

MECHANICAL SPECIFICATIONS

- PART 1 - GENERAL
- 1.1 SCOPE OF WORK
- A. FURNISH AND INSTALL ALL MATERIALS, EQUIPMENT AND LABOR REQUIRED AND NECESSARY TO COMPLETE THE WORK SHOWN ON THE DRAWINGS AND ALL OTHER WORK AND MISCELLANEOUS TASKS, NOT SPECIFICALLY MENTIONED BUT REASONABLY INFERRED FOR A COMPLETE INSTALLATION, INCLUDING ALL ACCESSORIES AND APPURTENANCES REQUIRED FOR TESTING THE SYSTEM. IT IS THE INTENT OF THE DRAWINGS AND SPECIFICATIONS THAT ALL SYSTEMS BE COMPLETE AND READY FOR OPERATION.
- B. ALL WORK BY THIS CONTRACTOR SHALL CONFORM TO ALL APPLICABLE, FEDERAL, STATE AND LOCAL BUILDING CODES.
- C. CONTRACTOR SHALL SECURE AND PAY FOR ALL CONSTRUCTION PERMITS AND LICENSES AND SHALL PAY ALL GOVERNMENTAL AND PUBLIC UTILITY CHARGES AND INSPECTION FEES NECESSARY FOR THE EXECUTION OF THE WORK.
- D. CONTRACTOR SHALL ARRANGE FOR AND PAY FOR ALL REQUIRED ENGINEERING STAMPS, LICENSES, PERMITS AND INSPECTION FEES FOR DEFERRED DESIGN AND INSPECTION SCOPES OF WORK.
- E. SAFETY: THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR CONDITIONS ON THE JOB SITE, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY DURING PERFORMANCE OF THE WORK.
- F. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REVIEWING THE EXISTING CONDITIONS AT THE JOBSITE BEFORE SUBMITTING PROPOSALS. SUBMISSION OF PROPOSALS SHALL BE TAKEN AS EVIDENCE THAT SUCH INSPECTIONS HAVE BEEN MADE. CLAIMS FOR EXTRA COMPENSATION FOR WORK THAT COULD HAVE BEEN FORESEEN BY SUCH INSPECTIONS, WHETHER SHOWN ON THE CONTRACT DOCUMENTS OR NOT SHALL NOT BE ACCEPTED OR PAID.
- G. MATERIALS AND EQUIPMENT FURNISHED UNDER THIS CONTRACT SHALL BE NEW AND SHALL BEAR THE U.L. LABEL, WHERE APPLICABLE, AND SHALL BE GUARANTEED AGAINST DEFECTIVE MATERIALS AND WORKMANSHIP FOR A PERIOD OF NOT LESS THAN ONE (1) YEAR AFTER COMPLETION AND ACCEPTANCE BY THE OWNER UNLESS SPECIFICALLY STATED OTHERWISE FOR A PARTICULAR PIECE OF EQUIPMENT, COMPONENT OR SYSTEM.
- H. COORDINATION: COORDINATE WORK WITH OTHER TRADES TO AVOID CONFLICT AND TO PROVIDE CORRECT ROUGH-IN AND CONNECTION FOR EQUIPMENT FURNISHED UNDER OTHER TRADES. VERIFY EQUIPMENT DIMENSIONS AND REQUIREMENTS WITH PROVISIONS SPECIFIED UNDER THIS SECTION. CHECK ACTUAL JOB CONDITIONS BEFORE FABRICATING WORK. REPORT NECESSARY CHANGES IN TIME TO PREVENT NECESSARY RE-WORK.
- I. DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL ARRANGEMENT OF EQUIPMENT, DUCTWORK AND PIPING SYSTEMS. CONTRACTOR SHALL CHECK ALL INFORMATION AND REPORT ANY APPARENT DISCREPANCIES BEFORE SUBMITTING BID.
- 1.2 CODE COMPLIANCE
- A. MATERIALS AND WORKMANSHIP SHALL COMPLY WITH THE CONTRACT DOCUMENTS AND APPLICABLE CODES AND STANDARDS.
- B. IN CASE OF DIFFERENCE BETWEEN APPLICABLE CODES AND STANDARDS AND THE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL PROMPTLY NOTIFY THE ARCHITECT/ENGINEER AND THE OWNER IN WRITING OF SUCH DIFFERENCE.
- C. SHOULD THE CONTRACTOR PERFORM ANY WORK THAT DOES NOT COMPLY WITH THE REQUIREMENTS OF APPLICABLE CODES AND STANDARDS, CONTRACTOR SHALL BEAR ALL COSTS ARISING IN CORRECTING SUCH DEFECTS. APPLICABLE CODES AND STANDARDS SHALL INCLUDE ALL ORDINANCES, UTILITY COMPANY REGULATIONS, AND APPLICABLE REQUIREMENTS OF NATIONALLY ACCEPTED CODES AND STANDARDS.
- 1.3 GENERAL DEMOLITION REQUIREMENTS
- A. CONTRACTOR SHALL PROTECT THE EXISTING HVAC EQUIPMENT AND SYSTEMS INDICATED TO REMAIN OPERATIONAL PERMANENTLY OR TEMPORARILY. IF DAMAGED OR DISTURBED IN THE COURSE OF THE DEMOLITION WORK, REMOVE DAMAGED PORTIONS AND REPAIR OR REPLACE WITH NEW PRODUCT OF EQUAL CAPACITY, QUALITY AND FUNCTIONALITY.
- B. CONTRACTOR SHALL MAKE "SAFE" ALL HVAC EQUIPMENTS. CONTRACTOR SHALL COORDINATE WITH THE OWNER TO ABRIDGE THE SHUT OFF OF UTILITIES. THE CONTRACTOR SHALL LOCATE, IDENTIFY, DISCONNECT, AND SEAL ON CAP OFF UTILITIES SERVING BUILDING PRIOR TO PROCEEDING WITH THE REMOVAL OF THE HVAC SYSTEMS. THE CONTRACTOR SHALL NOT RELY ON AN OPERABLE ISOLATION VALVE TO SECURELY ISOLATE A PIPING SYSTEM. CONTRACTOR SHALL PERMANENTLY CAP OR PLUG ALL OPEN PIPE ENDS.
- C. CONTRACTOR SHALL ENGAGE THE BUILDING AUTOMATION SYSTEM (BAS) CONTRACTOR SELECTED BY THE OWNER TO REMOVE AND DISCONNECT ANY BAS DEVICE AND COMMUNICATION NETWORK.
- D. EXISTING BELOW GRADE UTILITIES
1. ABANDON EXISTING UTILITIES AND BELOW GRADE UTILITY STRUCTURES. CUT UTILITIES AT LEAST 12 INCHES BELOW FRESH FLOOR.
2. DEMOLISH EXISTING UTILITIES AND BELOW-GRADE UTILITY STRUCTURES THAT ARE WITHIN 4 FEET OUTSIDE FOOTPRINT INDICATED FOR NEW CONSTRUCTION. ABANDON UTILITIES OUTSIDE THIS AREA.
3. FILL ABANDONED UTILITY STRUCTURES WITH SATISFACTORY SOIL MATERIALS ACCORDING TO PROJECT BACKFILL REQUIREMENTS.
- E. CONTRACTOR SHALL BOX AND/OR PALLETIZE ALL HVAC EQUIPMENT AND PROTECT ON SITE UNTIL THE OWNER DETERMINES THE EQUIPMENT'S SALVAGE VALUE. THE CONTRACTOR SHALL REMOVE THESE ITEMS FROM THE SITE AFTER AT THE DIRECTION OF THE OWNER.
- F. THE CONTRACTOR SHALL UTILIZE A CERTIFIED REFRIGERANT RECOVERY TECHNICIAN TO EVACUATE THE AIR CONDITIONING AND REFRIGERATION EQUIPMENT AND RECOVER THE REFRIGERANT. STATE THAT ALL REFRIGERANT THAT WAS PRESENT WAS RECOVERED AND THAT RECOVERY WAS PERFORMED ACCORDING TO EPA REGULATIONS. INCLUDE NAME AND ADDRESS OF THE REFRIGERANT RECOVERY TECHNICIAN.
- G. INSTALL TEMPORARY MECHANICAL SYSTEMS LEVELS AND PLUMB, PARALLEL AND PERPENDICULAR TO OTHER BUILDING SYSTEMS AND COMPONENTS, EXCEPT WHERE PITCH IS REQUIRED FOR PROPER DRAINAGE.
- H. CUTTING AND PATCHING: ALL CUTTING AND PATCHING REQUIRED FOR WORK OF IN THIS DIVISION IS PROVIDED BY THE CONTRACTOR. COORDINATION OF THE WORK WITH THE GENERAL CONTRACTOR IS IMPERATIVE. CONTRACTOR SHALL RECEIVE WRITTEN APPROVAL FROM THE GENERAL CONTRACTOR PRIOR TO SAW-CUTTING OR CORING ANY STRUCTURAL SLABS OR MEMBERS.
- I. PROVIDE HANGERS, SUPPORTS AND ANCHORS AS REQUIRED.
- 1.4 GENERAL REQUIREMENTS
- A. INSTALL MECHANICAL AND ELECTRICAL SYSTEMS LEVEL AND PLUMB, PARALLEL AND PERPENDICULAR TO OTHER BUILDING SYSTEMS AND COMPONENTS, EXCEPT WHERE PITCH IS REQUIRED FOR PROPER DRAINAGE.
- B. INSTALL MECHANICAL AND ELECTRICAL SYSTEMS TO FACILITATE SERVICING, MAINTENANCE, REPAIR OR REPLACEMENT OF EQUIPMENT COMPONENTS. PROVIDE ACCESS TO EQUIPMENT FOR EASE OF DISCONNECTING WITH MINIMUM OF INTERFERENCE WITH OTHER INSTALLATIONS.
- C. SHOULD THE CONTRACTOR SUPPLY EQUIPMENT DIFFERING FROM THE SCHEDULED EQUIPMENT IN THE CONTRACT DOCUMENTS, CONTRACTOR SHALL BEAR ALL COSTS TO COORDINATE REQUIRED DESIGN MODIFICATIONS AND INSTALLATION.
- D. DELIVERY, STORAGE, AND HANDLING OF MATERIAL AND EQUIPMENT SHALL BE STORED AND HANDLED PER MANUFACTURER'S RECOMMENDATIONS. COMPLY WITH MANUFACTURER'S PRODUCT DATA, INCLUDING TECHNICAL BULLETINS, PRODUCT CATALOG INSTALLATION INSTRUCTIONS.
- E. EQUIPMENT ROUGH-INS: EQUIPMENT LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE ONLY. OBTAIN EXACT ROUGH-IN LOCATIONS FROM GENERAL CONTRACTOR AND/OR OWNER.
- F. PROVIDE HANGERS, SUPPORTS AND ANCHORS AS REQUIRED.
- G. FOR THROUGH WALL PENETRATION PROTECTION SYSTEMS COMPLY WITH UL-C-1003 FOR CONCRETE FLOOR AND WALL PENETRATIONS AND UL-W-1-3039 FOR GYPSUM WALL BOARD PENETRATIONS.
- 1.5 SUBMITTALS
- A. PRODUCT DATA: SUBMIT MANUFACTURER'S TECHNICAL PRODUCT DATA TO MEET THE FOLLOWING REQUIREMENTS:
1. SHOW COMPLIANCE WITH THE BASIS OF DESIGN
- a. ALL EQUIPMENT DESIGNATED ON THE DRAWINGS
- b. ALL EQUIPMENT LISTED IN A SCHEDULE
- c. ALL DEVICES WHICH IS VISIBLE OR USED BY THE END-USER
2. SUBMIT MANUFACTURER'S ASSEMBLY TYPE SHOP DRAWINGS FOR EACH ITEM INDICATING MATERIALS AND METHODS OF ASSEMBLY OF COMPONENTS
3. SUBMIT MANUFACTURER'S TECHNICAL PRODUCT DATA AND INSTALLATION INSTRUCTIONS FOR METAL DUCTWORK MATERIALS AND PRODUCTS.
4. SUBMIT MANUFACTURER'S TECHNICAL PRODUCT DATA AND INSTALLATION INSTRUCTIONS FOR EACH TYPE OF MECHANICAL INSULATION. SUBMIT SCHEDULE SHOWING MANUFACTURER'S PRODUCT NUMBER, K-VALUE, THICKNESS, AND FURNISHED ACCESSORIES FOR EACH MECHANICAL SYSTEM REQUIRING INSULATION.
5. SUBMIT MAINTENANCE DATA, INCLUDING CLEANING INSTRUCTIONS FOR FINISHES, AND SPARE PARTS LISTS.
- B. SUBSTITUTIONS: WHENEVER POSSIBLE, MORE THAN ONE MANUFACTURER HAS BEEN LISTED FOR VARIOUS ITEMS OR EQUIPMENT, ANY ONE OF WHICH WILL BE ACCEPTABLE. BASE THE BID ON USE OF MATERIALS SPECIFIED. IF, AFTER AWARD OF THE CONTRACT, A SUBSTITUTE IS PROPOSED, THE REQUEST FOR PERMISSION TO SUBSTITUTE SHALL BE ACCOMPANIED WITH A STATEMENT OF THE AMOUNT OF MONEY TO REDUCE THE CONTRACT IF THE SUBSTITUTION IS PERMITTED. THE OWNER IS THE SOLE JUDGE OF ACCEPTABILITY OF PROPOSED SUBSTITUTIONS. IF A SUBSTITUTE IS PERMITTED AND ANY REDESIGN EFFORT IS THEREBY NECESSITATED, THE REQUIRED REDESIGN SHALL BE AT THE CONTRACTOR'S EXPENSE.
- 1.6 CONSTRUCT THE HVAC SYSTEM IN COMPLIANCE WITH THE FOLLOWING STANDARDS:
- A. SMACNA STANDARDS: COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS, METAL AND FLEXIBLE", THIRD EDITION, 2006, FOR FABRICATION AND INSTALLATION OF METAL DUCTWORK.
- B. SMACNA 1985: SMACNA HVAC AIR DUCT LEAKAGE TEST MANUAL, 1985.
- C. SMACNA ROUND INDUSTRIAL DUCT CONSTRUCTION STANDARDS.
- D. SHRAE STANDARDS: COMPLY WITH 2012 SHRAE HANDBOOK "HVAC SYSTEMS AND EQUIPMENT, CHAPTER 19 "DUCT CONSTRUCTION", FOR FABRICATION AND INSTALLATION OF METAL DUCTWORK.
- E. NFPA COMPLIANCE: COMPLY WITH NFPA 20A "STANDARD FOR THE INSTALLATION OF WATER AIR CONDITIONING AND VENTILATING SYSTEMS" AND NFPA 20B "STANDARD FOR THE INSTALLATION OF WATER AIR HEATING AND AIR CONDITIONING SYSTEMS".
- F. ASHRAE INDUSTRIAL VENTILATION - A MANUAL OF RECOMMENDED PRACTICE, 20TH EDITION, AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS.
- 1.7 HYDROIC PIPING SYSTEMS
- A. PIPE AND FITTING MATERIALS, JOINING METHODS, SPECIAL DUTY VALVES, AND SPECIALTIES FOR THE FOLLOWING SYSTEMS:
1. HOT-WATER HEATING PIPING.
2. CHILLED-WATER PIPING.
3. CONDENSATE DRAIN PIPING.
4. AIR-VENT PIPING.
- B. PERFORMANCE REQUIREMENTS
1. HYDROIC PIPING COMPONENTS AND INSTALLATION SHALL BE CAPABLE OF WITHSTANDING THE

