

15001

GENERAL INFORMATION

A. GENERAL

- 1. CONFORM TO ALL GENERAL AND SPECIAL CONDITIONS OF CONTRACT AS SPECIFIED BY ARCHITECT, TENANT AND OWNER.
- 2. SPECIFICATIONS ARE APPLICABLE TO ALL CONTRACTORS AND SUBCONTRACTORS FOR MECHANICAL AND ELECTRICAL SYSTEMS
- 3. CONTRACTOR SHALL COMPLY WITH OWNER'S STANDARDS, FACILITY SPECIFICATIONS, RULES AND REGULATIONS. ALL OWNER'S CRITERIA SHALL BE COMPLIED WITH AND INCLUDED IN THIS BID. CHECK OTHER PLANS AND SPECIFICATIONS AND FULLY COORDINATE WITH OTHER TRADES AND ARCHITECT'S REQUIREMENTS
- 4. VISIT SITE, CHECK FACILITIES AND CONDITIONS, AND VERIFY ALL UTILITY COMPANY REQUIREMENTS AND CONNECTION POINTS IN FIELD PRIOR TO STARTING WORK. TAKE ALL ITEMS INTO CONSIDERATION IN BID.
- 5. SYSTEMS ARE TO BE COMPLETE AND WORKABLE IN ALL RESPECTS, PLACED IN OPERATION AND PROPERLY ADJUSTED.
- 6. EACH CONTRACTOR SHALL PROVIDE FOR HIS OWN CLEAN-UP, REMOVAL AND LEGAL DISPOSAL OF ALL RUBBISH ONLY.
- 7. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, AND SEQUENCES OF CONSTRUCTION AND THE SAFETY OF WORKMEN. COMPLY WITH ALL OSHA REGULATIONS.
- 8. NO PIPING, DUCTWORK, CONTROLS, ETC., SHALL BE INSTALLED OR ROUTED ABOVE ELECTRICAL PANELS AND EQUIPMENT OR THROUGH ELEVATOR ROOMS OR SHIFTS.
- 9. THE MECHANICAL AND ELECTRICAL CONTRACTORS SHALL COORDINATE THE ELECTRICAL CHARACTERISTICS OF ALL MECHANICAL EQUIPMENT PRIOR TO ORDERING OF EQUIPMENT. NO ADDITIONAL PAYMENT WILL BE MADE FOR LACK OF CONTRACTOR COORDINATION OF ELECTRICAL CHARACTERISTICS.
- 10. ALL MECHANICAL AND ELECTRICAL SYSTEM COMPONENTS SHALL BE ROUTED HIGH TO UNDERSIDE OF STRUCTURE AND THROUGH JOISTS OR TRUSSES WHERE POSSIBLE. COORDINATE INSTALLATION TO PRESERVE HEADROOM, EQUIPMENT ACCESS, ARCHITECTURAL CLEARANCES FOR FINISHES, INCLUDING CEILING HEIGHTS. COORDINATE WITH ALL OTHER TRADES AND DO NOT CONFLICT WITH THE ARCHITECTURAL REQUIREMENTS FOR THE FINISHED CONSTRUCTION. PROVIDE OFFSETS WHERE REQUIRED TO COORDINATE WITH OTHER TRADES.
- 11. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR LOCATIONS OF ALL GRILLES AND DIFFUSERS.
- 12. OPERATION AND MAINTENANCE MANUALS: THREE (3) BOUND SETS OF THE OPERATION AND MAINTENANCE MANUALS SHALL BE PROVIDED TO THE CONSTRUCTION REPRESENTATIVE AT TURNOVER, AND ARE REQUIRED FOR FINAL ACCEPTANCE.
- 13. AS-BUILT DRAWINGS: THE HVAC SUBCONTRACTOR SHALL PROGRESSIVELY RECORD ALL HVAC DRAWING CHANGES WHICH SHALL BE MAINTAINED AT ALL TIMES FOR REVIEW BY THE CONSTRUCTION REPRESENTATIVE. AN AUTOCAD COPY OF THE FINAL AS-BUILT DRAWINGS SHALL BE PROVIDED TO THE CONSTRUCTION REPRESENTATIVE AT TURNOVER. THIS AUTOCAD AS-BUILT IS REQUIRED FOR FINAL ACCEPTANCE OF THE PROJECT.

B. CODES, STANDARDS AND REGULATIONS

- 1. CONFORM TO ALL APPLICABLE CODES, GOVERNMENT REGULATIONS, UTILITY COMPANY REQUIREMENTS, AND NATIONAL ELECTRICAL CODE.
- 2. OBTAIN PERMITS AND PAY ALL FEES. ARRANGE FOR ALL REQUIRED INSPECTIONS AND APPROVALS.

C. RELATED WORK SPECIFIED ELSEWHERE

- 1. OPENINGS AND CHASIS, WHEN SHOWN ON ARCHITECTURAL DRAWINGS.

D. DRAWINGS

- 1. THE SYSTEMS AS SHOWN ON THE CONTRACT DRAWINGS ARE DIAGRAMMATIC.
- 2. INTENT IS TO COMPLETE ALL MECHANICAL SYSTEMS. THE DRAWINGS AND THESE NOTES ARE TO BE USED TOGETHER AS A BASIS OF SHOWING AND/OR DESCRIBING THE SYSTEM REQUIREMENTS FOR THE FACILITY.
- 3. VERIFY ALL DIMENSIONS AND CLEARANCES BY FIELD MEASUREMENT AND CHECK FOR INTERFERENCES PRIOR TO STARTING WORK.

