROVED BY THE AUTHORITY HAVING JURISDICTION.

6.4.3.2 SET-POINT OVERLAP RESTRICTION

WHERE HEATING AND COOLING TO A ZONE ARE CONTROLLED BY SEPARATE ZONE THERMOSTATIC CONTROLS LOCATED WITHIN THE ZONE, MEANS (SUCH AS LIMIT SWITCHES; MECHANICAL STOPS; OR, FOR DDC SYSTEMS, SOFTWARE PROGRAMMING) SHALL BE PROVIDED TO PREVENT THE HEATING SET POINT FROM EXCEEDING THE COOLING SET POINT, MINUS ANY APPLICABLE PROPORTIONAL BAND.

6.4.3.3 OFF-HOUR CONTROLS

HVAC SYSTEMS SHALL HAVE THE OFF-HOUR CONTROLS REQUIRED BY SECTIONS 6.4.3.3.1 THROUGH 6.4.3.3.5.

EXCEPTIONS TO 6.4.3.3

HVAC SYSTEMS INTENDED TO OPERATE CONTINUOUSLY.

HVAC SYSTEMS HAVING A DESIGN HEATING CAPACITY AND COOLING CAPACITY LESS THAN 15,000 BTU/H THAT ARE EQUIPPED WITH READILY ACCESSIBLE MANUAL ON/OFF CONTROLS.

6.4.3.3.1 AUTOMATIC SHUTDOWN

HVAC SYSTEMS SHALL BE EQUIPPED WITH AT LEAST ONE OF THE FOLLOWING:

CONTROLS THAT CAN START AND STOP THE SYSTEM UNDER DIFFERENT TIME SCHEDULES FOR SEVEN DIFFERENT DAY TYPES PER WEEK, ARE CAPABLE OF RETAINING PROGRAMMING AND TIME SETTING DURING LOSS OF POWER FOR A PERIOD OF AT LEAST TEN HOURS, AND INCLUDE AN ACCESSIBLE MANUAL OVERRIDE OR EQUIVALENT FUNCTION THAT ALLOWS TEMPORARY OPERATION OF THE SYSTEM FOR UP TO TWO HOURS.

AN OCCUPANCY SENSOR THAT IS CAPABLE OF SHUTTING THE SYSTEM OFF WHEN NO OCCUPANT IS SENSED FOR A PERIOD OF UP TO 30 MINUTES.

A MANUALLY OPERATED TIMER CAPABLE OF BEING ADJUSTED TO OPERATE THE SYSTEM FOR UP TO TWO HOURS.

AN INTERLOCK TO A SECURITY SYSTEM THAT SHUTS THE SYSTEM OFF WHEN THE SECURITY SYSTEM IS ACTIVATED.

EXCEPTION TO 6.4.3.3.1

RESIDENTIAL OCCUPANCIES MAY USE CONTROLS THAT CAN START AND STOP THE SYSTEM UNDER TWO DIFFERENT TIME SCHEDULES PER WEEK.

6.4.3.3.2 SETBACK CONTROLS

HEATING SYSTEMS SHALL BE EQUIPPED WITH CONTROLS CAPABLE OF AND CONFIGURED TO AUTOMATICALLY RESTART AND TEMPORARILY OPERATE THE SYSTEM AS REQUIRED TO MAINTAIN ZONE TEMPERATURES ABOVE AN ADJUSTABLE HEATING SET POINT AT LEAST 10°F BELOW THE OCCUPIED HEATING SET POINT. COOLING SYSTEMS SHALL BE EQUIPPED WITH CONTROLS CAPABLE OF AND CONFIGURED TO AUTOMATICALLY RESTART AND TEMPORARILY OPERATE THE MECHANICAL COOLING SYSTEM AS REQUIRED TO MAINTAIN ZONE TEMPERATURES BELOW AN ADJUSTABLE COOLING SET POINT AT LEAST 5°F ABOVE THE OCCUPIED COOLING SET POINT OR TO PREVENT HIGH SPACE HUMIDITY LEVELS.

EXCEPTION TO 6.4.3.3.2

RADIANT HEATING SYSTEMS CAPABLE OF AND CONFIGURED WITH A SETBACK HEATING SET POINT AT LEAST 4°F BELOW THE OCCUPIED HEATING SET POINT.

6.4.3.3.3 OPTIMUM START CONTROLS

INDIVIDUAL HEATING AND COOLING SYSTEMS WITH SETBACK CONTROLS AND DDC SHALL HAVE OPTIMUM START CONTROLS. THE CONTROL ALGORITHM SHALL, AS A MINIMUM, BE A FUNCTION OF THE DIFFERENCE BETWEEN SPACE TEMPERATURE AND OCCUPIED SET POINT, THE OUTDOOR TEMPERATURE, AND THE AMOUNT OF TIME PRIOR TO SCHEDULED OCCUPANCY. MASS RADIANT FLOOR SLAB SYSTEMS SHALL INCORPORATE FLOOR TEMPERATURE INTO THE OPTIMUM START ALGORITHM.

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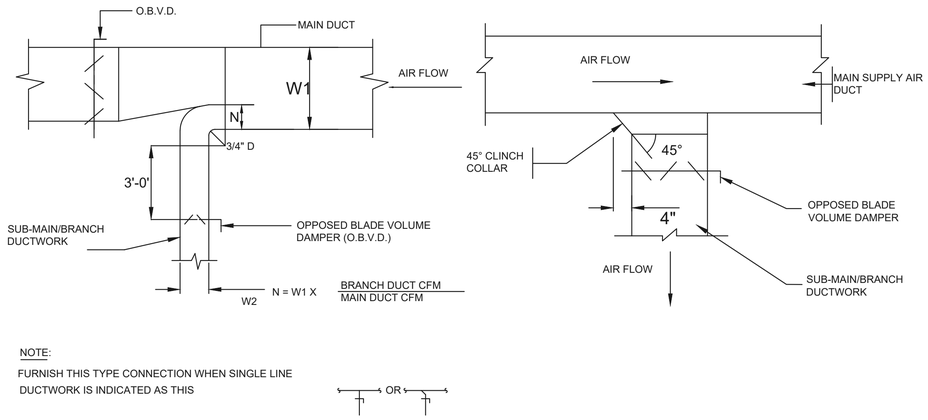
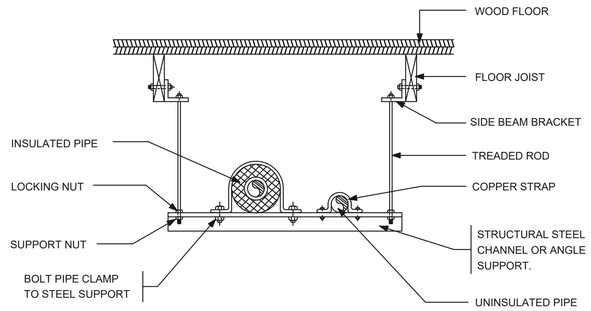