FOLLOWING MINIMUM WORKING PRESSURE AND TEMPERATURE:

- a. HOT-WATER HEATING PIPING: 150 PSIG AT 200 DEG.F.
- b. CHILLED-WATER PIPING: 150 PSIG AT 100 DEG.F.
- c. CONDENSATE-DRAIN PIPING: 100 DEG.F.
3. AIR-VENT PIPING: 100 DEG.F.
- C. QUALITY ASSURANCE
1. INSTALLER QUALIFICATIONS:
- a. INSTALLERS OF PRESSURE-SEALED JOINTS: INSTALLERS SHALL BE CERTIFIED BY THE PRESSURE-SEAL JOINT MANUFACTURER AS HAVING BEEN TRAINED AND QUALIFIED TO JOIN PIPING WITH PRESSURE-SEAL PIPE COUPLINGS AND FITTINGS.
2. STEEL SUPPORT WELDING: QUALIFY PROCESSES AND OPERATORS ACCORDING TO AWS D1.1/D1.1M, "STRUCTURAL WELDING CODE - STEEL".
3. WELDING: QUALIFY PROCESSES AND OPERATORS ACCORDING TO ASME BOILER AND PRESSURE VESSEL CODE: SECTION IX.
- a. COMPLY WITH PROVISIONS IN ASME B31 SERIES, "CODE FOR PRESSURE PIPING."
- b. CERTIFY THAT EACH WELDER HAS PASSED AWS QUALIFICATION TESTS FOR WELDING PROCESSES INVOLVED AND THAT CERTIFICATION IS CURRENT.
4. ASME COMPLIANCE: COMPLY WITH ASME B31.3, "BUILDING SERVICES PIPING," FOR MATERIALS, PRODUCTS, AND FABRICATION. SAFETY VALVES AND PRESSURE VESSELS SHALL BEAR THE APPROPRIATE ASME LABEL. FABRICATE AND STAMP AIR SEPARATORS AND EXPANSION TANKS TO COMPLY WITH ASME BOILER AND PRESSURE VESSEL CODE: SECTION VIII, DIVISION 1.

PART 2 - PRODUCTS

- 2.1 AIR DIFFUSERS, GRILLES AND REGISTER
- A. GENERAL: PROVIDE MANUFACTURER'S STANDARD CEILING AIR DIFFUSERS AND GRILLES WHERE SHOWN, OF SIZE, SHAPE, CAPACITY AND TYPE INDICATED, AND WITH ACCESSORIES AND FINISHES AS LISTED ON AIR DEVICE SCHEDULE. COLOR SELECTION SHALL BE FROM MANUFACTURER'S STANDARD COLOR CHIPS.
- B. CEILING COMPATIBILITY: PROVIDE DIFFUSERS WITH BORDER STYLES THAT ARE COMPATIBLE WITH ADJACENT CEILING SYSTEMS, AND THAT ARE SPECIFICALLY MANUFACTURED TO FIT INTO CEILING MODULE WITH ACCURATE FIT AND ADEQUATE SUPPORT. REFER TO ARCHITECTURAL REFLECTIVE CEILING PLAN, ROOM FINISHING SCHEDULE AND SPECIFICATIONS FOR TYPES OF CEILING AND WALLS SYSTEMS WHICH WILL CONTAIN EACH TYPE OF CEILING AIR DIFFUSER, GRILLE AND REGISTER. ALL AIR DEVICES INSTALLED IN PLASTER, GYP BOARD OR OTHER INDOOR CEILING OR WALLS SHALL BE PROVIDED WITH A SEPARATE MOUNTING FRAME.
- C. PROVIDE REMOTE MANUAL BALANCE DAMPER OPERATORS FOR ALL AIR DEVICE WHERE THE BALANCING DAMPER IS ABOVE AN SOLID CEILING. THE MANUAL OPERATOR SHALL BE AW IN THE DUCT OR OUT OF AIR STREAM TYPE WITH A CABLE EXTENDED TO AN ACCESSIBLE LOCATION - EQUAL TO MAT ROTO-TWIST CABLE OPERATED DAMPERS, OUT OF THE AIR STREAM TYPE CABLE SHALL BE TERMINATED AT INCONSPICUOUS WALL OR CEILING LOCATION WITH A MOUNTING BRACKET FOR ACTUATION CABLE SUPPORT WITH A CAP TO SEAL ACCESS HOLE - EQUAL TO MAT RT-CCM.
- D. MANUFACTURER: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE DIFFUSERS OF ONE OF THE FOLLOWING:
1. TITUS
2. KRIEGER
3. PRICE
4. METAIR
- 2.2 DUCTWORK INSULATION MATERIALS
- A. MINERAL FIBER INSULATION: COMPLY WITH ASTM C512 TYPE 1A OR 3B WITH FACTORY APPLIED PS JACKET.
- B. MINERAL FIBERGLASS BLANKET - 1.0 PCF: ASTM C 553 TYPE II, ASTM C 1290 TYPE III WITH FACTORY APPLIED FRK JACKET.
- C. JACKETS FOR DUCTWORK INSULATION: ASTM C 921, TYPE II FOR DUCTWORK WITH TEMPERATURES BELOW AMBIENT; TYPE I FOR DUCTWORK WITH TEMPERATURES ABOVE AMBIENT.
- D. DUCTWORK INSULATION ACCESSORIES: PROVIDE STAPLES, BANDS, WIRES, TAPE, ANCHORS, CORNER ANGLES AND SIMILAR ACCESSORIES AS RECOMMENDED BY INSULATION MANUFACTURER FOR APPLICATIONS INDICATED.
- E. DUCTWORK INSULATION COMPOUNDS: PROVIDE CEMENTS, ADHESIVES, COATINGS, SEALERS, PROTECTIVE FINISHES AND SIMILAR COMPOUNDS AS RECOMMENDED BY INSULATION MANUFACTURER FOR APPLICATIONS INDICATED.
- F. APPLICATION SCHEDULE
1. ITEMS NOT INSULATED:
- a. FACTORY INSULATED FLEXIBLE DUCTS
- b. METAL DUCTS WITH DUCT LINER OF SUFFICIENT THICKNESS TO COMPLY THE ENERGY CODE MINIMUM INSULATION R-VALUES.
2. CONCEALED SUPPLY AND RETURN AIR DUCT INSULATION:
- a. MATERIAL: MINERAL-FIBER BLANKET
- b. THICKNESS: 2 INCHES AND 1.0 PCF
3. EXPOSED SUPPLY AND RETURN AIR DUCT INSULATION:
- a. MATERIAL: MINERAL-FIBER BOARD
- b. THICKNESS: 2 INCHES AND 3.0 PCF
4. EQUIP CLEANING (EF-2) EXHAUST AIR
- a. MATERIAL: MINERAL-FIBER BLANKET
- b. THICKNESS: 2 INCHES AND 1.0 PCF
- 2.3 DUCTWORK CONSTRUCTION
- A. HVAC DUCTWORK MATERIALS
1. GALVANIZED STEEL DUCTWORK: SHALL BE CONSTRUCTED WITH G-90 OR BETTER GALVANIZED STEEL (ASTM A 653/A 653M 100, CHEM TR-68).
2. STAINLESS-STEEL SHEETS: COMPLY WITH ASTM A 480/A 480M, TYPE 304 OR 316, AS INDICATED IN THE "DUCT SCHEDULE" ARTICLE. COLD ROLLED, ANNEALED, SHEET. EXPOSED SURFACE FINISH SHALL BE NO. 2B, NO. 2D, NO. 3, OR NO. 4, AS INDICATED IN THE "DUCT SCHEDULE" ARTICLE.
3. ALUMINUM SHEETS: COMPLY WITH ASTM B 209 ALLOY 3003, H14 TEMPER, WITH MILL FINISH FOR CONCEALED DUCTS, AND STANDARD, ONE-SIDE BRIGHT FINISH FOR DUCT SURFACES EXPOSED TO VIEW, AND ITS EQUIPMENT.
- B. APPLICATION SCHEDULE
1. MEDIUM PRESSURE SUPPLY AIR:
- a. MATERIAL: G-90 GALVANIZED STEEL
- b. PRESSURE CLASS: -4 IN WG
2. LOW PRESSURE SUPPLY AIR:
- a. MATERIAL: G-90 GALVANIZED STEEL
- b. PRESSURE CLASS: -2 IN WG
3. RETURN AIR AND GENERAL TOILET EXHAUST AIR:
- a. MATERIAL: G-90 GALVANIZED STEEL
- b. PRESSURE CLASS: -1 IN WG
4. EQUIP CLEANING (EF-2) EXHAUST AIR:
- a. MATERIAL: TYPE 304 STAINLESS STEEL
- b. PRESSURE CLASS: -1 IN WG
- c. FINISH: NO. 2B.
- C. MISCELLANEOUS DUCTWORK MATERIALS
1. GENERAL: PROVIDE MISCELLANEOUS MATERIALS AND PRODUCTS TO COMPLETE THE DUCTWORK SYSTEM REQUIREMENTS INCLUDING PROPER CONNECTION OF DUCTWORK AND EQUIPMENT.
2. FITTINGS: PROVIDE MAJORITY TYPE FITTINGS FABRICATED OF MULTIPLE SECTIONS WITH MAXIMUM 15° CHANGE OF DIRECTION PER SECTION. UNLESS SPECIFICALLY DETAILED OTHERWISE, USE 45° LATERALS AND 45° ELBOWS FOR BRANCH TAKEOFF CONNECTIONS. WHERE 90° BRANCHES ARE INDICATED, PROVIDE CONICAL TYPE TEES.
3. DUCT LINER:
- a. FIBROGLASS GLASS, COMPLYING WITH THERMAL INSULATION MANUFACTURER'S ASSOCIATION (TMA) AHC-101, OF THICKNESS INDICATED, WITH ANTIMICROBIAL NEOPRENE COATING ADJACENT TO AIR STREAM.
- b. MANUFACTURERS:
- 1) CERTAINTED "ULTRALINER"
- 2) KNAUF TYPE "M"
- 3) JOHNS MANVILLE "UNACUSTIC"
- 4) OWENS-CORNING "AEROFLEX"
- c. DUCT LINER ADHESIVE:
- 1) COMPLY WITH ASTM C 916 "SPECIFICATIONS FOR ADHESIVES FOR DUCT THERMAL INSULATION." APPLICATION SHALL CONFORM TO MANUFACTURER'S WRITTEN RECOMMENDATIONS FOR THE APPARENT APPLICATION.
2. ADHESIVES SHALL BE NON-INFLAMMABLE AFTER CURING.
- 3) MANUFACTURERS:
- a) Benjamin-Foster.
- b) Duro Dyne "FPO".
- c) Kimo 35-137.
- d) Miraflex P-93.
- d. DUCT LINER FASTENERS:
- 1) COMPLY WITH SMACNA "INSTALLATION STANDARDS FOR RECTANGULAR DUCTS USING FLEXIBLE LINER", ARTICLES 5.2 THROUGH 5.2.1.
- 2) COMPLY WITH FINISH DETAILS AS SHOWN IN THE REFERENCED SMACNA SECTION, FIGURES 2-22 AND 2-23.
- 3) CLINCHED-WIN TYPE FASTENERS SHALL BE "GRIP-NAIL," OR APPROVED EQUAL.
- 4) PROTECTING PINS IN TYPE 3 OR TYPE 4 APPLICATIONS SHALL BE CLIPPED OFF CLOSE ENOUGH TO THE RETAINING DISC TO PROVIDE PROPER ANCHORING AND TO PREVENT INJURY TO PERSONNEL.
- D. DUCT SEALANT
1. DUCT SEALER SHALL BE FLEXIBLE, WATER-BASED, ADHESIVE SEALANT DESIGNED FOR USE IN ALL PRESSURE DUCT SYSTEMS. AFTER CURING, IT SHALL BE RESISTANT TO ULTRAVIOLET LIGHT AND SHALL SEAL OUT WATER, AIR, AND MOISTURE. SEALER SHALL BE UL LISTED AND CONFORM TO ASTM F 84.
2. COMPLY WITH REQUIREMENTS TABLE 3-1 IN SMACNA "HVAC DUCT CONSTRUCTION STANDARDS, METAL AND FLEXIBLE"
3. MANUFACTURERS:
- a. BENJAMIN-FOSTER
- b. DUCTMAK - PROSEAL
- c. DURO DYNE S2
- d. HARDCAST
- e. UNITED SHEET METAL.
- E. DUCTWORK SUPPORT MATERIALS:

1. GENERAL:
- a. EXCEPT AS OTHERWISE INDICATED, PROVIDE HOT-DIPPED GALVANIZED STEEL FASTENERS, ANCHORS, ROOLS, STRAPS, TRIM AND ANGLES FOR SUPPORT OF DUCTWORK.
- b. COMPLY WITH APPLICABLE PROVISIONS SMACNA "HVAC DUCT CONSTRUCTION STANDARDS, METAL AND FLEXIBLE", CHAPTER 3.
- F. FLEXIBLE DUCTS

1. GENERAL:
- a. EITHER SPIRAL WOUND SPRING STEEL WITH FLAMEPROOF VINYL SHEATHING, OR CORRUGATED ALUMINUM: COMPLYING WITH UL81.
- b. COMPLY WITH APPLICABLE PROVISIONS OF SMACNA "HVAC DUCT CONSTRUCTION STANDARDS, METAL AND FLEXIBLE", CHAPTER 3.
- c. INSTALLATION SHALL CONFORM TO CONDITIONS UNDER WHICH UL LISTING WAS GRANTED.
2. INSULATION:
- a. INSULATE ALL FLEXIBLE DUCTS, BOTH SUPPLY AND RETURN, WITH NOMINAL 2" THICK CONTINUOUS FLEXIBLE FIBERGLASS SHEATH WITH UL APPROVED VINYL BARRIER JACKET.
- b. INSULATION DENSITY SHALL BE 3/4 LB/CSQ FT.
- c. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE FLEXIBLE DUCTS MANUFACTURED BY ONE OF THE FOLLOWING:
- 1) ATCO
- 2) GENLEX
- 3) THERMAFLEX
- 2.4 DUCTWORK FABRICATION
- A. SHOP-FABRICATE DUCTWORK IN STANDARD LENGTHS, UNLESS OTHERWISE INDICATED OR REQUIRED TO COMPLETE RUNS. PREASSEMBLE WORK IN SHOP TO GREATEST EXTENT POSSIBLE, SO AS TO MINIMIZE FIELD ASSEMBLY OF SYSTEMS. DISASSEMBLE SYSTEMS ONLY TO EXTENT NECESSARY FOR SHIPPING AND HANDLING. MATCH MARK SECTIONS FOR REASSEMBLY AND COORDINATED INSTALLATION.
- B. SHOP-FABRICATE DUCTWORK OF GAUGES AND REINFORCEMENT COMPLYING WITH SMACNA "HVAC DUCT CONSTRUCTION STANDARDS, METAL AND FLEXIBLE" AS FOLLOWS:
1. RECTANGULAR, STEEL, CHAPTER 2.
2. FITTINGS AND CONSTRUCTION, CHAPTER 4.
3. ROUND, OVAL AND FLEXIBLE DUCT-CHAPTER 3.
4. RECTANGULAR DUCT LONGITUDINAL SEAMS: PITTSBURGH LOCK SHALL BE USED ON ALL LONGITUDINAL SEAMS. ALL LONGITUDINAL SEAMS WILL BE SEALED WITH MASTIC SEALANT.
5. ROUND DUCT SHALL BE EQUAL TO SPIRAL SEAM RL-1. ROUND DUCT WITH SNAPLOCK SEAMS SHALL IS LIMITED TO THE FINAL BRANCH RUN-OUT TO A SINGULAR AIR DIFFUSER NO LONGER THAN 30 FEET IN LENGTH.
6. DUCTMAK OR W.D.C.I. PROPRIETARY DUCT CONNECTION SYSTEMS WILL BE ACCEPTABLE. DUCT CONSTRUCTED USING THESE SYSTEMS WILL REFER TO THE MANUFACTURER'S GUIDELINES FOR SHEET GAUGE, INTERMEDIATE REINFORCEMENT SIZE AND SPACING, AND JOINT REINFORCEMENTS.
7. FORMED ON FLANGES (I.D. IT D.I. 7/25A/7-25B) WILL ONLY BE ACCEPTABLE WHEN SUBMITTED FOR APPROVAL PRIOR TO INSTALLATION OF ANY DUCTWORK. FORMED ON FLANGES WILL BE CONSTRUCTED AS SMACNA T-25 FLANGES. NO OTHER CONSTRUCTION PERTAINING TO FORMED ON FLANGES WILL BE ACCEPTABLE. FORMED ON FLANGES SHALL BE ACCEPTABLE FOR USE IN DUCTWORK 4" WIDE OR LESS, WITH 2" POSITIVE PRESSURE STATIC OR LESS, AND MUST INCLUDE THE USE OF CORNERS, BOLTS AND CLEAT.
8. FABRICATE DUCT FITTINGS TO MATCH ADDJONING DUCTS, AND TO COMPLY WITH DUCT REQUIREMENTS AS APPLICABLE TO FITTINGS. EXCEPT AS OTHERWISE INDICATED, FABRICATE ELBOWS WITH CENTER LINE RADIUS EQUAL TO ASSOCIATED DUCT WIDTH, AND FABRICATE TO INCLUDE TURNING VANES IN ELBOWS WHERE SHORTER RADIIUS IS NECESSARY. LIMIT ANGULAR TAPERS TO 30° FOR CONTRACTING TAPERS AND 20° FOR EXPANDING TAPERS.
9. FABRICATE DUCTWORK WITH DUCT LINER IN EACH SECTION OF DUCT WHERE INDICATED. LAMINATE LINER TO INTERNAL SURFACES OF DUCT IN ACCORDANCE WITH INSTRUCTIONS BY MANUFACTURERS OF LINERS AND ADHESIVE, AND FASTEN WITH MECHANICAL FASTENERS.
10. ROUND DUCT JOINTS:
- a. 6" -14" DIAMETER, INTERIOR SPL COUPLING BEADED AT CENTER, FASTENED TO DUCT WITH SEALING COMPOUND APPLIED CONTINUOUSLY AROUND JOINT BEFORE ASSEMBLING AND AFTER FASTENING.
11. PRESSURE CLASSIFICATIONS:
- a. STATIC PRESSURE RATINGS FOR DUCTWORK SYSTEMS ARE NOTED IN APURATION SCHEDULE.
- b. GAUGES OF METAL AND REINFORCING METHODS SHALL CONFORM TO SMACNA REQUIREMENTS.

