MECHANICAL SYSTEMS

1. REFER TO ARCHITECTURAL INDEX FOR PARTICULAR SPECIFICATIONS.

2. IT IS UNDERSTOOD AND AGREED THAT THE MECHANICAL CONTRACTOR HAS, BY CAREFUL EXAMINATION OF THE PLANS AND SPECIFICATIONS, AND THE SITE WHERE APPROPRIATE, SATISFIED HIMSELF AS TO THE NATURE AND LOCATION OF THE WORK, AND ALL CONDITIONS WHICH MUST BE MET IN ORDER TO CARRY OUT THE WORK UNDER THIS SECTION OF THE CONTRACT.

3. SCOPE OF THE WORK

   A. THE SCOPE OF THE WORK CONSISTS OF THE FURNISHING AND INSTALLING OF COMPLETE MECHANICAL SYSTEMS – EXTERIOR AND INTERIOR – INCLUDING MISCELLANEOUS SYSTEMS. THE MECHANICAL CONTRACTOR SHALL PROVIDE ALL SUPERVISION, LABOR, MATERIALS, EQUIPMENT, MACHINERY, AND ANY OTHER ITEMS NECESSARY TO COMPLETE THE SYSTEMS. THE MECHANICAL CONTRACTOR SHALL NOTE THAT ALL ITEMS OF EQUIPMENT ARE SPECIFIED IN THE SINGULAR; HOWEVER, THE CONTRACTOR SHALL PROVIDE AND INSTALL THE NUMBER OF ITEMS OF EQUIPMENT AS INDICATED ON THE DRAWINGS AND AS REQUIRED FOR COMPLETE SYSTEMS.

   B. IT IS THE INTENTION OF THE SPECIFICATIONS AND DRAWINGS TO CALL FOR FINISHED WORK, TESTED, AND READY FOR OPERATION.

   C. ANY APPARATUS, APPLIANCE, MATERIAL, OR WORK NOT SHOWN ON DRAWINGS BUT MENTIONED IN THE SPECIFICATIONS, OR VICE VERSA, OR ANY INCIDENTAL ACCESSORIES NECESSARY TO MAKE THE WORK COMPLETE AND PERFECT IN ALL RESPECTS AND READY FOR OPERATION, EVEN IF NOT PARTICULARLY SPECIFIED, SHALL BE FURNISHED, DELIVERED, AND INSTALLED BY THE CONTRACTOR WITHOUT ADDITIONAL EXPENSE TO THE OWNER.

   D. MINOR DETAILS NOT USUALLY SHOWN OR SPECIFIED, BUT NECESSARY FOR PROPER INSTALLATION AND OPERATION, SHALL BE INCLUDED IN THE CONTRACTOR'S ESTIMATE, THE SAME AS IF HEREIN SPECIFIED OR SHOWN.

   E. WITH SUBMISSION OF BID, THE MECHANICAL CONTRACTOR SHALL GIVE WRITTEN NOTICE TO THE ENGINEER OF ANY MATERIALS OR APPARATUS BELIEVED INADEQUATE OR UNSUITABLE, IN VIOLATION OF LAWS, ORDINANCES, RULES; AND ANY NECESSARY ITEMS OR WORK OMITTED. IN THE ABSENCE OF SUCH WRITTEN NOTICE, IT IS MUTUALLY AGREED THAT THE CONTRACTOR HAS INCLUDED THE COST OF ALL REQUIRED ITEMS IN HIS PROPOSAL, AND THAT HE WILL BE RESPONSIBLE FOR THE APPROVED SATISFACTORY FUNCTIONING OF THE ENTIRE SYSTEM WITHOUT EXTRA COMPENSATION.

4. MECHANICAL DRAWINGS

   A. THE MECHANICAL DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL ARRANGEMENT OF EQUIPMENT AND WORK INCLUDED IN THE CONTRACT.

   B. CONTRACTOR SHALL FOLLOW DRAWINGS IN LAYING OUT WORK AND CHECK DRAWINGS OF OTHER TRADES TO VERIFY SPACES IN WHICH WORK WILL BE INSTALLED. MAINTAIN MAXIMUM HEADROOM AND SPACE CONDITIONS AT ALL POINTS. WHERE HEADROOM OR SPACE CONDITIONS APPEAR INADEQUATE, THE ENGINEER SHALL BE NOTIFIED BEFORE PROCEEDING WITH INSTALLATION.