E. BASE EQUIPMENT AND MATERIALS AND SUBSTITUTIONS

- 1. ALL EQUIPMENT AND MATERIALS SHALL BE NEW, FREE OF DEFECTS AND U/L LABELED.
- 2. SHOP DRAWINGS FOR ALL EQUIPMENT, FIXTURES, ETC., INCLUDING ALL ACCESSORIES TO BE FURNISHED. BASE BID MANUFACTURERS AND MODELS ARE INCLUDED IN SPECIFICATIONS OR LISTED IN SCHEDULE ON DRAWING. ANY OTHER MANUFACTURER OR MODEL IS A SUBSTITUTION.
- 3. SUBSTITUTIONS ARE SUBJECT TO THE APPROVAL OF THE OWNER AND SHALL BE LISTED ON THE FORM OF PROPOSAL FOR THE OWNER'S CONSIDERATION PRIOR TO CONTRACT AWARD. IF SUBSTITUTION IS SUBMITTED, IT IS THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN AND VERIFY THAT THE SUBSTITUTION IS EQUIVALENT IN ALL RESPECTS TO THE BASE SPECIFICATIONS.
- 4. IF SUBSTITUTIONS ARE APPROVED, NOTIFY ALL OTHER CONTRACTORS, SUBCONTRACTORS OR OWNER'S AFFECTED SUBSTITUTION AND FULLY COORDINATE. ANY COSTS RESULTING FROM SUBSTITUTION, WHETHER BY CONTRACTOR OR OTHERS, SHALL BE RESPONSIBILITY OF AND PAID FOR BY SUBSTITUTING CONTRACTOR.
- 5. ALL EQUIPMENT SHALL BE INSTALLED IN FULL ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CHECK AND CONFORM TO THESE REQUIREMENTS PRIOR TO STARTING WORK.

F. CHECK, TEST, START, ADJUST, BALANCE AND INSTRUCTIONS

- 1. AFTER INSTALLATION, CHECK ALL EQUIPMENT, AND PERFORM START UP IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
- 2. ALL PIPING SHALL BE TESTED AND FREE OF LEAKS.
- 3. BALANCE ALL SYSTEMS, CALIBRATE CONTROLS, CHECK FOR PROPER STARTING SEQUENCE UNDER ALL CONDITIONS, AND MAKE ALL NECESSARY ADJUSTMENTS.
- 4. ALL WIRING SHALL BE FULLY TESTED AND MADE FREE OF GROUNDS AND SHORT CIRCUITS.
- 5. INSTRUCT OWNER IN OPERATION OF SYSTEMS AND SUBMIT OPERATING AND MAINTENANCE MANUAL ON ALL EQUIPMENT.
- 6. PROVIDE ENGRAVED LABELS AND IDENTIFICATION TAGS FOR ALL PIPING SYSTEMS, VALVES AND EQUIPMENT.
- 7. PROVIDE TYPED PANEL DIRECTIONS AND ENGRAVED LABELS FOR ALL PANELS AND EQUIPMENT.

G. CUTTING, PATCHING AND DRILLING

- 1. ALL CUTTING AND CHASING OF THE BUILDING CONSTRUCTION REQUIRED FOR THIS WORK SHALL BE BY THIS CONTRACTOR UNLESS SHOWN ON ARCHITECTURAL DRAWINGS AND CONFORMED TO SO SIZE LOCAL OR NATIONAL MANUFACTURING CONSTRUCTION, CUTTING SHALL BE IN GREAT AND MECHANICAL MANNER.
- 2. NEATLY SAW CUT ALL RECIANGULAR OPENING TO GET SLEEVE THROUGH OPENING, AND FINISHES AND PROVIDE NEW FINISHES AROUND OPENING.
- 3. NEATLY PATCH FLOORS FOR SLEEVES INSTALLATION AND PATCH FLOOR TO MATCH EXISTING, INCLUDING FLOOR COVERS.
- 4. CORNER PATCHING: PATCHING ALL ROUND CUTS AND SLOTTING BUILDING WALLS AS REQUIRED FOR DUCT INSTALLATION. PROVIDE STEEL LINER ABOVE OPENING WIDER THAN 10". SEE STRUCTURAL DRAWINGS FOR DETAILS.
- 5. PATCH ALL PENETRATIONS OF 2" WIDE SHEET METAL FLANGES AND ALL PENETRATIONS.
- 6. CORNER PATCHING: PATCHING ALL ROUND CUTS AND SLOTTING BUILDING WALLS AS REQUIRED FOR DUCT INSTALLATION. PROVIDE STEEL LINER ABOVE OPENING WIDER THAN 10". SEE STRUCTURAL DRAWINGS FOR DETAILS.
- 7. PATCH ALL PENETRATIONS OF 2" WIDE SHEET METAL FLANGES AND ALL PENETRATIONS.
- 8. PATCH ALL PENETRATIONS OF 2" WIDE SHEET METAL FLANGES AND ALL PENETRATIONS.
- 9. PATCH ALL PENETRATIONS OF 2" WIDE SHEET METAL FLANGES AND ALL PENETRATIONS.
- 10. PATCH ALL PENETRATIONS OF 2" WIDE SHEET METAL FLANGES AND ALL PENETRATIONS.

H. WARRANTY

- 1. FULLY WARRANT ALL MATERIALS, EQUIPMENT AND WORKMANSHIP FOR ONE (1) YEAR FROM DATE OF ACCEPTANCE.
- 2. REPAIR OR REPLACE WITHOUT CHARGE TO THE OWNER ALL ITEMS FOUND DEFECTIVE DURING THE WARRANTY PERIOD.