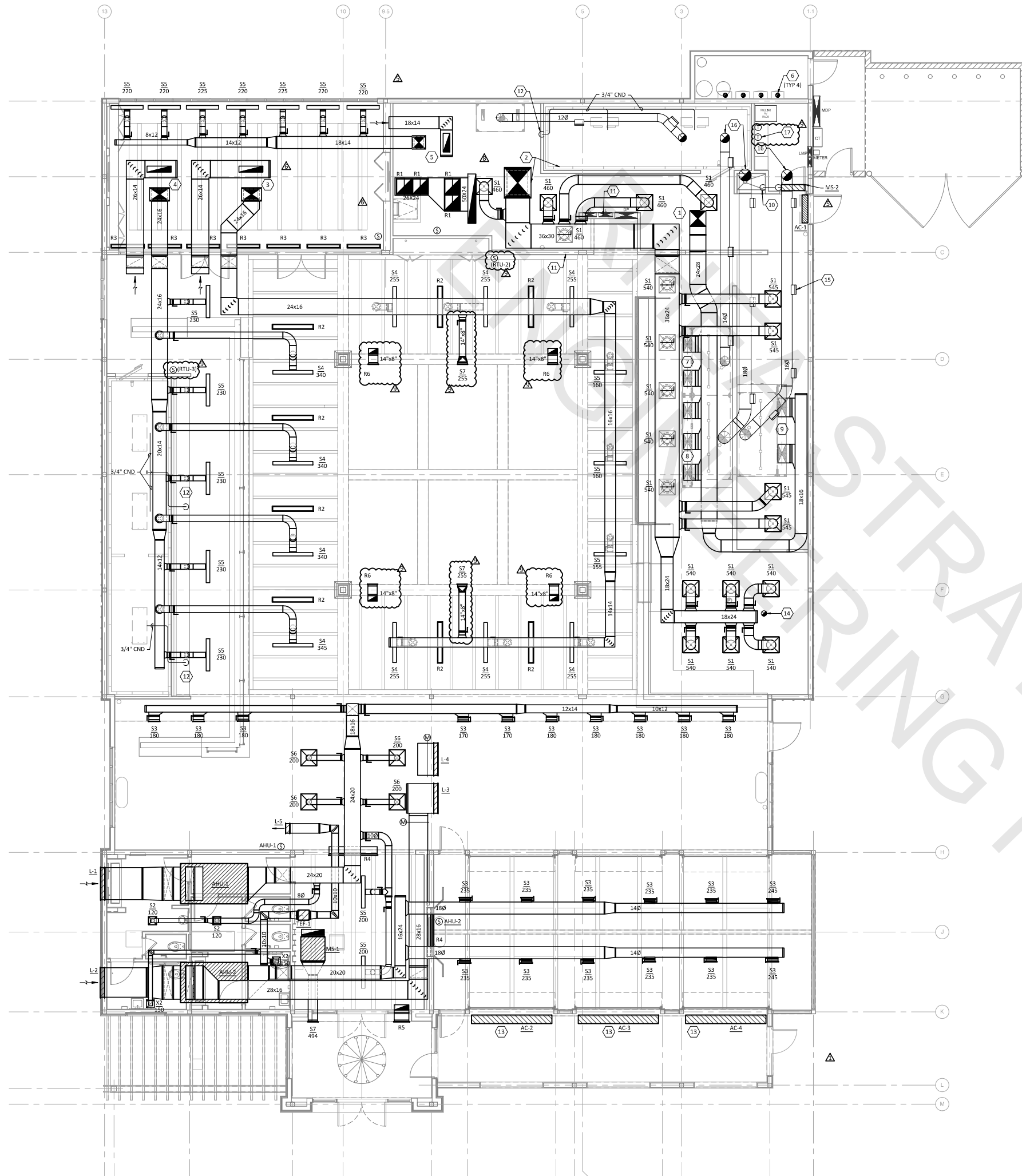
PART 3 - EXECUTION

- A. GENERAL: EXAMINE AREAS AND CONDITIONS UNDER WHICH METAL DUCTWORK IS TO BE INSTALLED. DO NOT PROCEED WITH WORK UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED IN MANNER ACCEPTABLE TO INSTALLER.
- B. INSTALLATION OF METAL DUCTWORK
1. INSTALLATION: INSTALL METAL DUCTWORK IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS.
- B. GENERAL: ASSEMBLE AND INSTALL DUCTWORK IN ACCORDANCE WITH RECORDED INDUSTRY PRACTICES WHICH WILL ACHIEVE AIR TIGHT (PS) LEAKAGE FOR SYSTEMS RATED 3 IN WG AND UNDER, 1% FOR SYSTEMS RATED OVER 3 IN WG AND NO LEESS AND NO DIRECTIONABLE NOISE SYSTEMS, CAPABLE OF PERFORMING EACH INDICATED SERVICE. INSTALL EACH RUN WITH MINIMUM BRANCHES. ALLOW DUCTWORK ACCURATELY AT CONNECTIONS, WITHIN 1/8" MISALIGNMENT TOLERANCE AND WITH INTERNAL SURFACES SMOOTH. SUPPORT DUCTS RIGIDLY WITH SUITABLE TIES, BRACES, HANGERS AND ANCHORS OF TYPE WHICH WILL HOLD DUCTS TRUE TO SHAPE AND TO PREVENT BUCKLING. SUPPORT VERTICAL DUCTS AT EVERY FLOOR.
- C. FIELD FABRICATION: COMPLETE FABRICATION OF WORK AT PROJECT AS NECESSARY TO MATCH SHOP FABRICATED WORK AND ACCOMMODATE INSTALLATION REQUIREMENTS.
- D. DUCT ROUTING:
1. LOCATE DUCTWORK RUNS, EXCEPT AS OTHERWISE INDICATED, VERTICALLY AND HORIZONTALLY TO THE BUILDINGS WALLS AND STRUCTURE AND AVOID DIAGONAL RUNS WHEREVER POSSIBLE. LOCATE DUCT AS INDICATED BY DIAGRAMS, DETAILS AND NOTATIONS OR, IF NOT OTHERWISE INDICATED, RUN DUCTWORK IN SHORTEST ROUTE WHICH DOES NOT OBSTRUCT USABLE SPACE OR BLOCK ACCESS FOR SERVICING BUILDING AND ITS EQUIPMENT.
2. HOLD DUCTS CLOSE TO WALLS, OVERHEAD CONSTRUCTION, COLUMNS, AND OTHER STRUCTURAL AND PERMANENT ENCLOSURE ELEMENTS OF BUILDING. PROVIDE CLEARANCE TO 1 INCH WHERE FURNISH IS SHOWN FOR ENCLOSURE OR CONCENTRATION OF DUCTS, ALLOW FOR INSULATION THICKNESS.
3. WHEREVER POSSIBLE IN FINISHED AND OCCUPIED SPACES, CONCEAL DUCTWORK FROM VIEW, BY LOCATING IN MECHANICAL SHAFTS, HOLLOW WALL CONSTRUCTION OR ABOVE SUSPENDED CEILINGS.
4. DO NOT LOCATE HORIZONTAL RUNS IN SOLID PARTITIONS, EXCEPT AS SPECIFICALLY SHOWN.
5. COORDINATE LAYOUT WITH STRUCTURAL MEMBERS, SUSPENDED CEILING, LIGHTING LAYOUTS, SPRINKLER PIPING, PLUMBING SYSTEMS AND SIMILAR FINISHED WORK.
- E. INSTALLATION OF EXPOSED DUCTWORK
1. PROTECT DUCTS EXPOSED IN FINISHED SPACES FROM BEING DENTED, SCRATCHED, OR DAMAGED. REMOVE CLEAN ALL TAGS AND SHOP FABRICATION MARKS FROM DUCTWORK.
2. TRIM DUCT SEALANTS FLUSH WITH METAL. CREATE A SMOOTH AND UNIFORM EXPOSED READ. DO NOT USE TWO-PART TAPE SEALING SYSTEM.
3. GRIND WELDS TO PROVIDE SMOOTH SURFACE FREE OF BURRS, SHARP EDGES, AND WELD SPATTER. WHEN WELDING STAINLESS STEEL WITH A NO. 3 OR 4 FINISH, GRIND THE WELD FLUSH. POLISH THE EXPOSED WELDS, AND TREAT THE WELDS TO REMOVE DISCOLORATION CAUSED BY WELDING.
4. MAINTAIN CONSISTENT, SYMMETRY, AND UNIFORMITY IN THE ARRANGEMENT AND FABRICATION OF FITTINGS, HANGERS AND SUPPORTS, DUCT ACCESSORIES, AND AIR OUTLETS.
5. REPAIR OR REPLACE DAMAGED SECTIONS AND FINISHED WORK THAT DOES NOT COMPLY WITH THESE REQUIREMENTS.
- F. ALL HVAC EQUIPMENT AND DUCT SYSTEMS MUST BE PROTECTED FROM COLLECTING DUST AND DEBRIS DURING THE FABRICATION, DELIVERY AND INSTALLATION OF HVAC SYSTEMS. CONTRACTOR SHALL IMPLEMENT CONTROL PROCEDURES TO PROTECT THE CLEANNESS OF THE HVAC EQUIPMENT AND DUCT SYSTEMS. CONTRACTOR SHALL WIPE CLEAN THE INTERIOR OF ALL SUPPLY AND RETURN DUCT WORK SEGMENTS PRIOR TO INSTALLATION. DURING CONSTRUCTION THE CONTRACTOR SHALL SEAL ALL SUPPLY AND RETURN AIR OPENINGS WITH PLASTIC. WHEN THE HVAC SYSTEMS ARE PLACED INTO OPERATION PRIOR TO OWNER ACCEPTANCE, THE CONTRACTOR SHALL INSTALL AND MAINTAIN TEMPORARY FILTER MEDIA AT ALL RETURN AIR INLET AND IMPEDEMENT LOCAL EXHAUST CAPTURE OF HIGH DUST PRODUCING CONSTRUCTION ACTIVITIES. THE TEMPORARY FILTER MEDIA SHALL A MERV RATING OF 8 AND WITH A TACKIFIER TO ENHANCE DUST RETENTION.
- G. ELECTRICAL EQUIPMENT SPACES: DO NOT ROUTE DUCTWORK THROUGH TRANSFORMER VAULTS AND THEIR ELECTRICAL EQUIPMENT SPACES AND ENCLOSURES.
- H. PENETRATIONS: WHERE DUCTS PASS THROUGH INTERIOR PARTITIONS AND EXTERIOR WALLS, AND ARE EXPOSED TO VIEW, CONCEAL SPACE BETWEEN CONSTRUCTION OPENING AND DUCT OR DUCT INSTALLATION WITH SHEET METAL FLANGES OF SAME GAUGE AS DUCT, OVERLAP OPENING ON 4 SIDES BY AT LEAST 3-1/2", FASTEN TO DUCT AND SUBSTRATE.
- I. WHERE DUCTS PASS THROUGH FIRE RATED FLOORS, WALLS, OR PARTITIONS, PROVIDE FIRE STOPPING BETWEEN DUCT AND SUBSTRATE.
- J. COORDINATION: COORDINATE DUCT INSTALLATIONS WITH INSTALLATION OF ACCESSORIES, DAMPERS, COIL FRAMES, EQUIPMENT, CONTROLS AND OTHER ASSOCIATED WORK OF DUCTWORK SYSTEM.
- 3.3 LOCATE CEILING AIR DIFFUSERS, REGISTERS, AND GRILLES, AS INDICATED ON GENERAL CONSTRUCTION "REFLECTED CEILING PLANS" UNLESS OTHERWISE INDICATED, LOCATE UNITS IN CENTER OF ACOUSTICAL CEILING MODULES.
- 3.4 DUCTWORK SYSTEM INSULATION
- A. INSTALL INSULATION MATERIALS, ACCESSORIES, AND FINISHES WITH SMOOTH, STRAIGHT, AND EVEN SURFACES; FREE OF JOINTS THROUGHOUT THE LENGTH OF DUCTS AND FITTINGS.
- B. INSTALL INSULATION MATERIALS, VAPOR BARRIERS OR RETARDERS, JACKETS, AND THICKNESSES REQUIRED FOR EACH ITEM OF DUCT SYSTEM AS SPECIFIED IN INSULATION SYSTEM SCHEDULES.
- C. INSTALL ACCESSORIES COMPATIBLE WITH INSULATION MATERIALS AND SUITABLE FOR THE SERVICE. INSTALL ACCESSORIES THAT DO NOT CORRODE, SORTEN, OR OTHERWISE ATTACK INSULATION OR JACKET IN EITHER WET OR DRY STATE.
- D. INSTALL INSULATION WITH LONGITUDINAL SEAMS AT TOP AND BOTTOM OF HORIZONTAL RUNS.
- E. KEEP MULTIPLE LAYERS OF INSULATION WITH LONGITUDINAL AND END SEAMS STAGGERED.
- F. REPAIR INSULATION MATERIALS DIRT DURING APPLICATION AND FINISHING.
- G. INSTALL INSULATION WITH TIGHT LONGITUDINAL SEAMS AND END JOINTS. BOND SEAMS AND JOINTS WITH ADHESIVE RECOMMENDED BY INSULATION MATERIAL MANUFACTURER.
- H. INSTALL INSULATION WITH LEAST NUMBER OF JOINTS PRACTICAL.
- I. WHERE VAPOR BARRIER IS REQUIRED: SEAL JOINTS, SEAMS, AND PENETRATIONS IN INSULATION AT HANGERS, SUPPORTS, ANCHORS, AND OTHER PROJECTIONS WITH VAPOR-BARRIER MASTIC.
1. INSTALL INSULATION CONTINUOUSLY THROUGH HANGERS AND AROUND ANCHOR ATTACHMENTS.
2. FOR INSULATION APPLICATION WHERE VAPOR BARRIERS ARE INDICATED, EXTEND INSULATION ON ANCHOR LEGS FROM POINT OF ATTACHMENT TO SUPPORTED ITEM TO POINT OF ATTACHMENT TO STRUCTURE. TAPER AND SEAL ENDS AT ATTACHMENT TO STRUCTURE WITH VAPOR-BARRIER MASTIC.
3. INSTALL INSERT MATERIALS AND INSTALL INSULATION TO TIGHTLY JOIN THE INSERT. SEAL INSULATION TO

- INSULATION INSERTS WITH ADHESIVE OR SEALING COMPOUND RECOMMENDED BY INSULATION MATERIAL MANUFACTURER.
- J. APPLY ADHESIVES, MASTICS, AND SEALANTS AT MANUFACTURER'S RECOMMENDED COVERAGE RATE AND WET AND DRY FILM THICKNESSES.