NOTE:
FURNISH THIS TYPE CONNECTION WHEN SINGLE LINE DUCTWORK IS INDICATED AS THIS

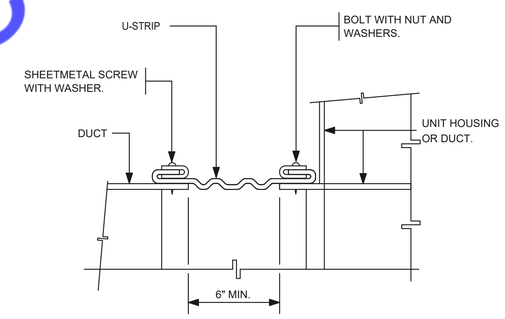
1 / M-101 SUPPLY AIR DUCTWORK SUB-MAIN/BRANCH DUCT CONNECTION
N.T.S



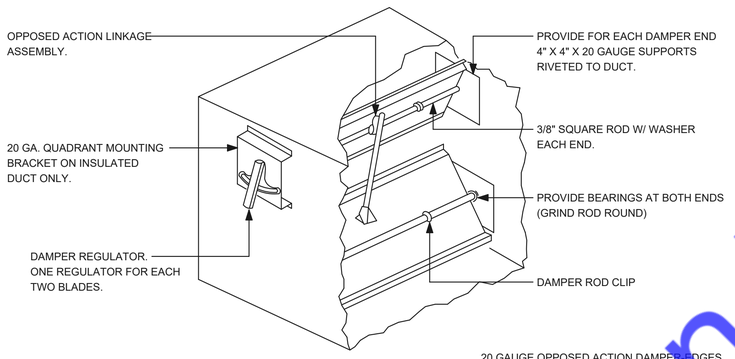
TYPICAL TRAPEZE HANGER SUPPORT

PIPE HANGER ROD AND SPACING SCHEDULE												
NOMINAL PIPE OR TUBE SIZE - INCHES	5/8	3/4	7/8	1	1 1/2	2	2 1/2	-	-	-	-
HANGER ROD SIZES INCHES	3/8	3/8	3/8	3/8	3/8	3/8	3/8	-	-	-	-	-
MAX. SPACING BETWEEN PIPE SUPPORTS - FEET	-	6	-	7	9	10	11	-	-	-	-	-
MAX. SPACING BETWEEN CU. TUBE SUPPORTS-FT.	6	6	6	6	8	9	10	-	-	-	-	-
NOTES : TRAPEZE HANGER SPACING SHALL BE BASED ON SPACING OF SMALLEST PIPE ON TRAPEZE. TRAPEZE SHALL BE DESIGNED WITH A FACTOR OF SAFETY OF 5 FOR CENTER OF SPAN CONCENTRATED LOAD.												

2 / M-101 METHOD OF HANGING REFRIGERANT PIPING
N.T.S

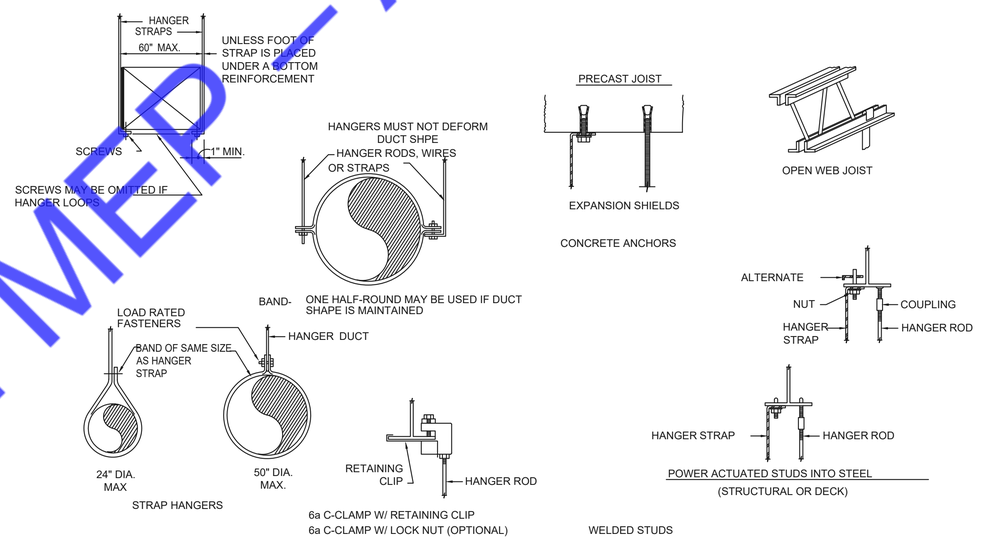


3 / M-101 FLEXIBLE CONNECTION (DUCT-EQUIPMENT)
N.T.S



NOTE : 1. FOR DUCTS OVER 29" WIDE AND/OR OVER 12" HIGH.

4 / M-101 LOW PRESSURE BALANCING DAMPER
N.T.S



5 / M-101 UPPER & LOWER ATTACHMENTS & DEVICES
N.T.S

NOTES:
DUCTS TO BE ACOUSTICALLY LINED SHALL BE DESIGNATED BY THE SYMBOL IN FIG. "C" TO THE EXTENT OF LINING. THICKNESS SHALL BE AS SPECIFIED.
DUCTS LINED WITH ACOUSTICAL MATERIAL SHOULD BE FASTENED WITH CLIPS, ADHESIVE, OR PINS

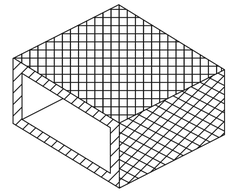


FIG. A

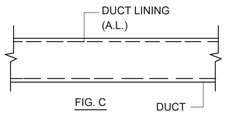


FIG. C

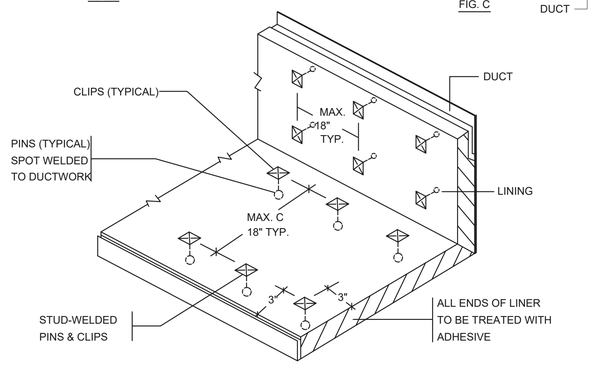


FIG. B

6 / M-101 ACOUSTICAL TREATMENT DUCT LINING
N.T.S

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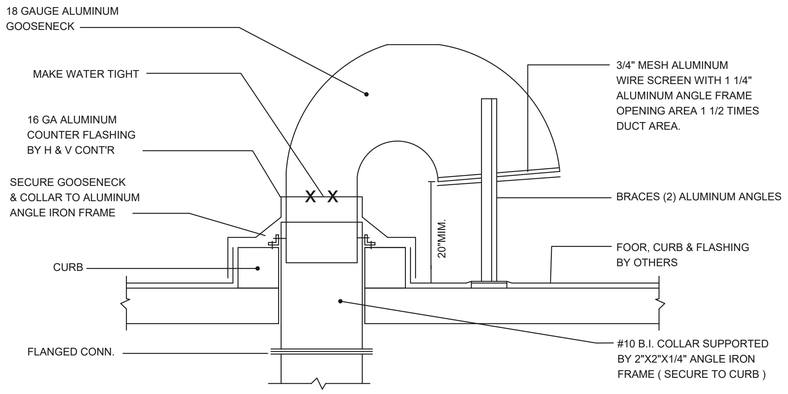
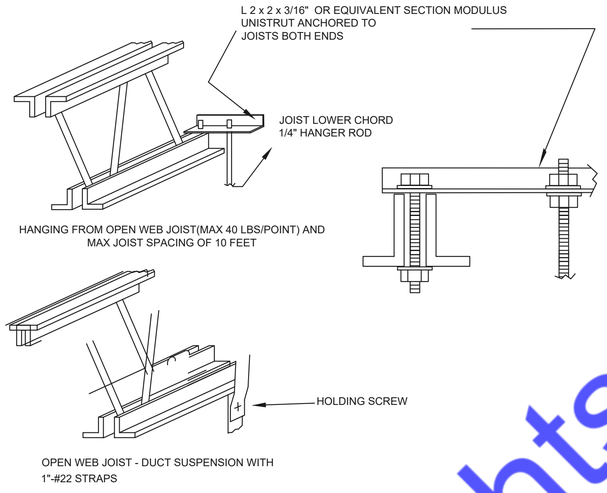
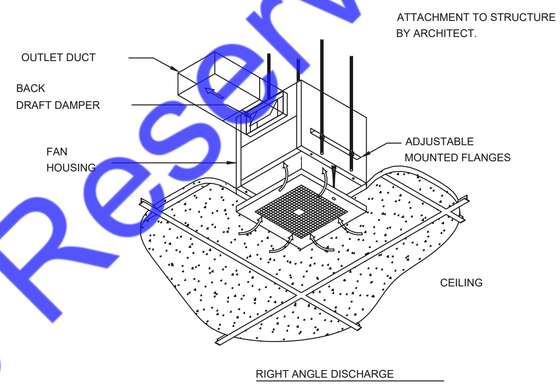