SECTION 15086

DUCT INSULATION

1.01 SECTION INCLUDES

A. DUCT INSULATION

B. DUCT LINER

1.02 SUBMITTALS

- A. PRODUCT DATA: PROVIDE PRODUCT DESCRIPTION, THERMAL CHARACTERISTICS, LIST OF MATERIALS AND THICKNESS FOR EACH SERVICE, AND LOCATIONS.
- B. MANUFACTURER'S INSTRUCTIONS: INDICATE INSTALLATION PROCEDURES NECESSARY TO ENSURE ACCEPTABLE WORKMANSHIP AND THAT INSTALLATION STANDARDS WILL BE ACHIEVED.

1.03 QUALITY ASSURANCE

- A. MANUFACTURER QUALIFICATIONS: COMPANY SPECIALIZING IN MANUFACTURING PRODUCTS OF THE TYPE SPECIFIED IN THIS SECTION WITH NOT LESS THAN THREE YEARS OF DOCUMENTED EXPERIENCE.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. ACCEPT MATERIALS ON SITE IN ORIGINAL FACTORY PACKAGING, LABELED WITH MANUFACTURER'S IDENTIFICATION, INCLUDING PRODUCT IDENTITY AND THICKNESS.
- B. PROTECT INSULATION FROM WEATHER AND CONSTRUCTION TRAFFIC, DIRT, WATER, CHEMICAL, AND MECHANICAL DAMAGE, BY STORING IN ORIGINAL WRAPPING.

1.05 FIELD CONDITIONS

- A. MAINTAIN AMBIENT TEMPERATURES AND CONDITIONS REQUIRED BY MANUFACTURERS OF ADHESIVES, MASTICS, AND INSULATION GEMENTS.
- B. MAINTAIN TEMPERATURE DURING AND AFTER INSTALLATION FOR MINIMUM PERIOD OF 24 HOURS.

PART 2 PRODUCTS

- 2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION
- A. SURFACE BURNING CHARACTERISTICS: FLAME SPREAD/SMOKE DEVELOPED INDEX OF 25/50, MAXIMUM, WHEN TESTED IN ACCORDANCE WITH ASTM E 84, NFPA 255, OR UL 723.
- 2.02 GLASS FIBER FLEXIBLE (THICKNESS SHALL PROVIDE R VALUE REQUIRED BY GOVERNING ENERGY CONSERVATION CODE FOR SPECIFIC APPLICATION)
- A. INSULATION: FLEXIBLE, NONCOMBUSTIBLE BLANKET.
 - 1. 'K' VALUE: 0.36 AT 75 DEGREES F.
 - 2. MAXIMUM SERVICE TEMPERATURE: 450 DEGREES F.
 - 3. MAXIMUM WATER VAPOR SORPTION: 5.0 PERCENT BY WEIGHT.
- B. VAPOR BARRIER JACKET:
 - 1. KRAT PAPER WITH GLASS FIBER YARN AND BONDED TO ALUMINIZED FILM.
 - 2. MOISTURE VAPOR PERMEABILITY: 0.02 PERM INCH.
 - 3. SECURE WITH PRESSURE SENSITIVE TAPE.
- C. VAPOR BARRIER TAPE:
 - 1. KRAT PAPER REINFORCED WITH GLASS FIBER YARN AND BONDED TO ALUMINIZED FILM, WITH PRESSURE SENSITIVE RUBBER BASED ADHESIVE.
 - 2. THE WIRE: ANNEALED STEEL, 16 GAGE.
- 2.03 DUCT LINER
- A. INSULATION:
 - 1. INCOMBUSTIBLE GLASS FIBER, FLEXIBLE BLANKET, RIGID BOARD, AND PREFORMED ROUND LINER BOARD, IMPREGNATED SURFACE AND EDGES COATED WITH POLY VINYL ACETATE POLYMER, OR ACRYLIC POLYMER SOLUTION TO BE FUNGUS AND BACTERIA RESISTANT.
 - 2. APPARENT THERMAL CONDUCTIVITY: MAXIMUM OF 0.31 AT 75 DEGREES F.
 - 3. SERVICE TEMPERATURE: UP TO 250 DEGREES F.
 - 4. RATED VELOCITY ON COATED AIR SIDE FOR AIR FRICTION: 5,000 FPM, MINIMUM.
 - 5. MINIMUM NOISE REDUCTION COEFFICIENTS:
 - a. 1 INCH THICKNESS: 0.45.
 - B. ADHESIVE: WATERPROOF, FIRE-RETARDANT TYPE.
 - C. LINER FASTENERS: GALVANIZED STEEL, SELF-ADHESIVE PAD, IMPACT APPLIED, OR WELDED WITH INTEGRAL OR PRESS-ON HEAD.

PART 3 EXECUTION

3.01 EXAMINATION

- A. VERIFY THAT DUCTS HAVE BEEN TESTED BEFORE APPLYING INSULATION MATERIALS.
- B. VERIFY THAT SURFACES ARE CLEAN, FOREIGN MATERIAL REMOVED, AND DRY.