- 3.5 INSTALLATION OF DUCT LINER
- A. GENERAL: INSTALL DUCT LINER IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS, PAGES 2-25 THRU 2-29.
- B. DUCT LINER SHALL BE INSTALLED ONLY AS INDICATED ON PLANS AND ACCORDING TO THE FOLLOWING:
1. FIRST 15 FEET OF DUCT WORK DOWN STREAM OF AIR TERMINALS, FAN COILS OR RTU'S SHALL BE INTERNAL LINED EQUAL TO MANVILLE/ZEHLER PERMACOUSTIC OR EQUAL, 1-1/2" THICK, 1.5 LB. DENSITY GLASS FIBER ACOUSTIC DUCT LINER.
- 3.6 INSTALLATION OF FLEXIBLE DUCTS
- A. MAXIMUM LENGTH: FOR ANY DUCT RUN USING FLEXIBLE DUCTWORK, DO NOT EXCEED 60' EXTENDED LENGTH.
- B. INSTALLATION: INSTALL IN ACCORDANCE WITH CHAPTER 3 OF SMACNA "HVAC DUCT CONSTRUCTION STANDARDS, METAL AND FLEXIBLE".
- 3.7 EQUIPMENT CONNECTIONS
- A. GENERAL: CONNECT METAL DUCTWORK TO EQUIPMENT AS INDICATED, PROVIDE FLEXIBLE CONNECTION FOR EACH DUCTWORK CONNECTION TO EQUIPMENT MOUNTED ON VIBRATION ISOLATORS, ANY/OR EQUIPMENT CONTAINING ROTATING MACHINERY. PROVIDE ACCESS DOORS AS INDICATED.
- B. FIELD QUALITY CONTROL
- 3.8 TEST AND ADJUST CONTROLS AND SAFETIES. REPLACE DAMAGED AND MALFUNCTIONING CONTROLS AND EQUIPMENT.
- 3.9 CLEANING
- A. AFTER COMPLETING SYSTEM INSTALLATION, INCLUDING OUTLET FITTINGS AND DEVICES, INSPECT EXPOSED FINISH. REMOVE BURRS, DIRT, AND CONSTRUCTION DEBRIS, AND REPAIR DAMAGED FINISHES.
- 3.10 TESTING AND BALANCING
- A. CONTRACTOR SHALL TEST AND BALANCE THE HVAC SYSTEMS TO THE SCHEDULED AIR AND WATER CAPACITIES WITH A N.E.B. OR A.A.B.C APPROVED TESTING AND BALANCED CONTRACTOR. THE TESTING AND BALANCING ACTIVITIES SHALL BE RECORD ON N.E.B. OR A.A.B.C OR SMACNA STANDARD FORMS. TESTING AND BALANCING SHALL BE SUBMITTED TO ENGINEER FOR REVIEW.
- 3.12 DEMONSTRATION
- A. ENGAGE A FACTORY AUTHORIZED SERVICE REPRESENTATIVE TO TRAIN OWNER'S MAINTENANCE PERSONNEL AS SPECIFIED BELOW:
1. TRAIN OWNER'S MAINTENANCE PERSONNEL ON PROCEDURES AND SCHEDULES RELATED TO STARTUP AND SHUTDOWN, TROUBLESHOOTING, SERVICING, AND PREVENTIVE MAINTENANCE.
2. REVIEW DATA IN THE MAINTENANCE MANUALS.
3. SCHEDULE TRAINING WITH OWNER, THROUGH ARCHITECT, WITH AT LEAST 7 DAY ADVANCE NOTICE.
- 3.13 FIELD RECORD & AS-BUILT DRAWINGS AND SUBMITTAL AND OPERATING & MAINTENANCE MANUALS
- A. CONTRACTOR SHALL KEEP A CLEAN SET OF CONTRACT DRAWINGS ON THE JOB, NOTING DAILY ALL CHANGES MADE IN THESE DRAWINGS IN CONNECTION WITH THE FINAL INSTALLATION INCLUDING EXACT DIMENSIONED LOCATIONS OF ALL NEW AND UNCOVERED EXISTING UTILITIES.
- B. CONTRACTOR SHALL OBTAIN ORIGINALS OF THE FOLLOWING PRODUCT INFORMATION TO PROVIDE THREE (3) THREE RING BINDERS TO BE TURNED OVER TO THE ARCHITECT FOR REVIEW AND SUBSEQUENT DELIVERY TO THE OWNER.
1. ALL WARRANTIES AND GUARANTEES FOR EQUIPMENT AND MATERIAL COVERED BY THE CONTRACT INCLUDING THE NAMES, ADDRESSES AND TELEPHONE NUMBERS OF THE MANUFACTURERS RESPONSIVE PARTY.
2. APPROVED PRODUCT AND EQUIPMENT SUBMITTAL DATA.
3. APPROVED SHOP DRAWINGS.
4. OPERATING AND MAINTENANCE INSTRUCTIONS FOR MECHANICAL AND PLUMBING SYSTEMS. INCLUDE THE FOLLOWING INFORMATION:
- a. DESCRIPTION OF FUNCTION, NORMAL OPERATING CHARACTERISTICS AND LIMITATIONS, PERFORMANCE CURVES, ENGINEERING DATA AND TESTS, AND COMPLETE NOMENCLATURE AND COMMERCIAL NUMBERS OF ALL REP-ACCEABLE PARTS.
5. MANUFACTURER'S PRINTED OPERATING PROCEDURES TO INCLUDE START-UP, BREAK-IN, ROUTINE AND NORMAL OPERATING INSTRUCTIONS, REGULATION, CONTROL, STOPPING, SHUTDOWN, AND EMERGENCY INSTRUCTIONS, AND SUMMER AND WINTER OPERATING INSTRUCTIONS.
6. MAINTENANCE PROCEDURES FOR ROUTINE PREVENTATIVE MAINTENANCE AND TROUBLESHOOTING: DISASSEMBLY, REPAIR, AND REASSEMBLY, ALIGNING AND ADJUSTING INSTRUCTIONS.
7. SERVICING INSTRUCTIONS AND LUBRICATION CHARTS AND SCHEDULES.
8. MAINTENANCE BROCHURES SHALL BE CLEARLY MARKED TO INDICATE THE ACTUAL EQUIPMENT MODEL NUMBERS, ACCESSORIES, FEATURES, OPTIONAL FEATURES, ETC. FURNISHED ON THE PROJECT. ALL EQUIPMENT BROCHURES SHALL REFERENCE THE IDENTIFYING LABELS USED ON THE PROJECT DRAWINGS.
9. TEST AND BALANCE REPORTS REQUIRED BY THESE SPECIFICATIONS.
6. OTHER TEST AND INSPECTION REPORTS, PRODUCT DATA AND/OR DRAWINGS REQUIRED DURING CONSTRUCTION.
7. VALUE TAG CHARTS AND DIAGRAMS.
- C. CONTRACTOR SHALL TWO-WEEKS PRIOR TO REQUESTING A FINAL INSPECTION, TURN OVER THE PROJECT THREE RING BINDERS AND TWO COPIES OF THE FIELD RECORD DRAWING MARKED AS "AS INSTALLED" WORK TO THE ARCHITECT FOR SUBSEQUENT REVIEW AND TRANSMITTAL TO THE OWNER. CONTRACTOR SHALL NOTE ALL CONSTRUCTION CHANGES, DATE EACH SHEET AND LABEL "AS-BUILT" IN THE REVISION BLOCK ON THE DRAWINGS. PROJECT CLOSE-OUT INFORMATION MUST BE SUBMITTED AND APPROVED PRIOR TO REQUESTS FOR FINAL PAYMENT.
- D. CONTRACTOR SHALL PROVIDE TWO ELECTRONIC COPIES OF ALL REQUIRED CLOSE-OUT DOCUMENTATION INDICATED ABOVE.

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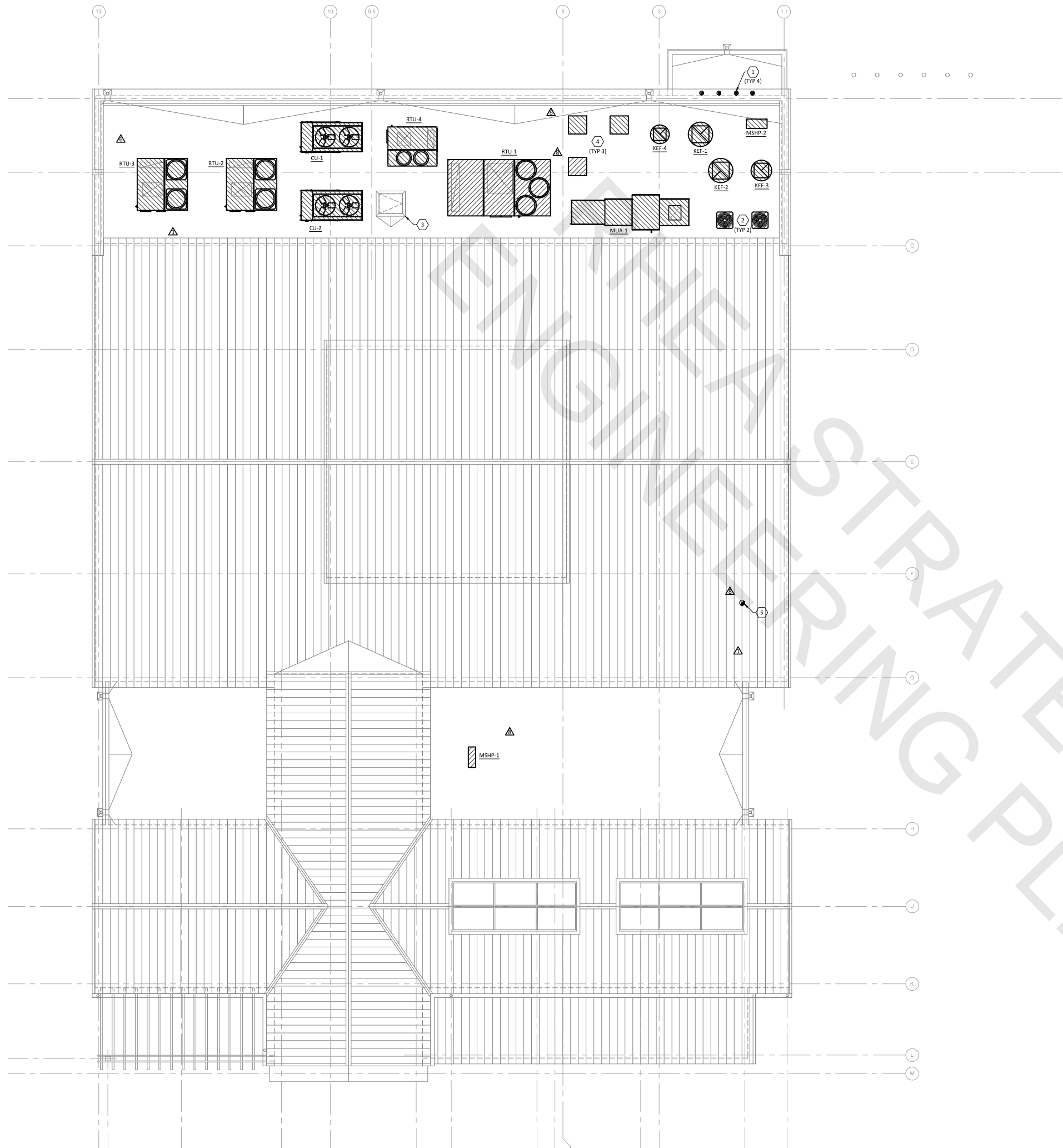
GENERAL NOTES:

- COORDINATE THE LOCATION OF ALL AIR DISTRIBUTION DEVICES WITH THE ARCHITECTURAL REFLECTED CEILING PLAN INCLUDING LIGHT FIXTURES AND LIFE SAFETY DEVICES.
- VERIFY LOCATION OF THERMOSTATS/TEMPERATURE SENSORS WITH THE ARCHITECT/ENGINEER PRIOR TO INSTALLATION TO COORDINATE WITH THE LATEST FURNITURE AND MILLWORK PLANS. INSTALL DEVICES AT 48" AFF, UNLESS NOTED OTHERWISE ON THE PLANS.
- ALL WORK SHALL COMPLY WITH THE LOCAL BUILDING, PLUMBING, AND MECHANICAL CODES, NFPA 90A, AND ANY OTHER APPLICABLE CODES.
- ALL LOCATIONS OF DEVICES ARE APPROXIMATE. SEE ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS.
- SEAL NEW OR EXISTING PENETRATIONS IN OF FLOORS, RATED PARTITIONS, AND CORRIDOR WALLS. USE FIRESTOP AT ALL RATED PARTITIONS.
- COORDINATE ALL FLOOR AND ROOF PENETRATIONS WITH STRUCTURAL.
- FLEX DUCT LENGTH NOT TO EXCEED 5'-0". PROVIDE MANUAL DAMPER AT ALL TAKE-OFFS.
- ALL DUCTWORK SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST SMACNA STANDARDS.
- ALL DUCTWORK DIMENSIONS ARE CLEAR INSIDE DIMENSIONS. ADJUST METAL SIZES TO ACCOMMODATE INTERNAL DUCT LINER AS REQUIRED.
- TURNING VANES ARE REQUIRED AT EACH TURN IN THE DUCT. EXTRACTORS ARE REQUIRED AT EACH SPLIT.
- PROVIDE FLEXIBLE CONNECTION AT INTAKE AND DISCHARGE OF MOTOR DRIVEN EQUIPMENT.
- LABEL ALL AIR VOLUME DAMPERS ON OUTSIDE OF DUCT INSULATION.
- FIELD VERIFY ALL LOCATIONS OF MECHANICAL EQUIPMENT AND EXHAUST FANS TO MAINTAIN A MINIMUM OF 10'-0" OF CLEARANCE BETWEEN ANY NEW AND/OR EXISTING OUTSIDE AIR INTAKES OR OPENINGS INTO BUILDING AND ANY EXHAUST OR VENT DISCHARGES.
- EQUIPMENT SHALL BE PROVIDED ACCESS TO PER SECTION 306 OF THE INTERNATIONAL MECHANICAL CODE- EXACT LOCATION AND REQUIREMENTS FOR ACCESS SHALL BE COORDINATED WITH ARCHITECT. REFER TO EXACT CODE SECTION FOR ADDITIONAL SPECIFIC REQUIREMENTS.
 - ALL EQUIPMENT SHALL BE PROVIDED WITH A CLEAR WORKING SPACE NOT LESS THAN 30" DEEP AND 30" WIDE IN FRONT OF CONTROL AREA AND ANY OTHER AREA REQUIRING ACCESS FOR MAINTENANCE, PER IMC 306.1.
 - EQUIPMENT IN AN ATTICS SHALL HAVE AN UNOBSTRUCTED PASSAGEWAY MEASURING NOT LESS THAN 30" HIGH x 22" WIDE x 20'-0" IN LENGTH ALONG THE PATH BACK TO THE ACCESS OPENING WITH CONTINUOUS, LEVEL FLOORING NOT LESS THAN 24" WIDE. ACCESS OPENING SHALL BE LARGE ENOUGH TO REMOVE THE LARGEST PIECE OF EQUIPMENT, BUT NOT LESS THAN 20"x30", PER IMC 306.3.
 - EQUIPMENT ON ROOFS OR ELEVATED STRUCTURES ABOVE 16'-0" SHALL BE PROVIDED WITH PERMANENT ACCESS, PER IMC 306.5.
 - GUARDS SHALL BE PROVIDED, ACCORDING TO FBCM 304.11, WHERE VARIOUS COMPONENTS THAT REQUIRE SERVICE AND ROOF HATCH OPENINGS ARE LOCATED WITHIN 10'-0" OF A ROOF EDGE OR OPEN SIDE OF A WALKING SURFACE AND SUCH EDGE OR OPEN SIDE IS LOCATED MORE THAN 2'-0" ABOVE THE FLOOR, ROOF, OR GRADE BELOW.