1 M-102 TYPICAL DETAIL OF ROOF GOOSENECK
N.T.S

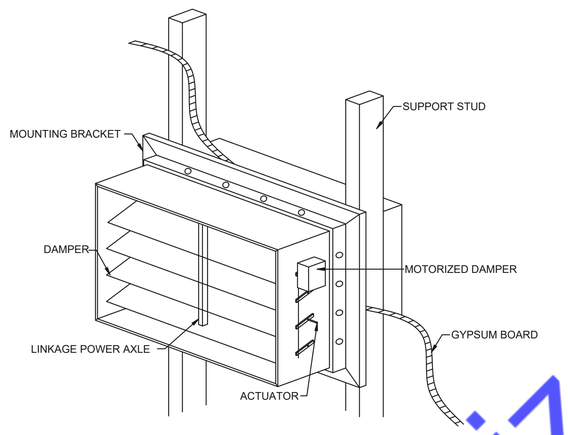


2 M-102 DUCT MOUNTING DETAIL
N.T.S

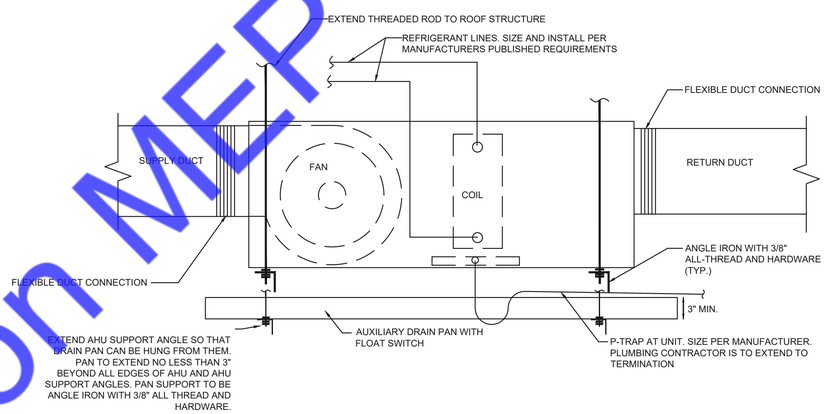


RIGHT ANGLE DISCHARGE

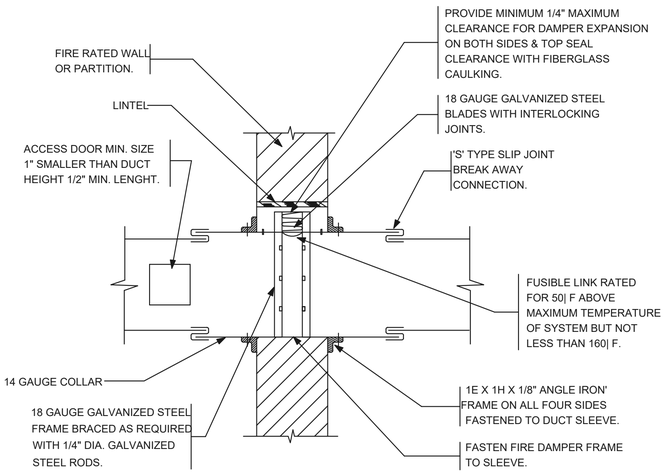
3 M-102 CEILING FAN HANGING SUPPORT DETAIL
N.T.S



4 M-102 MOTORIZED DAMPER DETAIL
N.T.S



5 M-102 TYPICAL HORIZONTAL AIR HANDLER DETAIL
N.T.S



VERTICAL MOUNT

6 M-102 SHUTTER TYPE FIRE DAMPER
N.T.S

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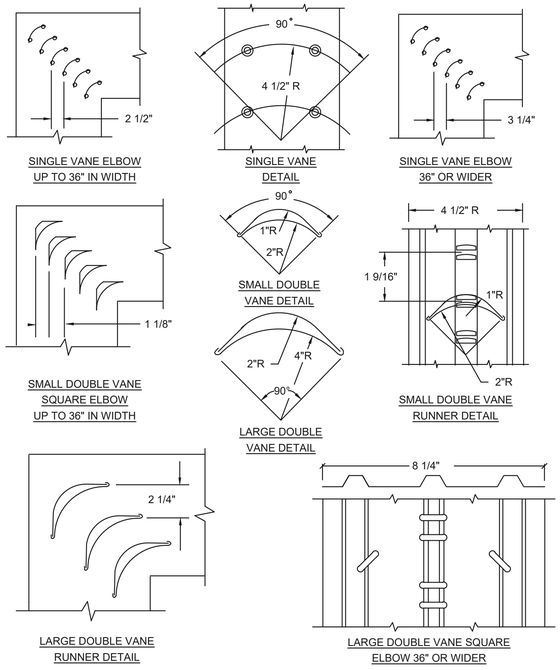
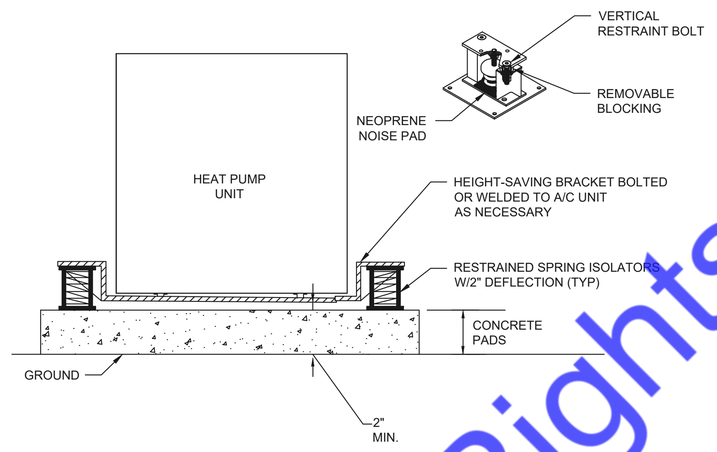


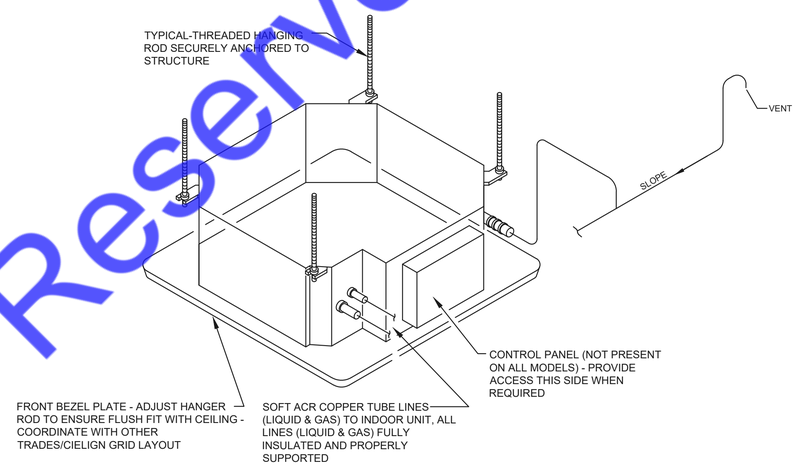
1 M-103 LOW VELOCITY DUCTWORK ELBOWS N.T.S

VIBRATION ISOLATOR SPECIFICATION:

1. PROVIDE KINETIC FLS-2 VIBRATION ISOLATOR.
2. VERTICALLY AND LATERALLY RESTRAINED SPRING ISOLATOR WITH CONSTANT FREE AND OPERATING HEIGHT AND REPLACEABLE NEOPRENE SNUBBING ELEMENTS.
3. WHEN PROPERLY ADJUSTED, MAX. CLEARANCE IN SNUBBING ELEMENTS IS LIMITED TO 0.25 INCHES
4. MINIMUM COIL OVERLOAD OF 50%.
5. MINIMUM Kx/Ky RATIO (DEFKECTION) OF 2.
6. POWDER COATED COILS AND HOT DIPPED GALVANIZED BRACKET.
7. HOUSINGS MAY BE USED FOR BLOCKING DURING EQUIPMENT ERECTION.
8. POWDER COATED COILS AND HOT DIPPED GALVANIZED BRACKET



2 M-103 OUTDOOR UNIT INSTALLATION DETAILS N.T.S



3 M-103 CASSETTE UNIT DETAIL N.T.S

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HEAT PUMP VRF UNIT SCHEDULE (OUTDOOR)

TAG	LOCATION	STATUS	NO OF MODULES	INDOOR UNIT SERVED	TON	NOMINAL COOLING	NOMINAL HEATING	DIMENSIONS (HxWxD) (IN.)	WEIGHT (LBS)	REFRIGERANT	PIPE DIA. (IN.)		ELECTRICAL DATA			EER	IEER	COP	MANUFACTURER	MODEL
											LIQ.	GAS	VOLT/PH//HZ	MCA (A)	MOCP (A)					
HP-1(N)	SEE PLAN	NEW	2	AC-1(N) TO AC-8(N)	12.0	144 (72 + 72)	160 (80 + 80)	2 X (71 x 36 x 30)	2 X 591	R32	3/8	7/8	208/3/60	51 x 2	60 x 2	13.50	22.90	4.02	MITSUBISHI (OR EQUIVALENT)	PUHY-HM144TSXU-A (OR EQUIVALENT)

NOTES :-

1. UNIT SHALL HAVE TEN YEAR EXTENDED WARRANTY FOR COMPRESSORS/PARTS.
2. PROVIDE COMPRESSOR CYCLE PROTECTOR.
3. CONTRACTOR SHALL PROVIDE A LONG LINE SET FOR REFRIGERANT PIPING IN THE EVENT THAT TOTAL REFRIGERANT LENGTH EXCEED THE MANUFACTURER'S STANDARD RECOMMENDED LENGTH.
4. OUDOOR HEATPUMPUNITS TO BE LOCATED WITH PROPER CLEARANCES AND MUST PREVENT RE-CIRCULATION OF AIR. COORDINATE WITH MANUFACTURER AND ARCHITECT.
5. HEAT PUMP UNIT SHALL NOT PRODUCE NOISE LEVELS IN EXCESS OF 42 DECIBELS FOR A SINGLE AIR CIRCULATING DEVICE AND 45 DECIBELS FOR THE CUMULATIVE NOISE LEVEL OF MULTIPLE AIR CIRCULATING DEVICES AS MEASURED 3 FEET FROM THE NOISE SOURCE AT AN OPEN DOOR OR WINDOW OF A NEARBY RESIDENCE.

VRF INDOOR UNIT SCHEDULE

TAG	AREA SERVED	STATUS	TYPE	CAPACITY (TON)	QUANTITY	NOMINAL COOLING CAPACITY (MBH)	NOMINAL HEATING CAPACITY (MBH)	SUPPLY AIRFLOW (CFM)	OA AIRFLOW (CFM)	ELECTRICAL DATA			DIMENSIONS (WxDxH) (IN.)	REFRIGERANT PIPE SIZE (IN.)		WEIGHT (LBS.)	MANUFACTURER	MODEL NO.
										V/ PZ / HZ	MCA	MOCP		LIQUID	SUCTION			
AC-1(N) TO AC-5(N)	SEE PLAN	NEW	CEILING CASSETTE	0.5	5.0	6.7	6.7	494	50 EACH	208/1/60	0.24	15	33 x 33 x 10	1/4	1/2	46.0	MITSUBISHI (OR EQUIVALENT)	PLFY-EM06NEMU-A (OR EQUIVALENT)
AC-6(N)	SEE PLAN	NEW	CEILING CASSETTE	4.0	1.0	48.0	54.0	1236	130	208/1/60	1.26	15	33 x 33 x 12	3/8	5/8	57.0	MITSUBISHI (OR EQUIVALENT)	PLFY-EM48NEMU-A (OR EQUIVALENT)
AC-7(N) TO AC-8(N)	SEE PLAN	NEW	CEILING CONCEALED	4.0	2.0	48.0	54.0	1306	320 EACH	208/1/60	3.38	15	55 x 29 x 10	3/8	5/8	86.0	MITSUBISHI (OR EQUIVALENT)	PEFY-M48NMAU-A (OR EQUIVALENT)

NOTES :-

1. SUPPLY AIR CFM BASED ON HIGH SPEED.
2. REFRIGERANT R32 SHALL BE PROVIDED.
3. PROVIDE ALL ASSOCIATED ACCESSORIES.
4. ALL REFRIGERANT PIPING TO BE SIZED AS PER MANUFACTURERS RECOMMENDATIONS.
5. CONTRACTOR SHALL PROVIDE A LONG LINE SET FOR REFRIGERANT PIPING IN THE EVENT THAT TOTAL REFRIGERANT LENGTH EXCEEDS THE MANUFACTURER'S STANDARD RECOMMENDED LENGTH. CONTRACTOR TO FIELD VERIFY THE EXACT TOTAL REFRIGERANT LENGTH AND COORDINATE WITH THE MANUFACTURER PRIOR ORDERING UNIT.
6. PROVIDE DISCONNECT SWITCH.
7. CONNECT 3/4" CD FROM ALL UNITS TO NEAREST APPROVED PLACE OF DISPOSAL. PROVIDE CONDENSATE PUMP IF REQUIRED.

HUMIDOR HUMIDITY SYSTEM

TAG	AREA SERVED	QUANTITY	ELECTRICAL DATA		BASIS OF DESIGN		REMARK
			V/PH/HZ	MOCP	MANUFACTURER	MODEL	
HHS-1(N) & HHS-2(N)	SEE PLAN	2	115/1/60	15	CORRIGAN	PRÉSERVE	1,2,3,4

NOTES:

1. INSTALL UNIT AS PER MANUFACTUR'S RECOMMENADATION.
2. PROVIDE DISCONNECT SWTICH.
3. PROVIDE WITH ALL REQUIRED ACCESSORIES.
4. PROVIDE WITH 1/2IN POTABLE COLD WATER SUPPLY AND NEARBY DRAIN CONNECTION.

ELECTRONIC CEILING-MOUNT SMOKE EATER

TAG	AREA SERVED	QUANTITY	WEIGHT (LBS)	ELECTRICAL DATA			BASIS OF DESIGN		REMARK
				V/PH/HZ	MCA	MOCP	MANUFACTURER	MODEL	
ESE-1(N) & ESE-2(N)	SEE PLAN	2	64	115/1/60	3.4	15	PURE AND NATURAL SYSEMS	CASE 1000	1,2,3

NOTES:

1. INSTALL UNIT AS PER MANUFACTUR'S RECOMMENADATION.
2. PROVIDE DISCONNECT SWTICH.
3. PROVIDE WITH ALL REQUIRED ACCESSORIES.