3.02 INSTALLATION

- A. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
- B. INSTALL IN ACCORDANCE WITH NAHM NATIONAL INSULATION STANDARDS.
- C. INSULATED DUCTS CONVEYING AIR BELOW AMBIENT TEMPERATURE:
 - 1. PROVIDE INSULATION WITH VAPOR BARRIER JACKETS.
 - 2. FINISH WITH TAPE AND VAPOR BARRIER JACKET.
 - 3. CONTINUE INSULATION THROUGH WALLS, SLEEVES, HANGERS, AND OTHER DUCT PENETRATIONS.
 - 4. INSULATE ENTIRE SYSTEM INCLUDING FITTINGS, JOINTS, FLANGES, FIRE DAMPERS, FLEXIBLE CONNECTIONS, AND EXPANSION JOINTS.
- D. EXTERNAL DUCT INSULATION APPLICATION:
 - 1. SECURE INSULATION WITH VAPOR BARRIER WITH WIRTS AND SEAL JACKET JOINTS WITH WAPOR ADHESIVE OR TAPE TO MATCH JACKET.
 - 2. SECURE INSULATION WITHOUT VAPOR BARRIER WITH STAPLES, TAPE, OR WIRES.
 - 3. INSTALL WITHOUT GAP ON UNDERSIDE OF DUCT. USE ADHESIVE OR MECHANICAL FASTENERS WHERE NECESSARY TO PREVENT SAGGING. LIFT DUCT OFF TRAYVEZ HANGERS AND INSERT SPACERS.
 - 4. SEAL VAPOR BARRIER PENETRATIONS BY MECHANICAL FASTENERS WITH VAPOR BARRIER ADHESIVE.
 - 5. STOP AND POINT INSULATION AROUND ACCESS DOORS AND DAMPER OPERATORS. ALLOW OPERATION WITHOUT DISTURBING WRAPPING.
- E. DUCT AND PLUMB LINE APPLICATION:
 - 1. ADHERE INSULATION WITH ADHESIVE FOR 80 PERCENT COVERAGE.
 - 2. SECURE INSULATION WITH MECHANICAL LINER FASTENERS. REFER TO SMCMA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE FOR WRAPPING.
 - 3. SEAL AND SMOOTH JOINTS: SEAL AND COVER JOINTS WITH ADHESIVE JOINT.
 - 4. SEAL LINER SURFACE PENETRATIONS AND EDGES WITH ADHESIVE.
 - 5. DUCT DIMENSIONS INDICATED ARE 1/2 INCH DIMENSIONS REQUIRED FOR AIR FLOW. INCREASE DUCT SIZE TO ALLOW FOR INSULATION THICKNESS.

3.03 SCHEDULES

- A. SUPPLY AIR DUCT AND TO SLEEVES OF DIFFUSERS:
 - 1. RIGID GLASS FIBER DUCT LINER: 1 INCHES THICK WITHIN 10 FEET OF AC UNITS.
 - 2. FLEXIBLE GLASS FIBER DUCT WRAP INSULATION: 1 INCHES THICK ON ALL OTHERS.
- B. RETURN AIR DUCT:
 - 1. RIGID GLASS FIBER DUCT LINER: 1 INCHES THICK WITHIN 10 FEET OF AC UNITS.

SECTION 15087

DUCTWORK

PART 1 GENERAL

- 1.01 SECTION INCLUDES
- A. METAL DUCTWORK.
- B. DUCT CLEANING.
- PART 2 PRODUCTS
- 2.01 DUCT ASSEMBLIES
- A. ALL DUCTS: GALVANIZED STEEL, UNLESS OTHERWISE INDICATED.
- B. LOW PRESSURE SUPPLY: 2 INCH W.G. PRESSURE CLASS, GALVANIZED STEEL.
- C. RETURN AND RELIEF: 2 INCH W.G. PRESSURE CLASS, GALVANIZED STEEL.
- 2.02 MATERIALS
- A. GALVANIZED STEEL FOR DUCTS: HOT-DIPPED GALVANIZED STEEL SHEET, ASTM A 653/A 653M 'S' TYPE B, WITH 60/2180 COATING.
- B. ALUMINUM FOR DUCTS: ASTM B 209 (ASTM B 209M) ALUMINUM SHEET, ALLOY 3003-H14, ALUMINUM CONNECTORS AND BAR STOCK: ALLOY 6061-16S1 OR OF EQUIVALENT STRENGTH.
- C. STAINLESS STEEL FOR DUCTS: ASTM A 240/A 240M, TYPE 304.
- D. JOINT SEALERS AND SEALANTS: NON-HARDENING, WATER RESISTANT, MILDEW AND MOLD RESISTANT.
 - 1. TYPE: HEAVY MASTIC OR LIQUID USED ALONE OR WITH TAPE, SUITABLE FOR JOINT CONSTRUCTION AND COMPATIBLE WITH SUBSTRATES, AND RECOMMENDED BY MANUFACTURER FOR PRESSURE CLASS OF DUCTS.
 - 2. VOC CONTENT: NOT MORE THAN 250 G/L, EXCLUDING WATER.
 - 3. SURFACE BURNING CHARACTERISTICS: FLAME SPREAD OF ZERO, SMOKE DEVELOPED OF ZERO, WHEN TESTED IN ACCORDANCE WITH ASTM E 84.
- E. HANGER ROD: ASTM A 36/A 36M, STEEL, GALVANIZED; THREADED BOTH ENDS, THREADED ONE END, OR CONTINUOUSLY THREADED.
- 2.03 DUCTWORK FABRICATION
- A. FABRICATE AND SUPPORT IN ACCORDANCE WITH SMCMA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE, AND AS INDICATED.
- B. NO VARIATION OF DUCT CONFIGURATION OR SIZE PERMITTED EXCEPT BY WRITTEN PERMISSION. SIZE ROUND DUCT INSTALLED IN PLACE OF RECTANGULAR DUCTS IN ACCORDANCE WITH ASHRAE HANDBOOK - FUNDAMENTALS.
- C. DUCT SYSTEMS HAVE BEEN DESIGNED FOR METAL DUCT. FIBROUS GLASS DUCT MAY NOT BE SUBSTITUTED FOR METAL DUCT.
- D. PROVIDE DUCT MATERIAL, GAGES, REINFORCING, AND SEALING FOR OPERATING PRESSURES INDICATED.
- E. CONSTRUCT U'S, BENDS, AND ELBOWS WITH RADIUS OF NOT LESS THAN 1-1/2 TIMES RADIUS OF DUCT ON CENTERLINE. WHERE NOT POSSIBLE, RECTANGULAR ELBOWS MUST BE USED. IN RECTANGULAR ELBOWS PROVIDE AIR FOL TURNING VANES OF PERFORATED METAL WITH GLASS FIBER INSULATION.
- F. PROVIDE TURNING VANES OF PERFORATED METAL WITH GLASS FIBER INSULATION WHEN ACUSTICAL LINING IS INDICATED.
- G. INCREASE DUCT SIZES GRADUALLY, NOT EXCEEDING 15 DEGREES DIVERGENCE WHEREVER POSSIBLE; MAXIMUM 30 DEGREES DIVERGENCE UPSWRAW OF EQUIPMENT AND 45 DEGREES CONVERGENCE DOWNSWRAW.
- H. FABRICATE CONTINUOUSLY WELDED ROUND AND DWAL DUCT FITTINGS IN ACCORDANCE WITH SMCMA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE.
 - 1. WHERE DUCTS ARE CONNECTED TO EXTERIOR WALL LOUVERS AND DUCT OUTLET IS SMALLER THAN LOUVER FRAME, PROVIDE TRANSITION TO LOUVER'S FULL PERIMETER SEAL TO LOUVER FRAME AND DUCT.
- 2.04 MANUFACTURED DUCTWORK AND FITTINGS
- A. FLEXIBLE DUCTS: BLACK POLYMER FILM SUPPORTED BY HELICALLY WOUND SPRING STEEL WIRE.
 - 1. U/L LABELED.
 - 2. INSULATION: FIBERGLASS INSULATION WITH POLYETHYLENE VAPOR BARRIER FILM.
 - 3. PRESSURE RATING: 10 INCHES WG POSITIVE AND 0.5 INCHES WG NEGATIVE.
 - 4. MAXIMUM VELOCITY: 4000 FPM.
 - 5. TEMPERATURE RANGE: -20 DEGREES F TO 175 DEGREES F.