NOTES BY SYMBOL (THIS SHEET ONLY)

- ROUTE FULL SIZE MAKEUP AIR DUCT DOWN THROUGH ROOF FROM MUA-1. TRANSITION DUCTWORK AS REQUIRED.
- ROUTE FULL SIZE SUPPLY AND RETURN DUCT DOWN THROUGH ROOF FROM RTU-1. TRANSITION DUCTWORK AS REQUIRED.
- ROUTE FULL SIZE SUPPLY AND RETURN DUCT DOWN THROUGH ROOF FROM RTU-2. TRANSITION DUCTWORK AS REQUIRED.
- ROUTE FULL SIZE SUPPLY AND RETURN DUCT DOWN THROUGH ROOF FROM RTU-3. TRANSITION DUCTWORK AS REQUIRED.
- ROUTE FULL SIZE SUPPLY AND RETURN DUCT DOWN THROUGH ROOF FROM RTU-4. TRANSITION DUCTWORK AS REQUIRED.
- WATER HEATER MANUFACTURER'S CONCENTRIC TERMINATION THROUGH ROOF. INSTALL PER MANUFACTURER'S INSTALLATION INSTRUCTION. ENSURE TERMINATION IS MINIMUM 10'-0" FROM ALL MECHANICAL AIR INTAKES. OFFSET INTAKE AND VENT PIPING AS REQUIRED (TYPICAL OF 4).
- CONNECT 24"x12" MAKEUP AIR DUCT TO MAKEUP AIR PLENUM FOR KH-1 (TYPICAL OF 2 CONNECTIONS AT 712 CFM EACH). REFER TO KITCHEN HOOD AND FAN DRAWINGS FOR MORE INFORMATION.
- CONNECT 24"x12" MAKEUP AIR DUCT TO MAKEUP AIR PLENUM FOR KH-2 (TYPICAL OF 3 CONNECTIONS AT 723 CFM EACH). REFER TO KITCHEN HOOD AND FAN DRAWINGS FOR MORE INFORMATION.
- CONNECT 28"x12" MAKEUP AIR DUCT TO MAKEUP AIR PLENUM FOR KH-3 (TYPICAL OF 2 CONNECTIONS AT 840 CFM EACH). REFER TO KITCHEN HOOD AND FAN DRAWINGS FOR MORE INFORMATION.
- 3/4" CND FROM MS-1 UP. ROUTE ABOVE CEILING AND DOWN WALL AS SHOWN ON PLANS. COORDINATE EXACT ROUTING IN FIELD. DISCHARGE INTO MOP SINK BASIN WITH OPEN SITE CONNECTION.
- COORDINATE INSTALLATION OF EQUIPMENT, DUCTWORK, AND PIPING WITH ALL TRADES. DO NOT ROUTE DUCTWORK OR PIPING OVER ELECTRICAL PANELS.
- ROUTE 3/4"Ø CND FROM FREEZER/COOLER EVAPORATORS AS SHOWN ON PLANS. DISCHARGE INTO FLOOR SINK WITH OPEN SITE CONNECTION. REFER TO KITCHEN VENDOR DRAWINGS FOR MORE INFORMATION.
- PROVIDE DOOR MONITORING SYSTEM FOR OVERHEAD DOOR. INTERLOCK WITH AHU-2. REFER TO SPLIT SYSTEM AIR CONDITIONING SCHEDULE FOR MORE INFORMATION.
- 8"Ø PIZZA OVEN FLUE UP THROUGH ROOF. INSTALL PER MANUFACTURER'S INSTRUCTIONS.
- PER FBCM S06.3.8, PROVIDE GREASE DUCT ACCESS DOOR (TYPICAL). REFERENCE 08/M501.01.
- CONNECT WELDED STEEL GREASE DUCT TO KITCHEN EXHAUST FAN AT THE ROOF/CURB COLLAR AND TRANSITION TO SIZE INDICATED ON PLANS. THE DUCT SHALL BE WRAPPED WITH 2 LAYERS OF 3MTM FIRE BARRIER DUCT WRAP 615+ (REFERENCE 12/M501.01). THE DUCT SHALL SLOPE AT 1/4" PER LINEAR FOOT TOWARD THE HOOD OR TOWARD A GREASE RESERVOIR INSTALLED PER FBCM S06.3.7.
- MOUNT THERMOSTATS FOR RTU-1, RTU-2, RTU-3, AND RTU-4 ON WALL AT 48" AFF. PROVIDE ALL CONTROL WIRING AS REQUIRED.

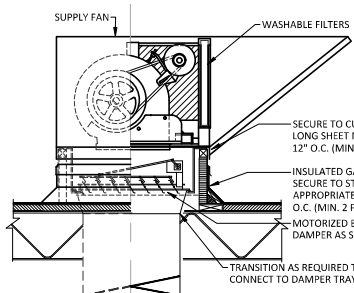
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- GENERAL NOTES:
- A. COORDINATE THE LOCATION OF ALL AIR DISTRIBUTION DEVICES WITH THE ARCHITECTURAL REFLECTED CEILING PLAN INCLUDING LIGHT FIXTURES AND LIFE SAFETY DEVICES.
 - B. VERIFY LOCATION OF THERMOSTATS/TEMPERATURE SENSORS WITH THE ARCHITECT/ENGINEER PRIOR TO INSTALLATION TO COORDINATE WITH THE LATEST FURNITURE AND MILLWORK PLANS. INSTALL DEVICES AT 48" AFF, UNLESS NOTED OTHERWISE ON THE PLANS.
 - C. ALL WORK SHALL COMPLY WITH THE LOCAL BUILDING, PLUMBING, AND MECHANICAL CODES, NFPA 90A, AND ANY OTHER APPLICABLE CODES.
 - D. ALL LOCATIONS OF DEVICES ARE APPROXIMATE. SEE ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS.
 - E. SEAL NEW OR EXISTING PENETRATIONS IN OF FLOORS, RATED PARTITIONS, AND CORRIDOR WALLS. USE FIRESTOP AT ALL RATED PARTITIONS.
 - F. COORDINATE ALL FLOOR AND ROOF PENETRATIONS WITH STRUCTURAL.
 - G. FLEX DUCT LENGTH NOT TO EXCEED 5'-0". PROVIDE MANUAL DAMPER AT ALL TAKE-OFFS.
 - H. ALL DUCTWORK SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST SMACNA STANDARDS.
 - I. ALL DUCTWORK DIMENSIONS ARE CLEAR INSIDE DIMENSIONS. ADJUST METAL SIZES TO ACCOMMODATE INTERNAL DUCT LINER AS REQUIRED.
 - J. TURNING VANES ARE REQUIRED AT EACH TURN IN THE DUCT. EXTRACTORS ARE REQUIRED AT EACH SPLIT.
 - K. PROVIDE FLEXIBLE CONNECTION AT INTAKE AND DISCHARGE OF MOTOR DRIVEN EQUIPMENT.
 - L. LABEL ALL AIR VOLUME DAMPERS ON OUTSIDE OF DUCT INSULATION.
 - M. FIELD VERIFY ALL LOCATIONS OF MECHANICAL EQUIPMENT AND EXHAUST FANS TO MAINTAIN A MINIMUM OF 10'-0" OF CLEARANCE BETWEEN ANY NEW AND/OR EXISTING OUTSIDE AIR INTAKES OR OPENINGS INTO BUILDING AND ANY EXHAUST OR VENT DISCHARGES.
 - N. EQUIPMENT SHALL BE PROVIDED ACCESS TO PER SECTION 306 OF THE INTERNATIONAL MECHANICAL CODE- EXACT LOCATION AND REQUIREMENTS FOR ACCESS SHALL BE COORDINATED WITH ARCHITECT. REFER TO EXACT CODE SECTION FOR ADDITIONAL SPECIFIC REQUIREMENTS.
 - a. ALL EQUIPMENT SHALL BE PROVIDED WITH A CLEAR WORKING SPACE NOT LESS THAN 30" DEEP AND 30" WIDE IN FRONT OF CONTROL AREA AND ANY OTHER AREA REQUIRING ACCESS FOR MAINTENANCE, PER IMC 306.1.
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 - c. EQUIPMENT ON ROOFS OR ELEVATED STRUCTURES ABOVE 16'-0" SHALL BE PROVIDED WITH PERMANENT ACCESS, PER IMC 306.5.
 - d. GUARDS SHALL BE PROVIDED, ACCORDING TO FBCM 304.11, WHERE VARIOUS COMPONENTS THAT REQUIRE SERVICE AND ROOF HATCH OPENINGS ARE LOCATED WITHIN 10'-0" OF A ROOF EDGE OR OPEN SIDE OF A WALKING SURFACE AND SUCH EDGE OR OPEN SIDE IS LOCATED MORE THAN 2'-0" ABOVE THE FLOOR, ROOF, OR GRADE BELOW.

- NOTES BY SYMBOL (THIS SHEET ONLY)
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 - 2. REMOTE CONDENSER SERVES MUA-1 (TYPICAL OF 2).
 - 3. ROOF HATCH. REFER TO ARCHITECTURAL FOR MORE INFORMATION.
 - 4. REMOTE CONDENSERS SERVE COOLER AND FREEZER. COORDINATE EXACT REQUIREMENTS WITH FOOD SERVICE DRAWINGS (TYPICAL OF 3).
 - 5. PIZZA OVEN EXHAUST FLUE UP THROUGH ROOF. TERMINATE WITH ROOF CAP A MINIMUM OF 0'-0" ABOVE ROOF. PROVIDE 16-GAGE BLACK IRON OR 18-GAGE STAINLESS STEEL GREASE DUCTWORK. PROVIDE 2 LAYERS OF 3M FIRE BARRIER DUCT WRAP 615+, OR EQUAL. PROVIDE LONG RADIUS ELBOWS. SLOPE DUCT BACK TOWARDS HODD PER CODE.

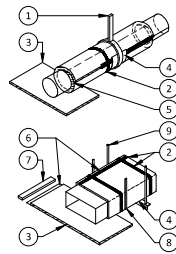
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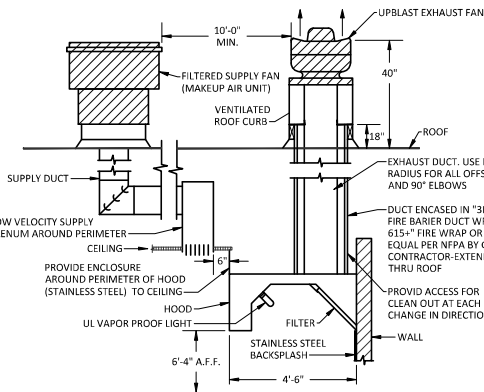
04 MAKEUP AIR FAN DETAIL
SCALE: NTS

1. CONNECT STRAP TO STRUCTURE ABOVE. REFER TO SMACNA SHEETMETAL CONSTRUCTION STANDARDS.
2. SEAL SEAMS AND PENETRATIONS WITH APPROVED MASTIC REINFORCED W/ 3\"/>
3. WRAP FLEXIBLE FIBERGLASS INSULATION AROUND DUCTS AND SECURE WITH OUTWARD-CLINCHING STRAPES.
4. INSTALL NON-COMPRESSIBLE INSULATION MATERIAL AT HANGER SUPPORTS. ALL HANGER SUPPORTS AND SADDLES SHALL BE OUTSIDE OF INSULATION AND VAPOR BARRIER.
5. LAP INSULATION A MINIMUM OF 4 INCHES.
6. 2\"/>
7. DISCARD EXCESS INSULATION.
8. STRAP SUPPORTS. REFER TO SMACNA SHEETMETAL CONSTRUCTION STANDARDS.
9. ALL-THREAD RODS. REFER TO SMACNA SHEETMETAL CONSTRUCTION STANDARDS

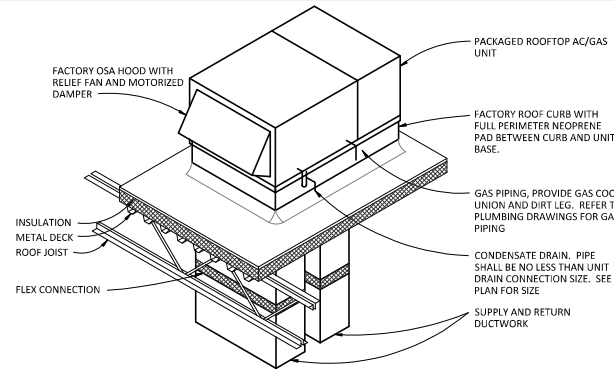
NOTE: REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS



03 ROUND/RECTANGULAR DUCT INSULATION DETAIL
SCALE: NTS

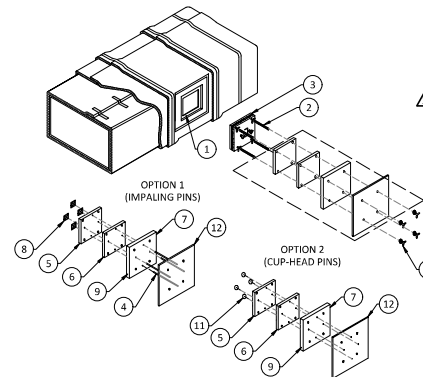


02 KITCHEN HOOD SYSTEM DETAIL
SCALE: NTS



NOTES:
PROVIDE THROUGH THE CURB ELECTRICAL CONNECTION(S)
INSTALL DUCT SMOKE DETECTOR PER LOCAL CODES

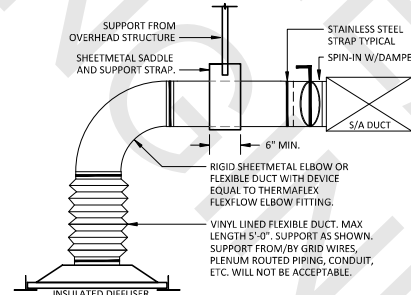
01 DOWNFLOW ROOFTOP UNIT DETAIL
SCALE: NTS



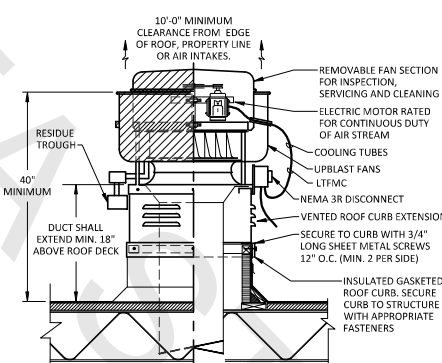
08 GREASE DUCT ACCESS DOOR DETAIL
SCALE: NTS

PRE-FABRICATED 1- OR 2- HOUR ACCESS DOOR SYSTEM

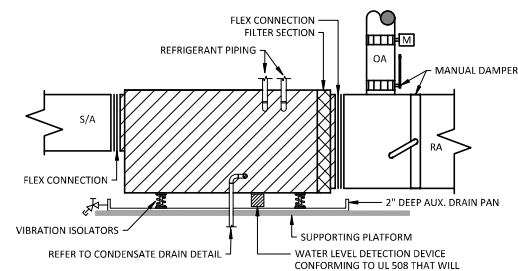
1. ACCESS HOLE. 12\"/>
2. DUCT (MAY BE ULTRATEX DOOR). WELDED.
5. FIRST LAYER 3M\"/>
6. SECOND LAYER 3M\"/>
7. THIRD LAYER 3M\"/>
8. SPEED CLIPS.
9. ALUMINUM TAPE COVERING ALL EXPOSED EDGES.
10. 1/4\"/>
11. INSULATION PINS (CUP-HEAD PINS) - WELDED.
12. ACCESS DOOR COVER - 16 GAUGE CUT SAME SIZE AS THIRD LAYER OF DUCT WRAP WITH CLEARANCE HOLES TO MATCH PATTERN OF ALL-THREADED RODS.



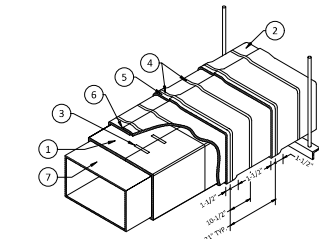
07 TYPICAL DIFFUSER DETAIL
SCALE: NTS



06 KITCHEN HOOD FAN DETAIL
SCALE: NTS



05 HORIZONTAL FAN COIL UNIT DETAIL - PLATFORM
SCALE: NTS

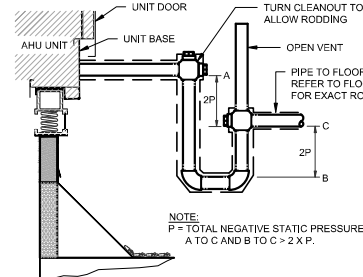


12 GREASE DUCT WRAP SYSTEMS
SCALE: NTS

1- OR 2-HOUR SHAFT ALTERNATIVE ZERO CLEARANCE TO COMBUSTIBLES TELESCOPING WRAP TECHNIQUE WITH BANDING FOR DUCTS 24\"/>

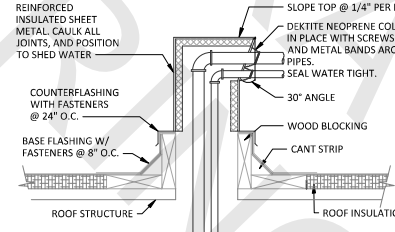
1. FIRST LAYER 3M\"/>
2. SECOND LAYER 3M\"/>
3. 3/4\"/>
4. STEEL BANDING 1/2\"/>
5. LONGITUDINAL JOINT BUTT OR MIN. 3\"/>
6. PERIMETER (LATERAL) JOINT BUTT OR MIN. 3\"/>
7. METALLIC COMMERCIAL COOKING EXHAUST DUCT.

NOTE: SYSTEM INTEGRITY IS LIMITED BY QUALITY OF INSTALLATION. DUCTS 24\"/>

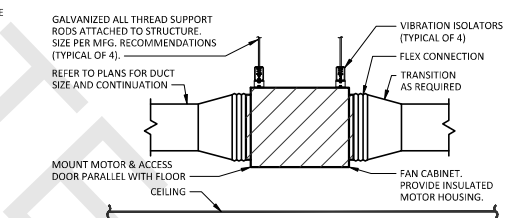


11 AHU CONDENSATE DRAIN DETAIL
SCALE: NTS

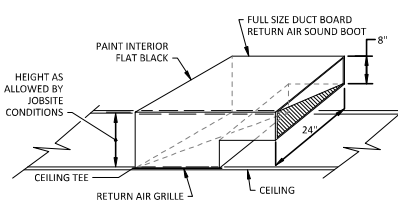
NOTE:
P = TOTAL NEGATIVE STATIC PRESSURE.
A TO C AND B TO C > 2 X P.



10 PIPE PENETRATION THROUGH ROOF DETAIL
SCALE: NTS



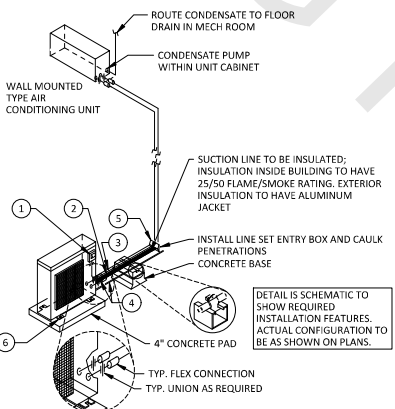
09 IN-LINE FAN DETAIL - SUSPENDED
SCALE: NTS



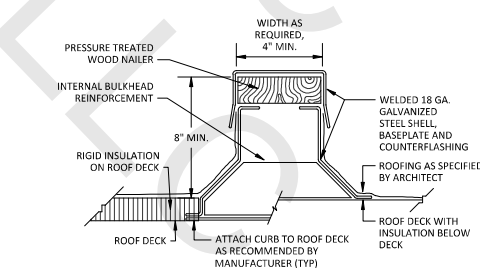
NOTE:
DUCT BOARD RETURN AIR SOUND BOOTS ARE REQUIRED ON ALL RETURN AIR GRILLES LOCATED LESS THAN 10'-0\"/>

15 RETURN AIR SOUND BOOT DETAIL
SCALE: NTS

1. DISCONNECT SWITCH, W/P, MOUNTED ON CONDENSING UNIT WITH GALVANIZED FASTENERS, AVOID MOUNTING ON ACCESS CONNECTOR (BY E.C.).
2. LOW VOLTAGE CONTROL WIRING BY HVAC CONTRACTOR.
3. LIQUIDTIGHT FLEX CONDUIT WITH APPROVED FITTINGS, CLAMPS TO UNIT TO MINIMIZE STRAIN ON CONNECTOR (BY E.C.), MAX 48\"/>
4. LIQUID AND SUCTION REFRIGERANT LINES. SUPPORT ON GALVANIZED UNISTRUT CHANNEL IF MORE THAN 24\"/>
5. SEAL WALL PENETRATION NEATLY WITH CONSTRUCTION SEALANT (BY HVAC CONTRACTOR). PROVIDE PIPE SLEEVE. PROVIDE SHEET METAL WEATHERHOOD OVER REFRIGERANT LINES ENTRY.
6. COMPRESSOR/CONDENSING UNIT ON RIBBED NEOPRENE MOUNTING PADS, LOAD NO GREATER THAN 25 PSI. AMBER/BOOTH CO. AMPAD TYPE NRC OR EQUAL. UNIT TO BE BOLTED TO EQUIPMENT SUPPORTS WITH GALVANIZED BOLTS.



14 DUCTLESS SPLIT SYSTEM
SCALE: NTS



13 TYPICAL PIPE/EQUIPMENT ROOF SUPPORT
SCALE: NTS

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AIR CURTAIN SCHEDULE											
MARK	MANUFACTURER	MODEL	LENGTH	MAX AIRFLOW (CFM)	MAX VELOCITY (FPM)	FAN QTY	FAN HP	VOLT/Ø	MCA	MOCP	REMARKS
AC-1	MARS	LPV242-1UA-08	42"	1050	1800	1	1/6	115/1	3	15	1,2,3,5
AC-2,3,4	MARS	STD2120-3UA-08	120"	4341	4660	3	1/2	208/3	20.25	30	1,2,4,5

- REMARKS:
- COORDINATE FINISH WITH ARCHITECT.
 - PROVIDE DOOR LIMIT SWITCH (MODEL #: 99-014).
 - PROVIDE TRANSOM MOUNTING BRACKET SET (MODEL #: B0042).
 - PROVIDE ADJUSTABLE MOUNTING BRACKET FOR USE WITH ROLL UP DOOR.
 - 5 YEAR PARTS WARRANTY.

AIR DEVICE SCHEDULE							
MARK	MANUFACTURER	MODEL	FACE SIZE	NECK SIZE	MAX FLOW	MAX NC	DESCRIPTION
S1	PRICE	PDS	24x24	14ø	550	30	PERFORATED CEILING DIFFUSER, NO DIRECTIONAL VANES
S2	PRICE	SCD	12x12	6ø	150	25	SQUARE CONE CEILING DIFFUSER
S3	PRICE	620	18x6	16x4	270	25	SIDEWALL, 22.5" HORIZONTAL DEFLECTION
S4	PRICE	SDS150	62x6	10ø	430	25	(2) 1.5" SLOTS, SDB PLENUM, INSULATED
S5	PRICE	SDS150	50x6	8ø	300	25	(2) 1.5" SLOTS, SDB PLENUM, INSULATED
S6	PRICE	SCD	24x24	8ø	250	25	SQUARE CONE CEILING DIFFUSER
S7	PRICE	620	16x10	14x8	550	25	SIDEWALL, 22.5" HORIZONTAL DEFLECTION
R1	PRICE	PDDR	24x24	22x22	2250	25	PERFORATED CEILING DIFFUSER
R2	PRICE	SDR	62x6	60x5.25	420	25	(2) 1.5" SLOTS, FIELD FABRICATED SOUND BOOT, INSULATED
R3	PRICE	SDR	50x6	48x5.25	310	25	(2) 1.5" SLOTS, FIELD FABRICATED SOUND BOOT, INSULATED
R4	PRICE	630	74x16	72x14	3200	25	SIDEWALL, 45" VERTICAL DEFLECTION, 3/4" BLADE SPACING
R5	PRICE	630	24x10	22x8	550	25	SIDEWALL, 45" VERTICAL DEFLECTION, 3/4" BLADE SPACING
R6	PRICE	630	16x10	14x8	550	25	SIDEWALL, 45" VERTICAL DEFLECTION, 3/4" BLADE SPACING
X1	PRICE	PDDR	12x12	6x6	150	25	PERFORATED CEILING DIFFUSER

- NOTES:
- COORDINATE BORDER AND FINISH WITH ARCHITECTURAL DOCUMENTS.
 - PROVIDE CEILING RADIATION DAMPER AT RATED ASSEMBLIES.
 - PROVIDE MANUAL BALANCER DAMPER FOR EACH SUPPLY AIR DEVICE.
 - BRANCH DUCT SIZE SHALL BE SAME AS NECK SIZE UNLESS OTHERWISE SHOWN ON DRAWINGS.