MECHANICAL FAN SCHEDULE

TAG	AREA SERVED	FLOW RATE	STATIC PRESSURE	ELECTRIC DATA				MAXIMUM LOUDNESS	BASIS OF DESIGN		REMARK
		CFM	EXTERNAL IN W.G.	SPEED RPM	HP	V/PH/HZ	FLA	SONES	MANUFACTURER	MODEL	
OAF-1(N)	SEE PLAN	1240	1.0	1713	0.5	208/1/60	4.0	13.2	GREENHECK	SQ-12-M2-VG	2,3,4,5,7
EF-1(N)	SEE PLAN	1200	1.0	1592	0.5	208/1/60	4.0	10.3	GREENHECK	SQ-120-VG	1,2,3,6

NOTES:

1. INTERCONNECT WITH AC-7(N) & AC-8(N). REFER TO ELECTRICAL LIGHTING PLAN.
2. PROVIDE FACTORY MOUNTED AND INSTALLED DISCONNECT
3. PROVIDE THERMAL OVERLOAD PROTECTION, AMCA SEAL AND UL CERTIFIED, SPEED CONTROLLER.
4. INTERCONNECT WITH AC-1(N) TO AC-8(N). REFER TO ELECTRICAL LIGHTING PLAN.
5. PROVIDE MERV-8 FILTER.
6. PROVIDE BACKDRAFT DAMPER.
7. PROVIDE MOTORIZED DAMPER.

MECHANICAL AIR TERMINAL DEVICES SCHEDULE

TAG	SIZE	DESCRIPTION	CONSTRUCTION	BASIS OF DESIGN		NOTES
				MANUFACTURER	MODEL	
CDS	AS SHOWN	SUPPLY DIFFUSER	ALUMINIUM	TITUS	TMS-AA	ALL
CDR	AS SHOWN	RETURN DIFFUSER	ALUMINIUM	TITUS	56FL	ALL
CGS	AS SHOWN	SUPPLY AIR GRILLE	ALUMINIUM	TITUS	50FF	ALL
CGE	AS SHOWN	EXHAUST AIR GRILLE	ALUMINIUM	TITUS	50FF	ALL

NOTES:

1. COORDINATE WITH THE ARCHITECT FOR THE FINISH AND COLOUR.
2. PAINT ALL SURFACES VISIBLE THROUGH FACE OF RETURN AIR GRILLE FLAT BLACK. THIS SHALL INCLUDE PIPING, CONDUIT, DUCTWORK AND STRUCTURAL MEMBERS.
3. PROVIDE FRAME FOR MOUNTING AIR DEVICE IN LAY-IN GRID CEILING UNLESS REFLECTED CEILING PLAN INDICATES HARD CEILING. IN AREAS WITH HARD CEILINGS, PROVIDE FRAMES FOR SURFACE MOUNTING.
4. UNLESS OTHERWISE NOTED, BRANCH DUCTS SERVING AIR DEVICES SHALL BE SAME SIZE AS NECK OF AIR DEVICE.
5. AIR DEVICE SHALL BE OF GALVANIZED FINISH WHEN INSTALLED ON EXPOSED DUCTWORK.
6. CABLE OPERATED DAMPERS SHALL BE PROVIDED FOR ANY DIFFUSERS/GRILLES INSTALLED IN THE HARD CEILING AREA.

ELECTRIC DUCT HEATER SCHEDULE

UNIT ID	MANUFACTURER	MODEL	HEATER TYPE	LOCATION	DUCT HEATER DIMENSIONS (IN)		ELECTRICAL DATA				
					W	H	KW	V	PH	Hz	Amps (A)
EDH-1(N)	GREENHECK	IDHE	FLANGE	SEE PLAN	16	12	20.0	208	3	60	55.6

NOTES:-

1. INSTALL ELECTRIC DUCT HEATER AS PER MANUFACTUR'S RECOMMENADATION.
2. PROVIDE T-STAT AND WIRE TO DUCT HEATER.
3. PROVIDE DISCONNECT SWTICH, VAPOR BARRIER, DUST TIGHT BOX AND FAN INTERLOCK SWITCH.
4. PROVIDE DUCT HEATER WITH SCR CONTROL AND THERMOSTAT.

VENTILATION CALCULATION - 1 WEST FOREST AVE- 2021 INTERNATIONAL MECHANICAL CODE

ROOM TAG	AREA	OCCUPANCY AS PER 2021 IMC/1000SQ.FT.	OCCUPANY AS PER 2022 NYMC	ARCHITECTURAL OCCUPANCY	FINAL OCCUPANCY	CFM/PERSON	CFM/SQ.FT	SUPPLY CFM	PROVIDED CFM	EXHUAST CFM/SQ.FT./FIXTURE	EXHAUST CFM	SELECTED EXHAUST CFM
1 ENTRY FOYER (100)	98	10	1	0	1	5	0.06	11		0	0	0
2 OFFICE 1 (101)	101	5	1	2	2	5	0.06	17		0	0	0
3 OFFICE 2 (102)	138	5	1	2	2	5	0.06	19		0	0	0
4 OFFICE 3 (103)	138	5	1	2	2	5	0.06	19		0	0	0
5 CORRIDOR	270	0	0	0	0	0	0.06	17	1240	0	0	0
6 PHOTO/VIDEO SUITE (104)	306	10	4	25	25	5	0.12	162		0	0	0
7 SALES/CIGAR LOUNGE (105)	634	15	10	43	43	7.5	0.12	399		1	634	640
8 STORAGE (106)	43	0	0	1	1	0	0.12	6		0	0	0
9 MANUFACTURING (107)	551	7	4	6	6	7.5	0.12	112		1	551	560
TOTAL	**2279**	-	**22**	**81**	**82**		-	**762**	**1240**	-	-	**1200**

AIR BALANCE

UNIT	AREA SERVED	SUPPLY AIR	OUTSIDE AIR	RETURN AIR	EXHAUST AIR
AC-1(N)	SEE PLAN	494 CFM	50 CFM	444 CFM	-
AC-2(N)	SEE PLAN	494 CFM	50 CFM	444 CFM	-
AC-3(N)	SEE PLAN	494 CFM	50 CFM	444 CFM	-
AC-4(N)	SEE PLAN	494 CFM	50 CFM	444 CFM	-
AC-5(N)	SEE PLAN	494 CFM	50 CFM	444 CFM	-
AC-6(N)	SEE PLAN	1236 CFM	130 CFM	1106 CFM	-
AC-7(N)	SEE PLAN	1306 CFM	320 CFM	986 CFM	-
AC-8(N)	SEE PLAN	1306 CFM	320 CFM	986 CFM	-
EF-1(N)	SEE PLAN	-	-	-	1200 CFM
	TOTAL:	6318 CFM	1020 CFM	5298 CFM	1200 CFM
	BUILDING PRESSURE:			-180 CFM	**NEGATIVE**

NOTES:

1. CONTRACTOR TO ADJUST MOTORIZED DAMPER ON FRESH AIR TAP TO PROVIDE OUTSIDE AIR AS MENTIONED IN ABOVE TABLE.

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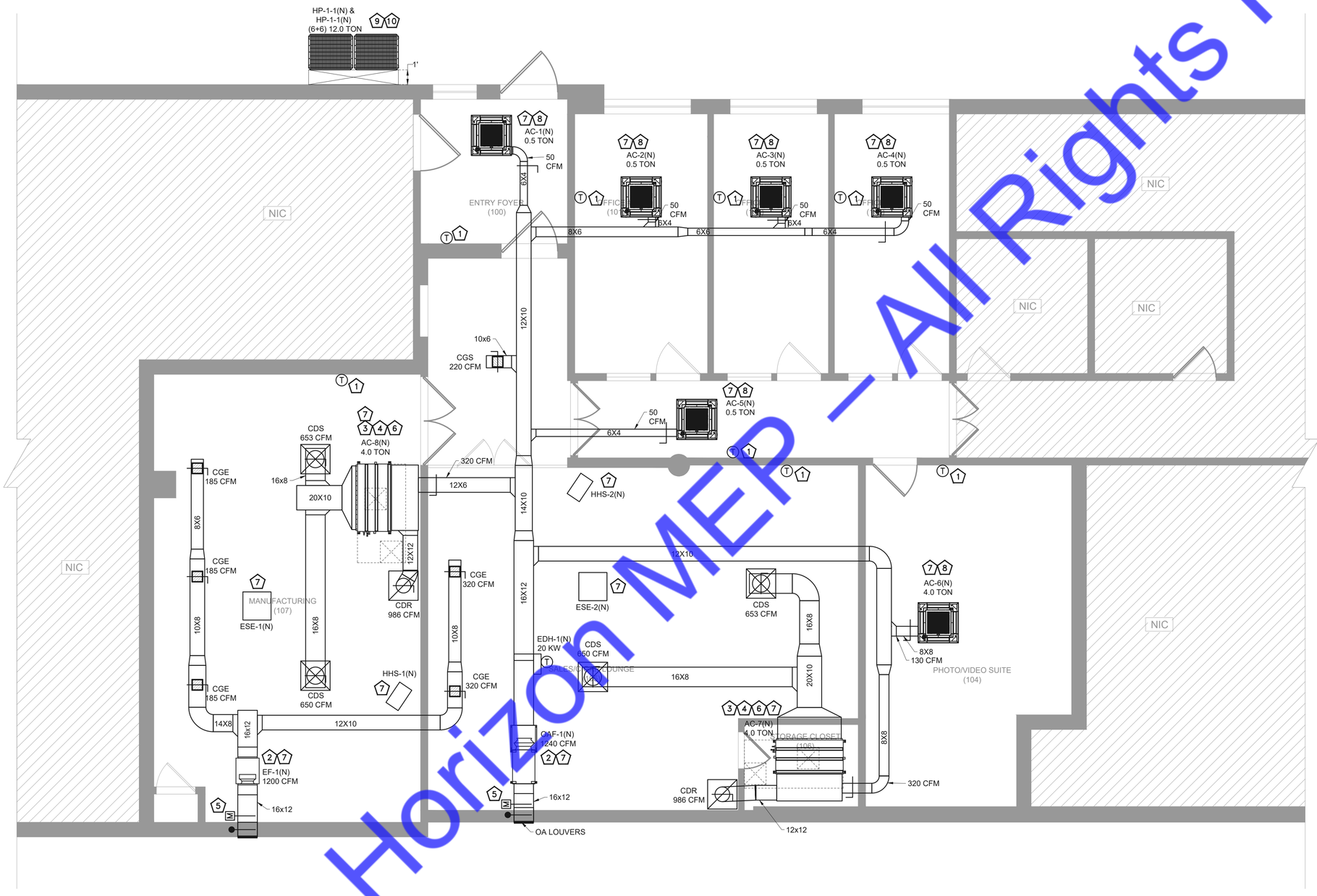

GENERAL NOTES:

1. CONTRACTOR SHALL BALANCE EACH AIR DIFFUSER WITH THE CFM SHOWN PLAN.
2. DUCTWORK SHOWN ON PLAN ARE SCHEMATIC ONLY. CONTRACTOR SHALL COORDINATE WITH OTHER TRADES FOR DUCTWORK ROUTING. OFFSET AND RUN PIPING, DUCTWORK INSIDE THE STRUCTURE IF REQUIRED. PROVIDE ANY EXTRA DUCTWORK, FITTINGS, INSULATIONS AND OTHER ACCESSORIES IN ORDER TO COMPLETE THE INSTALLATION.
3. EQUIPMENT SIZES, DIMENSIONS AND REQUIRED CONNECTIONS SHALL BE VERIFIED WITH THE ACTUAL EQUIPMENT, SELECTED VENDOR DRAWINGS BEFORE FABRICATION OF DUCTWORK, PIPING ETC.
4. DUCT SIZES SHOWN ON PLANS ARE CLEAR INSIDE AIR STREAM DIMENSIONS.
5. CONTRACTOR SHALL COORDINATE ALL ELECTRICAL REQUIREMENTS FOR ALL HVAC BASED ON ACTUAL EQUIPMENT SELECTED PRIOR TO INSTALLATION.
6. CONTRACTOR SHALL COORDINATE EQUIPMENT WEIGHTS AND SUPPORTS BASED ON ACTUAL EQUIPMENT SELECTED.
7. ALL EXPOSED DUCTWORK SHALL BE AS SHOWN,DOUBLE WALL, INSULATED METAL, PRIMED FOR PAINTING. ALL CONCEALED DUCTWORK SHALL BE INSULATED METAL RECTANGULAR AND CIRCULAR DUCT SHALL BE INSULATED INTERNALLY UNLESS OTHERWISE ALLOWED IN WRITING BY THE ENGINEER OF RECORD. COORDINATE FINAL FINISH WITH ARCHITECT.
8. COORDINATE WITH ALL TRADES FOR MATERIALS IN RATED AND PLENUM SPACES.
9. ALL EXHAUST FANS SCHEDULED TO BE AUTOMATICALLY CONTROLLED BY MECHANICAL AIR HANDLERS SHALL BE CONNECTED BY MEANS OF AN AUXILIARY RELAY. PROVIDE AUXILIARY RELAY AS NEEDED.
10. ALL SOURCE OF MECHANICAL INTAKE SHALL MAINTAIN 10 LINEAR FEET SEPARATION BETWEEN ANY SOURCE OF EXHAUST. CONTRACTOR IS RESPONSIBLE TO ADJUST DUCT LENGTH AS NEEDED.
11. MD TO INTERLOCK WITH RESPECTIVE INDOOR UNITS.
12. COORDINATE FINAL LOCATION OF EQUIPMENT WITH STRUCTURAL DRAWINGS.
13. CONTRACTOR SHALL DEMOLISH ALL EXISTING HVAC SYSTEMS INCLUDING FURNACE, DUCTWORK AND ALL ASSOCIATED ACCESSORIES.
14. BEFORE STARTING DEMOLITION, PROVIDE NECESSARY PROTECTIVE DEVICES WHERE REQUIRED AND IN STRICT ACCORDANCE WITH OSHA AND ICRA REGULATIONS.
15. TAKE NECESSARY PRECAUTIONS TO PREVENT DUST AND DIRT MIGRATING TO OCCUPIED AREAS OF THE BUILDING. THIS INCLUDES BLANKING OFF ANY RETURN AIR GRILLES/ DUCTS IN THE WORK AREA. PROVIDE TEMPORARY EXHAUST FANS, DUCTED DIRECTLY TO OUTDOORS, TO MAINTAIN NEGATIVE PRESSURE WITHIN THE WORK AREA.
16. KEEP ALL ADJOINING AREAS ADJACENT TO THE WORK AREAS CLEAN AND FREE OF DEBRIS.
17. ALL DEMOLISHED MATERIALS SHALL BE REMOVED AND DISPOSED OF OFF SITE.
18. REPAIR/ REPLACE EXISTING EQUIPMENT/ MATERIALS NOT SCHEDULED OR NOTED TO BE DEMOLISHED BUT BECOME DAMAGED DURING THE PROGRESS OF THE WORK. MAKE ANY AND ALL SUCH REPAIRS, REPLACEMENTS, MODIFICATIONS TO RESTORE THE DAMAGED ITEMS TO THEIR ORIGINAL CONDITIONS AT THE TIME OF DAMAGE, TO THE SATISFACTION OF AND AT NO ADDITIONAL COST TO THE OWNER.
19. PROVIDE WEATHER PROOF COATING FOR ALL EXTERIOR PIPING INSULATION.
20. MECHANICAL CONTRACTOR TO COORDINATE ALL DUCT WORK, CROSSINGS, OVERLAPPING AND PENETRATIONS WITH SITE CONDITIONS AND AS PER EXISTING JOIST LAYOUT AND SKYLIGHT IN FIELD. MODIFY DUCT WORK WHEREVER REQUIRED.
21. PROVIDE FIRE OR FIRE+SMOKE DAMPER WHEREVER DUCTS ARE CROSSING FIRE/SMOKE RATED WALLS/BARRIERS/SLABS. COORDINATE WITH ARCHITECTURAL DRAWING FOR FIRE RATING OF THE WALLS.