PART 3 EXECUTION

3.01 INSTALLATION

- A. INSTALL, SUPPORT, AND SEAL DUCTS IN ACCORDANCE WITH SMCMA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE.
- B. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
- C. DURING CONSTRUCTION PROVIDE TEMPORARY CLOSURES OF METAL OR TAPED POLYETHYLENE ON OPEN DUCTWORK TO PREVENT CONSTRUCTION DUST FROM ENTERING DUCTWORK SYSTEM.
- D. FLEXIBLE DUCTS: CONNECT TO METAL DUCTS WITH ADHESIVE AND MANUFACTURER'S PLASTIC DRAW BANDS.
- E. DUCT SIZES INDICATED ARE INSIDE CLEAR DIMENSIONS. FOR LINED DUCTS, MAINTAIN SIZES INSIDE LUTING.
- F. LOCATE DUCTS WITH SUFFICIENT SPACE AROUND EQUIPMENT TO ALLOW NORMAL OPERATING AND MAINTENANCE ACTIVITIES.
- G. USE CRAMP JOINTS WITH OR WITHOUT BEAD FOR JOINING ROUND DUCT SIZES 8 INCH AND SMALLER WITH CRAMP IN DIRECTION OF AIR FLOW.
- H. USE DOUBLE NUTS AND LOCK WASHERS ON THREADED ROD SUPPORTS.
- I. CONNECT TERMINAL UNITS TO SUPPLY DUCTS DIRECTLY OR WITH 1/2" FOOT MAXIMUM LENGTH OF FLEXIBLE DUCT. DO NOT USE FLEXIBLE DUCT TO CHANGE DIRECTION.
- J. CONNECT DIFFUSERS OR LIQUID TROUEN ROOFS TO LOW PRESSURE DUCTS DIRECTLY OR WITH 5 FEET MAXIMUM LENGTH OF FLEXIBLE DUCT HELD IN PLACE WITH MANUFACTURER'S PLASTIC DRAW BAND.
- K. AT EXTERIOR WALL LOUVERS, SEAL DUCT TO LOUVER FRAME.
- 3.02 CLEANING
- A. CLEAN DUCT SYSTEM AND FORCE AIR AT HIGH VELOCITY THROUGH DUCT TO REMOVE ACCUMULATED DUST. TO OBTAIN SUFFICIENT AIR, CLEAN HALF THE SYSTEM AT A TIME. PROTECT EQUIPMENT THAT COULD BE HARMED BY EXCESSIVE DIRT WITH TEMPORARY FILTERS, OR BYPASS DURING CLEANING.
- B. CLEAN EXISTING DUCTWORK WHERE REUSED, USING THE LATEST NAHCA STANDARDS FOR EXISTING DUCTWORK.