HVAC MATERIALS SCHEDULE		
SYSTEM	MATERIAL	INSULATION VALUE
SUPPLY/RETURN (INDOORS)	G-90 OR BETTER GALVANIZED SHEET METAL, SEE NOTE 1	R-6
SUPPLY/RETURN (OUTDOORS)		R-8 (CLIMATE ZONE 0-4)
		R-12 (CLIMATE ZONE 5-8)
GENERAL EXHAUST		N/A
TYPE 1 HOODS	16 GAGE STEEL	N/A
	18 GAGE STAINLESS STEEL	
SUPPLY/RETURN FLEX DUCT	UL 181 HELICAL SPRING STEEL W/ VINYL FILM	R-6
CONDENSATE DRAIN (INDOORS)	TYPE L COPPER (PLENUM)	R-3
	PVC	
	TYPE L COPPER (PLENUM)	
CONDENSATE DRAIN (OUTDOORS)	PVC	N/A
REFRIGERANT PIPING (SUCTION)	TYPE K COPPER	R-3
REFRIGERANT PIPING (LIQUID)	TYPE K COPPER	N/A

- NOTES:
- LOW PRESSURE DUCT THICKNESS WHEN LARGE DIMENSION IS:
 - UP TO 12" - 26 GAUGE
 - 13" TO 30" - 24 GAUGE
 - 21" TO 54" - 22 GAUGE
 - REFER TO EQUIPMENT MANUFACTURER'S INSTALLATION MANUAL FOR REFRIGERANT PIPING SIZING AND LINE LENGTH LIMITATIONS.
 - NOT ALL SYSTEMS MAY APPEAR IN PROJECT

AIR BALANCE SCHEDULE		
SYSTEM	OUTSIDE AIR (CFM)	EXHAUST AIR (CFM)
RTU-1	2501	0
RTU-2	1182	0
RTU-3	1182	0
RTU-4	434	0
AHU-1	1360	0
AHU-2	635	0
MUA-1	5275	0
KEF-1	0	1700
KEF-2	0	2888
KEF-3	0	2100
KEF-4	0	900
TEF-1	0	300
PIZZA OVEN	0	200
TOTAL	12569	8088

PACKAGED ROOF-TOP UNIT SCHEDULE																						
MARK	SERVES	BASIS OF DESIGN		SUPPLY FAN				COOLING @ 100° F. AMBIENT					GAS HEAT					ELECTRICAL			WEIGHT	
		MANUFACTURER	MODEL	CFM	O.A. CFM	ESP IN. W.G.	HP	TOTAL MBH	SENSIBLE MBH	EAT DB/WB	LAT DB/WB	IEER	INPUT BTU	OUTPUT BTU	EFF %	EAT DB	LAT DB	VOLT/Ø	MCA	MOCP	LBS	REMARKS
RTU-1	KITCHEN	CAPTIVEAIRE	CASRTU4-1500-30-30T	10420	2501	1.0	15	384	250.2	76.7/66.6	54.3/54.2	17.8	405062	328100	81	62.9	90.9	208/3	172.2	200	5109	1-11
RTU-2	DINING	CAPTIVEAIRE	CASRTU2-1200-18-10T	2515	1182	1.0	3	139.7	69.3	78.2/70.6	52.6/52.6	18.6	192593	156000	81	55.4	110.4	208/3	60.3	70	1998	1-11
RTU-3	DINING	CAPTIVEAIRE	CASRTU2-1200-18-10T	2515	1182	1.0	3	139.7	69.3	78.2/70.6	52.6/52.6	18.6	192593	156000	81	55.4	110.4	208/3	60.3	70	1998	1-11
RTU-4	PRIVATE DINING	CAPTIVEAIRE	CASRTU1-1100-18-5T	1550	434	1.0	2	65	39.3	76.9/67.3	53.3/53.3	17.9	60000	48600	81	61.1	89.1	208/3	29	35	1233	1-11

- REMARKS (PROVIDE AS NOTED):
- PROVIDE WITH UN-POWERED, FIELD WIRED, GFCI CONVENIENCE OUTLET.
 - MANUFACTURER'S ROOF CURB.
 - CLOGGED FILTER & CONDENSATE OVERFLOW SWITCH.
 - 7 DAY PROGRAMMABLE THERMOSTAT + REMOTE TEMPERATURE AND HUMIDITY SENSORS.
 - FACTORY MOUNTED SUPPLY AIR SMOKE DETECTOR.
 - 0-100% ECONOMIZER WITH DIFFERENTIAL DRY BULB AND ENTHALPY CONTROL AND BAROMETRIC RELIEF.
 - FULLY MODULATING GAS HEAT WITH 6:1 TURNDOWN.
 - MODULATING HOT GAS REHEAT.
 - DIRECT DRIVE PLENUM BLOWER.
 - EC MOTOR CONDENSING FANS.
 - INVERTER SCROLL COMPRESSOR WITH INTEGRATED OIL SENSOR.

- NOTES:
- PROVIDE ALL ROOFTOP UNITS WITH FACTORY MOUNTED DISCONNECT AND SINGLE POINT POWER CONNECTION.
 - APPROVED MANUFACTURERS ARE: AAOON, CAPTIVEAIRE, CARRIER, LENNOX, TRANE, & YORK.
 - COORDINATE EXACT LOCATION OF UNIT WITH STRUCTURAL.
 - INSTALL ALL UNITS LEVEL FOR PROPER CONDENSATE DRAINAGE, SHIM CURBS AS REQUIRED.
 - PROVIDE ALL UNITS WITH HINGED ACCESS PANELS.
 - PROVIDE ALL UNITS WITH CONDENSER COIL GUARDS.
 - INTERLOCK RTU-1 AND KITCHEN EXHAUST SYSTEMS SUCH THAT RTU-1 SUPPLY FAN SHALL BE ENABLED WHEN KITCHEN EXHAUST SYSTEMS ARE ENABLED AND DISABLED UPON DETECTION OF FIRE ALARM.

SPLIT SYSTEM AIR CONDITIONING SCHEDULE																						
MARK	SERVES	BASIS OF DESIGN		FAN				COOLING @ 100° F. AMBIENT					ELECTRIC HEATING					ELECTRICAL			WEIGHT	
		MANUFACTURER	MODEL	CFM	O.A. CFM	ESP (IN)	QTY/HP	TOTAL MBH	SENSIBLE MBH	EAT DB/WB	LAT DB/WB	EER (SEER)	KW @ 208 V	NO. OF STAGES	EAT DB	LAT DB	VOLT/Ø	FLA	MCA	MOCP	LBS	REMARKS
AHU-1	WAITING/LOBBY	AAON	H3-CRB-8-0-162C-3G4	3220	1360	0.5	2/1.34	167.8	92.0	81.6/70.6	54.3/53.3	11.7	37	7	56	93.3	208/3	108.7	136	150	800	
CU-1		AAON	CFA-015-B-A-8-DA00N														208/3	62	68	90	1124	
AHU-2		AAON	H3-CRB-8-0-162C-3E3	2840	635	0.5	2/1.34			77.5/67.0	54.1/53.4	13.2	26.3	5	63	92.4	208/3	79	99	100	800	
CU-2		AAON	CFA-011-B-A-8-DA00N					113.9	70.1								208/3	39	43	50	1078	

- REMARKS:
- PROVIDE 7-DAY PROGRAMMABLE THERMOSTAT, RETURN AIR FILTER BANK, AND SUPPLY AIR SMOKE DETECTOR FOR EACH UNIT.
 - PROVIDE SINGLE POINT POWER CONNECTION TO EACH AIR HANDLING UNIT AND CONDENSING UNIT.
 - PROVIDE ELECTRICAL DISCONNECT FOR EACH AIR HANDLING UNIT AND CONDENSING UNIT.
 - REFER TO MANUFACTURER'S REQUIREMENTS FOR LINESET SIZING.
 - PROVIDE LOW VOLTAGE WIRING BETWEEN CONDENSING UNIT AND AIR HANDLER. REFER TO MANUFACTURER'S INSTALLATION INSTRUCTIONS.

- NOTES:
- INTERLOCK AHU-2 WITH DOOR MONITORING SYSTEMS SUCH THAT THE FAN REMAINS ON, COMPRESSORS TURN OFF, AND HEATING ELEMENTS TURN OFF WHEN THE GARAGE DOORS TO THE EXTERIOR ARE OPEN.

MAKE UP AIR UNIT SCHEDULE																				
MARK	BASIS OF DESIGN		SUPPLY FAN			COOLING		GAS HEAT			EFFICIENCY	ELECTRICAL					WEIGHT		REMARKS	
												FAN			REMOTE CONDENSER 1&2					
	MANUFACTURER	MODEL	CFM	ESP IN. W.G.	HP	TOTAL MBH	SENSIBLE MBH	INPUT MBH	OUTPUT MBH	EFF %		TEMP RISE	SEER	VOLT/Ø	MCA	MOCP	VOLT/Ø	MCA		MOCP
MUA-1	CAPTIVE AIRE	A3-24D-MPU	8275	0.5	7.5	118.3	72.1					14	208/3	26.4	40	208/3	21.4	30	1689	1

- REMARKS:
- REFER TO KITCHEN AND FAN DRAWINGS FOR MORE INFORMATION. ACCESSORIES INCLUDE: ROOF CURB, COOLING INTERLOCK RELAY, MOTORIZED BACKDRAFT DAMPER AND HINGED DOUBLE WALL INSULATED DOOR ASSEMBLY.

EXHAUST FAN SCHEDULE											
MARK	SERVES	BASIS OF DESIGN		AIRFLOW	ESP IN. W.G.	MOTOR HP	ELECTRICAL		WEIGHT LBS	CONTROL	REMARKS
		MANUFACTURER	MODEL				VOLT / Ø				
KEF-1	HOOD 1	CAPTIVE AIRE	DU180HFA	1700	1	1	120/1		93	N/A	1
KEF-2	HOOD 2	CAPTIVE AIRE	DU180HFA	2888	1.5	3	208/3		183	N/A	1
KEF-3	HOOD 3	CAPTIVE AIRE	DU85HFA	2100	1.25	1	120/1		92	N/A	1
KEF-4	HOOD 4	CAPTIVE AIRE	DU50HFA	900	0.5	0.5	120/1		77	N/A	1
TEF-1	RESTROOMS	GREENHECK	SQ-80-VG	300	0.25	1/10	120/1		60	TIMECLOCK	2-5

- REMARKS:
- REFER TO KITCHEN HOOD AND FAN DRAWINGS FOR MORE INFORMATION.
 - PRE-WIRED NON-FUSED DISCONNECT SWITCH
 - GRAVITY BACKDRAFT DAMPER
 - SPEED CONTROLLER
 - EC MOTOR

SPLIT SYSTEM HEAT PUMP SCHEDULE													
MARK	SERVES	MANUFACTURER	MODEL		CAPACITY (MBH)		AIRFLOW	ELECTRICAL DATA			WEIGHT (LBS)		REMARKS
			INDOOR	OUTDOOR	COOLING	HEATING		CFM	VOLT/Ø	MCA	MOCP	INDOOR	OUTDOOR
MS-1/MSHP-1	VESTIBULE	MITSUBISHI	PEAD-A12AA8	SUZ-KA12NA2	12	17	494	208/1	9	15	58	81	1-4
MS-2/MSHP-2	OFFICE	MITSUBISHI	PKA-A12LA	PUZ-A12NKA7-BS	12	18	455	208/1	11	15	28	93	1-5

- REMARKS:
- EQUIPMENT CAPACITY IS BASED ON THE FOLLOW AMBIENT TEMPERATURES - COOLING/HEATING = 95°F/47°F.
 - SIZE REFRIGERANT PIPING PER MANUFACTURER'S RECOMMENDATIONS. FIELD VERIFY EXACT LOCATION AND REQUIREMENTS.
 - OUTDOOR UNIT PROVIDES POWER TO INDOOR UNIT.
 - PROVIDE WITH 7-DAY PROGRAMMABLE THERMOSTAT.
 - PROVIDE MFG. RECOMMENDED CONDENSATE PUMP.

LOUVERS										
MARK	SERVES	BASIS OF DESIGN		TYPE	CFM	SP (IN. W.G.)	VELOCITY (FPM)	BPWP (FPM)	NOMINAL DIMENSIONS	NET FREE AREA (FT²)
		MANUFACTURER	MODEL							
L-1	AHU-1	GREENHECK	ESD-635	INTAKE	3220	0.088	767	1250	48x26	4.2
L-2	AHU-2	GREENHECK	ESD-635	INTAKE	2840	0.082	742	1250	44x26	3.83
L-3	AHU-1	GREENHECK	ESD-635	RELIEF	3220	0.088	767	1250	48x26	4.2
L-4	AHU-2	GREENHECK	ESD-635	RELIEF	2840	0.082	742	1250	44x26	3.83
L-5	TEF-1	GREENHECK	ESD-635	EXHAUST	300	0.098	856	1250	14x14	0.35

- REMARKS:
- BIRDSCREEN
 - COLOR/FINISH BY ARCHITECT.
 - PROVIDE STORM/SECURITY RATED LOUVERS WHERE INDICATED.
 - EXTERIOR WALL LOUVERS SHAVE BE SIZED FOR RAIN RESISTANCE AND BE DRAINABLE.

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