KEYED NOTES:

1. LOCATION OF DIGITAL PROGRAMMABLE THERMOSTAT. INSTALL AND WIRE NEW 7-DAY PROGRAMMABLE THERMOSTAT FOR THE RESPECTIVE UNITS. COORDINATE EXACT LOCATION WITH ARCHITECT AND OWNER PRIOR TO ROUGH-IN. PROVIDE LOCKABLE COVER.
2. INLINE EXHAUST FAN. FAN SHALL BE SUSPENDED FROM STRUCTURE ABOVE. VERIFY EXACT LOCATION OF STRUCTURAL MEMBERS PRIOR TO INSTALLATION. INTERCONNECT WITH MECHANICAL SCHEDULE FOR MORE DETAILS.
3. EXTEND FULL SIZE SUPPLY & RETURN DUCTWORK FROM AC'S TO SPACE. EXTEND AS SHOWN. ACOUSTICALLY LINE THE FIRST 10'-0" OF BOTH SUPPLY AND RETURN MAIN DUCTS.
4. PROVIDE REMOTE TEMP MOUNTED IN THE RETURN AIR DUCT AND WIRE BACK TO THE RESPECTIVE T-STAT.
5. INTERCONNECT THE MOTORIZED DAMPER WITH RESPECTIVE FAN.
6. PROVIDE SECONDARY DRIP PAN UNDER AC UNIT WITH WATER LEAKAGE SENSOR TO SHUT DOWN THE UNIT.
7. COORDINATE WITH ARCHITECT/ OWNER FOR THE FINAL LOCATION FOR THE UNIT. COORDINATE/ SUBMIT FINAL LOAD OF MECHANICAL UNITS, SUPPORT DETAILS WITH STRUCTURAL DRAWINGS. TAKE STRUCTURAL ENGINEER'S APPROVAL BEFORE CONSTRUCTION.
8. CONTRACTOR TO TERMINATE THE CONDENSATE DRAIN TO THE NEAREST APPROVED PLACE OF DISPOSAL WITH AN AIR GAP FITTING. COORDINATE WITH PLUMBING CONTRACTOR
9. COORDINATE WITH ARCHITECT/ OWNER FOR THE FINAL LOCATION FOR THE UNIT. INSTALL REFRIGERANT PIPING BETWEEN INDOOR AND OUTDOOR UNITS AS PER THE MANUFACTURER'S RECOMMENDATIONS. PROVIDE INSULATION TO REFRIGERANT PIPING AS PER 2019 ASHRAE 90.1. COORDINATE REFRIGERANT PIPE ROUTING WITH ARCHITECT/OWNER.
10. CONTRACTOR SHALL COORDINATE REFRIGERANT PIPING BETWEEN INDOOR AND OUTDOOR UNITS AS PER THE MANUFACTURER'S RECOMMENDATIONS. MAXIMUM REFRIGERANT PIPING LENGTH SHALL NOT EXCEED THE MANUFACTURER'S RECOMMENDATION.

1 MECHANICAL FLOOR PLAN
SCALE: 1/4" = 1'-0"

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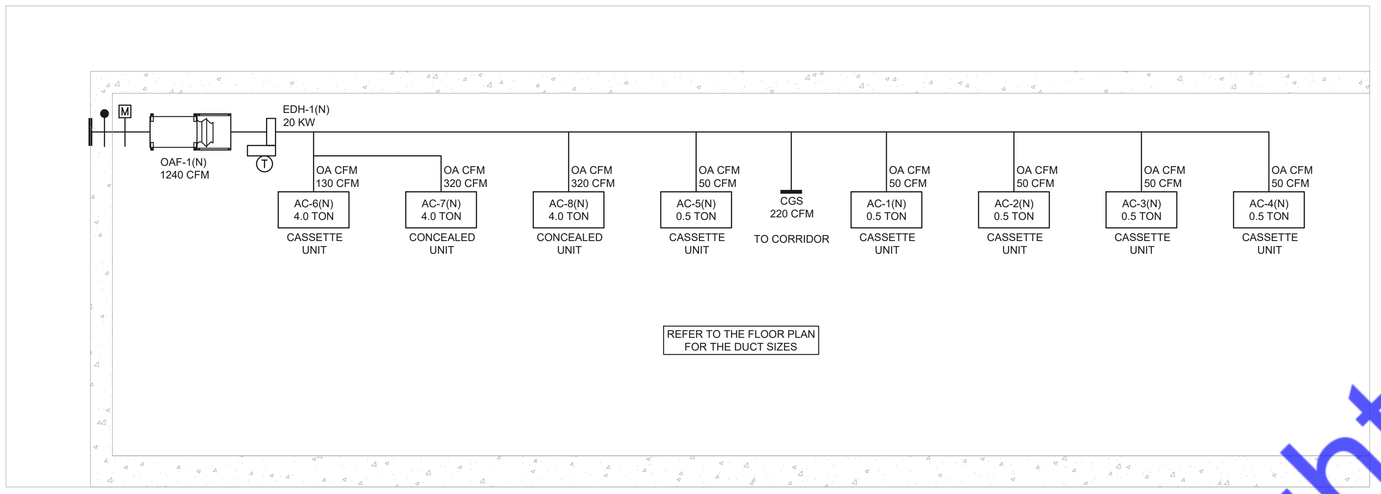
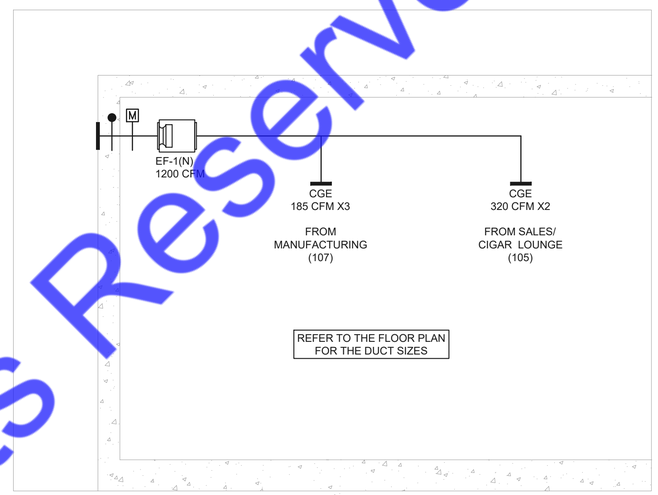
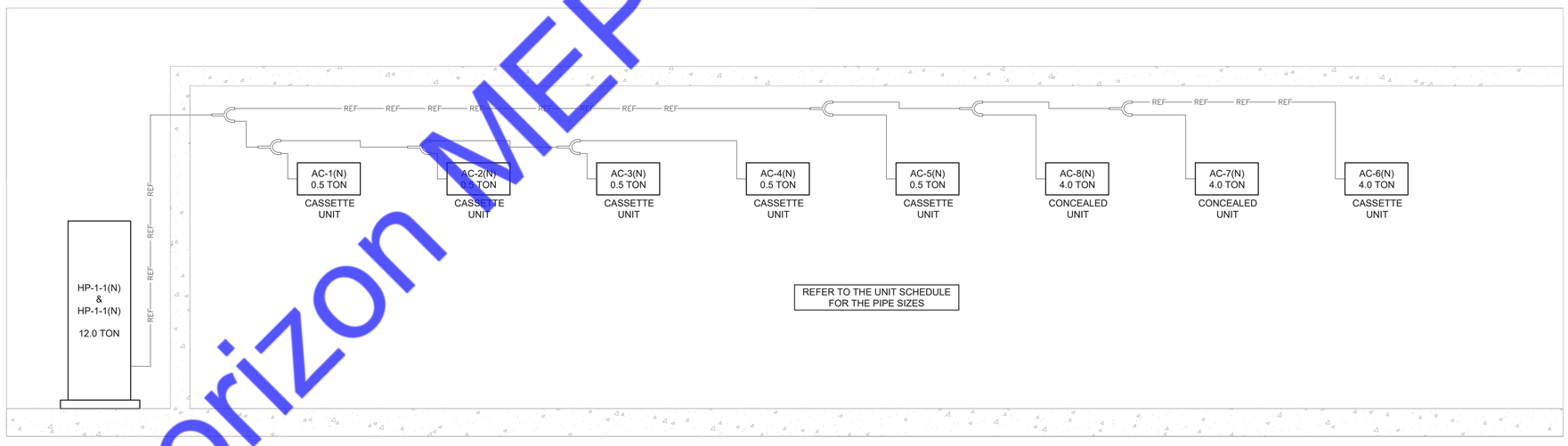