SECTION 15092

DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. AIR RETURN DEVICES/EXTRACTORS.
- B. DUCT ACCESS DOORS.
- C. FLEXIBLE DUCT CONNECTIONS.
- D. VOLUME CONTROL DAMPERS.
- 1.02 DELIVERY, STORAGE, AND HANDLING
- A. PROTECT DAMPERS FROM DAMAGE TO OPERATING LINKAGES AND PARTS.
- PART 2 PRODUCTS
- 2.01 AIR RETURN DEVICES/EXTRACTORS
- A. MULTI-BLADE DEVICE: MULTI-BLADES ALIGNED IN SHORT DIMENSION STEEL CONSTRUCTION, WITH INDIVIDUALLY ACCESSIBLE BLADES, WINGS AND STRAPS.
- 2.02 DUCT ACCESS DOORS
- A. FABRICATE IN ACCORDANCE WITH SMCMA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE, AS INDICATED.
- B. ACCESS DOORS WITH METAL AND FLEXIBLE FASTENERS ARE NOT ACCEPTABLE.
- 2.03 DUCT CONNECTIONS
- A. FABRICATE IN ACCORDANCE WITH SMCMA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE, AS INDICATED.
- B. FLEXIBLE DUCT CONNECTIONS: FABRIC CRIMPED INTO METAL EDGING STRIP.
 - 1. FABRIC: MULTILAYER, FIRE-RETARDANT NEOPRENE, COATED WOVEN GLASS FIBER FABRIC TO 30 MESH MAXIMUM DENSITY, 30 OZ PER SQ YD.
 - 2. NET TENSILE WIDTH: APPROXIMATELY 2 INCHES WIDE.
 - 3. INSTALL 3/8 INCHES WIDE, 24 GAGE THICK GALVANIZED STEEL.
 - C. LINED VINYL SHEETS: MINIMUM 0.55 INCH THICK, 0.87 LBS PER SQ FT, TO DB WEAR AND TEAR.
 - 4. MAXIMUM INSTALLED LENGTH: 14 INCH.
- 2.04 VOLUME CONTROL DAMPERS
- A. FABRICATE IN ACCORDANCE WITH SMCMA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE, AND AS INDICATED.
- B. SINGLE BLADE DAMPERS: FABRICATE FOR DUCT SIZES UP TO 6 X 30 INCH.
 - 1. FABRICATE FOR DUCT SIZES UP TO 6 X 30 INCH.
 - 2. BLADE: 24 GAGE, MINIMUM.
 - C. MULTI-BLADE DAMPER: FABRICATE OF OPPOSED BLADE PATTERN WITH MAXIMUM BLADE SIZES 8 X 72 INCH. ASSEMBLE CENTER AND EDGE CRAMPED BLADES IN PRIME COATED OR GALVANIZED CHANNEL FRAME WITH SUITABLE HARDWARE.
 - D. END BEARINGS: EXCEPT IN ROUND DUCTS 12 INCHES AND SMALLER, PROVIDE END BEARINGS. ON MULTIPLE BLADE DAMPERS, PROVIDE OIL-IMPREGNATED NYLON OR SINTERED BRONZE BEARINGS.
 - E. QUADRANTS:
 - 1. PROVIDE LOCKING, INDICATING QUADRANT REGULATORS ON SINGLE AND MULTI-BLADE DAMPERS.
 - 2. ON INSULATED DUCTS MOUNT QUADRANT REGULATORS ON STAND-OFF MOUNTING BRACKETS, BASES, OR HOOPS.
 - 3. WHERE ROD LENGTHS EXCEED 30 INCHES PROVIDE REGULATOR AT BOTH ENDS.

PART 3 EXECUTION

3.01 INSTALLATION

- A. INSTALL ACCESSORIES IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS, AND FOLLOW SMCMA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE.
- B. PROVIDE DUCT ACCESS DOORS FOR INSPECTION AND CLEANING BEFORE AND AFTER FILTERS, COILS, FANS, AUTOMATIC DAMPERS, AND ELEMENTS AS INDICATED. PROVIDE MINIMUM 8 X 8 INCH SIZE FOR HAND ACCESS. SIZE FOR SHOULDER ACCESS, AND AS INDICATED. PROVIDE 4 X 4 INCH FOR BALANCING DAMPERS ONLY. REVIEW LOCATIONS PRIOR TO FABRICATION.
- C. PROVIDE DUCT TEST HOLES WHERE INDICATED AND REQUIRED FOR TESTING AND BALANCING PURPOSES.
- D. AT FANS AND MOTORIZED EQUIPMENT ASSOCIATED WITH DUCTS, PROVIDE FLEXIBLE DUCT CONNECTIONS IMMEDIATELY ADJACENT TO THE EQUIPMENT.
- E. AT EQUIPMENT SUPPORTED BY VIBRATION ISOLATORS, PROVIDE FLEXIBLE DUCT CONNECTIONS IMMEDIATELY ADJACENT TO THE EQUIPMENT.
- F. FOR FANS DEVELOPING STATIC PRESSURES OF 5.0 INCHES AND OVER, COVER FLEXIBLE CONNECTIONS WITH LEADING VINYL SHEET, HELD IN PLACE WITH METAL STRAPS.
- G. PROVIDE BALANCING DAMPERS AT POINTS ON SUPPLY, RETURN, AND EXHAUST SYSTEMS WHERE BRANCHES ARE TAKEN FROM LARGER DUCTS AS REQUIRED FOR AIR BALANCING. INSTALL MINIMUM 2 DUCT WINGS FROM DUCT TAKE-OFF.
- H. PROVIDE BALANCING DAMPERS ON DUCT TAKE-OFF TO DIFFUSERS, GRILLES, AND REGISTER, REGARDLESS OF WHETHER DAMPERS ARE SPECIFIED AS PART OF THE DIFFUSER, GRILLE, OR REGISTER ASSEMBLY.

SECTION 15090

AIR DISTRIBUTION DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. DIFFUSERS.

B. REGISTERS/GRILLES.

1.02 MANUFACTURERS, AS SCHEDULED ON DRAWINGS OR APPROVED EQUAL.

2.01 RECTANGULAR CEILING DIFFUSERS

- A. TYPE: SQUARE, STAMPED, MULTI-CORE DIFFUSER TO DISCHARGE AIR IN 360 DEGREE PATTERN WITH SECTORIZING BATFLS WHERE INDICATED.
- B. FRAME: SURFACE MOUNT TYPE, IN PLASTER CEILING, PROVIDE PLASTER FRAME AND CEILING FRAME. PROVIDE CLANGED FRAME FOR SUSPENDED LINK CEILING.
- C. FABRICATION: STEEL, WITH BAKED ENAMEL FINISH.
- D. COLOR: AS SELECTED BY ARCHITECT FROM MANUFACTURER'S STANDARD RANGE.
- E. ACCESSORIES: ROUND TO SQUARE ADAPATORS, RADIAL OPPOSED BLADE DAMPER AND MULTI-LOUVERED EQUALIZING GRID WITH DAMPER ADJUSTABLE FROM DIFFUSER FACE.

2.02 RECTANGULAR CEILING DIFFUSERS

- A. TYPE: STREAMLINED BLADES, 3/4 INCH MINIMUM DEPTH, 3/4 INCH MAXIMUM SPACING, WITH BLADES SET AT 45 DEGREES, VERTICAL FACE.
- B. FRAME: 1-1/4 INCH MARGIN WITH COUNTERSUNK SCREW MOUNTING.
- C. FABRICATION: STEEL WITH 20 GAGE MINIMUM FRAMES AND 22 GAGE MINIMUM BLADES, STEEL AND ALUMINUM WITH 20 GAGE MINIMUM FRAME, OR ALUMINUM EXTRUSIONS, WITH FACTORY BAKED ENAMEL FINISH.
- D. COLOR: TO BE SELECTED BY ARCHITECT FROM MANUFACTURER'S STANDARD RANGE.
- E. DAMPER: INTEGRAL, GANG-OPERATED, OPPOSED BLADE TYPE WITH REMOVABLE KEY OPERATOR, OPERABLE FROM FACE WHERE NOT INDIVIDUALLY CONNECTED TO EXHAUST FANS.

PART 3 EXECUTION

3.01 INSTALLATION

- A. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
- B. CHECK LOCATION OF OUTLETS AND INLETS AND MAKE NECESSARY ADJUSTMENTS IN POSITION TO CONFORM WITH ARCHITECTURAL FEATURES, SYMMETRY, AND LIGHTING ARRANGEMENT.
- C. INSTALL DIFFUSERS TO DUCTWORK WITH AIR TIGHT CONNECTION.
- D. PROVIDE BALANCING DAMPERS ON DUCT TAKE-OFF TO DIFFUSERS, AND GRILLES AND REGISTERS, DESPITE WHETHER DAMPERS ARE SPECIFIED AS PART OF THE DIFFUSER, OR GRILLE AND REGISTER ASSEMBLY.
- E. PAINT DUCTWORK VISIBLE BEHIND AIR OUTLETS AND INLETS WHITE BLACK.

TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. TESTING, ADJUSTMENT, AND BALANCING OF AIR SYSTEMS.
- B. TESTING, ADJUSTMENT, AND BALANCING OF REFRIGERATING SYSTEMS.
- C. MEASUREMENT OF FINAL OPERATING CONDITION OF HVAC SYSTEMS.

1.02 SUBMITTALS

- A. TAB PLAN: SUBMIT A WRITTEN PLAN INDICATING THE TESTING, ADJUSTING, AND BALANCING STANDARD TO BE FOLLOWED AND THE SPECIFIC APPROACH FOR EACH SYSTEM AND COMPONENT.
 - 1. INCLUDE CERTIFICATION THAT THE PLAN DEVELOPER HAS REVIEWED THE CONTRACT DOCUMENTS, THE EQUIPMENT AND SYSTEMS, AND THE CONTROL SYSTEM WITH THE ARCHITECT AND OTHER INSTALLERS TO SUFFICIENTLY UNDERSTAND THE DESIGN INTENT FOR EACH SYSTEM.
 - 2. INCLUDE AT LEAST THE FOLLOWING IN THE PLAN:
 - a. LIST OF ALL AIR FLOW, WATER FLOW, SOUND LEVEL, SYSTEM CAPACITY AND EFFICIENCY MEASUREMENTS TO BE PERFORMED AND A DESCRIPTION OF SPECIFIC TEST PROCEDURES, PARAMETERS, FORMULAS TO BE USED.
 - b. COPY OF FIELD CHECKOUT SHEETS AND LOGS TO BE USED FOR EACH PIECE OF EQUIPMENT TO BE TESTED, ADJUSTED AND BALANCED.
 - c. DISCUSSION OF WHAT NOTATIONS AND MARKINGS WILL BE MADE ON DUCT AND PIPING DRAWINGS DURING THE PROCESS.
 - d. FINAL TEST REPORT FORMS TO BE USED.
 - e. PROCEDURES FOR FORMAL DEFECT REPORT, INCLUDING TEST FREQUENCY AND DISTRIBUTION.
 - 3. REVEAL TAB PLAN TO REFLECT ALL TEST PROCEDURES AND SUBMIT AS PART OF FINAL REPORT.
 - 4. TEST REPORTS: INDICATE TEST PROCEDURES IN SYSTEM THAT WILL PREVENT PROPER TESTING, ADJUSTING, AND BALANCING OF SYSTEMS AND EQUIPMENT TO ACHIEVE SPECIFIED PERFORMANCE.
 - 1. REVEAL TAB PLAN TO REFLECT ALL TEST PROCEDURES AND SUBMIT AS PART OF FINAL REPORT.
 - 2. SUBMIT TWO COPIES OF REPORT FOR REVIEW PRIOR TO FINAL ACCEPTANCE OF PROJECT.
 - 3. SUBMIT ONE COPIES OF FINAL REPORT FOR ARCHITECT AND FOR INCLUSION IN OPERATING AND MAINTENANCE MANUAL.
 - 4. INCLUDE ACTUAL TEST REPORT LIST, WITH MANUFACTURER NAME, SERIAL NUMBER, AND DATE OF CALIBRATION.
 - 5. FORM OF REPORTS: WHERE THE TAB STANDARD BEING FOLLOWED RECOMMENDS A REPORT FORMAT USE THAT; OTHERWISE, FOLLOW ASHRAE SDI 11.
 - 6. UNITS OF MEASURE: REPORT DATA IN P-P (POUND-POUND) UNITS.
 - 7. PRODUCTS - NOT USED.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. PERFORM TOTAL SYSTEM BALANCE IN ACCORDANCE WITH ONE OF THE FOLLOWING:
 - 1. ASHRAE MN-1, ASHRAE NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE.
 - 2. NBB PROCEDURAL STANDARDS FOR TESTING ADJUSTING BALANCING OF ENVIRONMENTAL SYSTEMS.
- B. BEGIN WORK AFTER COMPLETION OF SYSTEMS TO BE TESTED, ADJUSTED, OR BALANCED AND COMPLETE WORK PRIOR TO SUBSTANTIAL COMPLETION OF THE PROJECT.
- C. WHERE HVAC SYSTEMS AND/OR COMPONENTS INTERFACE WITH LIFE SAFETY SYSTEMS, INCLUDING FIRE AND SMOKE DETECTION, ALARM, AND CONTROL, COORDINATE SCHEDULING, TESTING AND INSPECTION PROCEDURES WITH THE AUTHORITIES HAVING JURISDICTION.