OUTSIDE AIR DUCT RISER



EXHAUST AIR DUCT RISER

1 VENTILATION DUCT RISER
SCALE: N.T.S



2 REFRIGERANT PIPING RISER
SCALE: N.T.S

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Air System Sizing Summary for 0 TOTAL SUMMARY

Project Name: 1 West Forest
Prepared by: ADSP
11-08-2025
06:23PM

Air System Information

Air System Name ..... **0 TOTAL SUMMARY**
Equipment Class ..... **SPLT AHU**
Air System Type ..... **SZCAV**

Number of zones **1**
Floor Area ..... **2279.0** ft²
Location ..... **Newark, New Jersey**

Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Sum of space airflow rates**
Space CFM Sizing ..... **Individual peak space loads**

Central Cooling Coil Sizing Data

Total coil load ..... **13.5** Tons
Total coil load ..... **161.9** MBH
Sensible coil load ..... **128.3** MBH
Coil CFM at Jul 1500 ..... **5540** CFM
Max block CFM ..... **5540** CFM
Sum of peak zone CFM ..... **5540** CFM
Sensible heat ratio **0.793**
CFM/Ton **410.7**
ft²/Ton **168.9**
BTU/(hr·ft²) **71.0**
Water flow @ 10.0 °F rise ..... **N/A**

Load occurs at ..... **Jul 1500**
OA DB / WB ..... **92.6 / 74.1** °F
Entering DB / WB ..... **77.6 / 64.7** °F
Leaving DB / WB ..... **56.2 / 54.8** °F
Coil ADP ..... **53.3** °F
Bypass Factor **0.120**
Resulting RH ..... **50** %
Design supply temp. ..... **56.0** °F
Zone T-stat Check ..... **1 of 1** OK
Max zone temperature deviation ..... **0.0** °F

Central Heating Coil Sizing Data

Max coil load ..... **65.2** MBH
Coil CFM at Des Htg ..... **5540** CFM
Max coil CFM ..... **5540** CFM
Water flow @ 20.0 °F drop ..... **N/A**

Load occurs at ..... **Des Htg**
BTU/(hr·ft²) **28.6**
Ent. DB / Lvg DB ..... **63.3 / 74.2** °F

Supply Fan Sizing Data

Actual max CFM ..... **5540** CFM
Standard CFM ..... **5539** CFM
Actual max CFM/ft² ..... **2.43** CFM/ft²

Fan motor BHP ..... **0.00** BHP
Fan motor kW ..... **0.00** kW
Fan static ..... **0.00** in wg

Outdoor Ventilation Air Data

Design airflow CFM ..... **800** CFM
CFM/ft² ..... **0.35** CFM/ft²

CFM/person ..... **9.76** CFM/person

Zone Sizing Summary for 0 TOTAL SUMMARY

Project Name: 1 West Forest
Prepared by: ADSP
11-08-2025
06:23PM

Air System Information

Air System Name ..... **0 TOTAL SUMMARY**
Equipment Class ..... **SPLT AHU**
Air System Type ..... **SZCAV**

Number of zones **1**
Floor Area ..... **2279.0** ft²
Location ..... **Newark, New Jersey**

Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Sum of space airflow rates**
Space CFM Sizing ..... **Individual peak space loads**

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (CFM)	Minimum Supply Airflow (CFM)	Zone CFM/ft²	Reheat Coil Load (MBH)	Reheat Coil Water gpm @ 20.0 °F	Zone Htg Unit Coil Load (MBH)	Zone Htg Unit Water gpm @ 20.0 °F	Mixing Box Fan Airflow (CFM)
Zone 1	5374	5374	2.36	0.0	-	0.0	-	0

Zone Peak Sensible Loads

Zone Name	Zone Cooling Sensible (MBH)	Time of Peak Sensible Cooling Load	Zone Heating Load (MBH)	Zone Floor Area (ft²)
Zone 1	110.2	Jul 1700	11.8	2279.0

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (MBH)	Time of Peak Sensible Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (ft²)	Space CFM/ft²
Zone 1							
1 ENTRY FOYER (100)	1	3.2	Jul 1700	154	2.1	98.0	1.57
2 OFFICE 1 (101)	1	3.6	Jul 1700	178	1.5	101.0	1.76
3 OFFICE 2 (102)	1	4.0	Jul 1700	194	1.4	138.0	1.41
4 OFFICE 3 (103)	1	4.0	Jul 1700	194	1.4	138.0	1.41
5 CORRIDOR	1	2.8	Jan 2300	134	0.0	270.0	0.50
6 PHOTO/VIDEO STE (104)	1	29.5	Jul 2000	1437	0.9	306.0	4.70
7 SALES/CIGAR LNGE (105)	1	36.8	Jul 2000	1795	1.9	634.0	2.83
8 STORAGE (106)	1	1.0	Jul 2000	49	0.7	43.0	1.14
9 MANUFACTURING (107)	1	25.4	Jul 2000	1239	1.7	551.0	2.25

Ventilation Sizing Summary for 0 TOTAL SUMMARY

Project Name: 1 West Forest
Prepared by: ADSP
11-08-2025
06:23PM

1. Summary

Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Design Ventilation Airflow Rate ..... **800** CFM

2. Space Ventilation Analysis

Zone Name / Space Name	Mult.	Floor Area (ft²)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft²)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
1 ENTRY FOYER (100)	1	98.0	1.0	153.8	0.00	0.00	20.0	0.0	20.0
2 OFFICE 1 (101)	1	101.0	2.0	177.6	0.00	0.00	20.0	0.0	20.0
3 OFFICE 2 (102)	1	138.0	2.0	194.0	0.00	0.00	20.0	0.0	20.0
4 OFFICE 3 (103)	1	138.0	2.0	194.0	0.00	0.00	20.0	0.0	20.0
5 CORRIDOR	1	270.0	0.0	134.3	0.00	0.00	20.0	0.0	20.0
6 PHOTO/VIDEO STE (104)	1	306.0	25.0	1437.2	0.00	0.00	170.0	0.0	170.0
7 SALES/CIGAR LNGE (105)	1	634.0	43.0	1795.3	0.00	0.00	400.0	0.0	400.0
8 STORAGE (106)	1	43.0	1.0	49.1	0.00	0.00	10.0	0.0	10.0
9 MANUFACTURING (107)	1	551.0	6.0	239.2	0.00	0.00	120.0	0.0	120.0
Totals (incl. Space Multipliers)				5374.3					**800.0**

1 MECHANICAL LOAD CALCULATION
SCALE: N.T.S

COM*check* Software Version COMcheckWeb

Mechanical Compliance Certificate

Project Information

Energy Code: 90.1 (2019) Standard
Project Title: 1 WEST FOREST AVENUE
Location:
Climate Zone: 5a
Project Type: Alteration

Owner/Agent: Designer/Contractor:

Mechanical Systems List

Quantity System Type & Description

1 HP-1(N)
VRF Condensing Unit, Air Cooled Heat Pump
Heating Mode: Capacity = 160 kBtu/h,
Proposed Efficiency = 4.02 COP, Required Efficiency = 3.20 COP
Cooling Mode: Capacity = 144 kBtu/h,
Proposed Efficiency = 13.50 EER, Required Efficiency = 10.60 EER
Proposed Part Load Efficiency = 22.90 IEER, Required Part Load Efficiency = 13.90 IEER
Fan System: None

SYSTEM VERIFICATION REQUIRED.

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical alteration project 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 (2019) Standard requirements in COM*check* Version COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Name - Title Signature Date

2 ENERGY ANALYSIS
SCALE: N.T.S

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