D. TAB AGENCY QUALIFICATIONS:

- 1. COMPANY SPECIALIZING IN THE TESTING, ADJUSTING, AND BALANCING OF SYSTEMS SPECIFIED IN THIS SECTION.

E. TAB SUPERVISOR AND TECHNICIAN QUALIFICATIONS: CERTIFIED BY SOME ORGANIZATION AS TAB AGENCY.

3.02 AIR SYSTEM PROCEDURE

- A. PRIOR TO COMMENCING WITH THE BALANCING WORK THE BALANCING CONTRACTOR SHALL INSPECT THE DUCTWORK INSULATION TO DETERMINE IF ALL REQUIRED BALANCING DAMPERS AND ACCESS DOOR PANELS HAVE BEEN INSTALLED. DO NOT USE OUTLET OR FOR BALANCING.
- B. PRIOR TO SCHEDULING THE TOC, THE HVAC SUBCONTRACTOR SHALL VERIFY THAT: THE SHIPPING BLOCKS HAVE BEEN REMOVED. ALL OF THE AIR CONDITIONING UNITS ARE OPERATIONAL, DUCTWORK, GAS PIPING, CONDENSATE PIPING, POWER WIRING AND CONTROLS WIRING HAVE BEEN INSTALLED.
- C. THE HVAC SUBCONTRACTOR SHALL PROVIDE AT THEIR COST A QUALIFIED SERVICE TECHNICIAN TO BE PRESENT DURING THE EQUIPMENT OPERATION CHECK.
- D. ANY AND ALL DEFECTS IN THE AIR CONDITIONING UNITS, INSTALLATION AND SYSTEM OPERATION SHALL BE CORRECTED BY THE HVAC SUBCONTRACTOR WITHIN 30 DAYS AFTER THE DISTRIBUTION OF THE TOC REPORT. FAILURE TO IDENTIFY A DEFECT DURING THE TOC DOES NOT RELIEVE THE HVAC SUB-CONTRACTOR OF THE RESPONSIBILITY TO CORRECT SUBSEQUENTLY IDENTIFIED DEFECTS.
- E. ALL EQUIPMENT, INSTALLATION, DESIGN AND OPERATION DEFECTS DISCOVERED DURING THE INSTALLATION, CHECK, BALANCE AND OPERATION OF THE HVAC SYSTEM THAT REQUIRE A CHANGE IN THE DESIGN AND SPECIFICATION OF THE HVAC SYSTEM OR ITS COMPONENTS MUST BE PROPERLY INCORPORATED BY CHANGE ORDER IN THE PROJECT CONSTRUCTION DOCUMENTS.
- F. BALANCE ALL FANS AIRFLOW WITHIN +/-0.6% OF DESIGN. REPLACE FAN DRIVE IF REQUIRED TO OBTAIN THE DESIGN CAPACITY.
- G. BALANCE OUTLETS AS FOLLOWS:
 - 1. SMALL AREAS WITH 1 OR 2 OUTLETS: +/- .5% OF DESIGN.
 - 2. LARGE AREAS WITH 3 OR MORE OUTLETS: +/- .75% OF DESIGN.
- H. REPORT IN WRITING ALL DEFICIENCIES AND PROBLEMS DISCOVERED, AS WELL AS COMPLETED BALANCING REPORT TO THE HVAC SUBCONTRACTOR PRIOR TO COMPLETING THE BALANCING WORK. THIS REPORT SHOULD INCLUDE THE "CAUSE" AND SUGGESTED "SOLUTION", IF KNOWN.
- I. THE AIR CONDITIONING UNITS SHALL BE BALANCED IN THE MINIMUM OUTSIDE AIR MODE. THE OUTSIDE AIR DAMPER 75% MINIMUM OPEN POSITION" AND THE "METHOD" USED SHALL BE INCLUDED IN THE BALANCING REPORT. ALSO MEASURE AND REPORT THE FAN OPERATING DATA FOR UNITS WITH ECONOMIZERS IN THE YORK BUSSE AIR MODE.
- J. CORRECTION OF DEFECTS: REQUIRED WITHIN 30 DAYS OF THE DISTRIBUTION OF THE BALANCING REPORT.

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For Construction Only