   C. IF DIRECTED BY THE ENGINEER, THE CONTRACTOR SHALL, WITHOUT EXTRA CHARGE, MAKE REASONABLE MODIFICATIONS IN THE LAYOUT AS NEEDED TO PREVENT CONFLICT WITH WORK OF OTHER TRADES OR FOR PROPER EXECUTION OF THE WORK.

5. CODES, PERMITS, AND FEES

   A. CONTRACTOR SHALL GIVE ALL NECESSARY NOTICES, OBTAIN ALL PERMITS AND PAY ALL GOVERNMENT TAXES, FEES AND OTHER COSTS, INCLUDING UTILITY CONNECTIONS OR EXTENSIONS IN CONNECTION WITH HIS WORK; FILE ALL NECESSARY PLANS, PREPARE ALL DOCUMENTS AND OBTAIN ALL NECESSARY APPROVALS OF ALL GOVERNMENTAL DEPARTMENTS HAVING JURISDICTION; OBTAIN ALL REQUIRED CERTIFICATES OF INSPECTION FOR HIS WORK AND DELIVER SAME TO THE ENGINEER BEFORE REQUEST FOR ACCEPTANCE AND FINAL PAYMENT FOR THE WORK.

   B. CONTRACTOR SHALL INCLUDE IN THE WORK, WITHOUT EXTRA COST TO THE OWNER, ANY LABOR MATERIALS, SERVICES, APPARATUS, DRAWINGS (IN ADDITION TO CONTRACT DRAWINGS AND DOCUMENTS) IN ORDER TO COMPLY WITH ALL APPLICABLE LAWS, ORDINANCES, RULES AND REGULATIONS, WHETHER OR NOT SHOWN ON DRAWINGS AND/OR SPECIFIED.

   C. WORK AND MATERIALS SHALL CONFORM TO THE LATEST RULES OF THE NATIONAL BOARD OF FIRE UNDERWRITERS' CODE, REGULATIONS OF THE STATE FIRE MARSHAL, AND WITH APPLICABLE LOCAL CODES AND WITH ALL PREVAILING RULES AND REGULATIONS PERTAINING TO ADEQUATE PROTECTION AND/OR GUARDING OF ALL MOVING PARTS, OR OTHERWISE HAZARDOUS CONDITIONS. NOTHING IN THESE SPECIFICATIONS SHALL BE CONSTRUED TO PERMIT WORK NOT CONFORMING TO THE MOST STRINGENT OF APPLICABLE CODES.

   IF DIRECTED BY THE ENGINEER, THE CONTRACTOR SHALL, WITHOUT EXTRA CHARGE, MAKE REASONABLE MODIFICATIONS IN THE LAYOUT AS NEEDED TO PREVENT CONFLICT WITH WORK OF OTHER TRADES OR FOR PROPER EXECUTION OF THE WORK.

6. SHOP DRAWINGS

   A. THE MECHANICAL CONTRACTOR SHALL SUBMIT ONE (1) COPY OF THE SHOP DRAWINGS TO THE ENGINEER FOR APPROVAL WITHIN FOURTEEN (14) DAYS AFTER THE AWARD OF THE CONTRACT. IF SUCH A SCHEDULE CANNOT BE MET, THE MECHANICAL CONTRACTOR MAY REQUEST IN WRITING FOR AN EXTENSION OF TIME TO THE ENGINEER. IF THE MECHANICAL CONTRACTOR DOES NOT SUBMIT SHOP DRAWINGS IN THE PRESCRIBED TIME, THE ENGINEER HAS THE RIGHT TO SELECT THE EQUIPMENT.

   B. SHOP DRAWINGS SHALL BE SUBMITTED ON ALL MAJOR PIECES OF MECHANICAL EQUIPMENT. EACH ITEM OF EQUIPMENT PROPOSED SHALL BE A STANDARD CATALOG PRODUCT OF AN ESTABLISHED MANUFACTURER. THE SHOP DRAWING SHALL GIVE COMPLETE INFORMATION ON THE PROPOSED EQUIPMENT. EACH ITEM OF THE SHOP DRAWINGS SHALL BE PROPERLY LABELED, INDICATING THE INTENDED SERVICE OF THE MATERIAL, THE JOB NAME AND MECHANICAL CONTRACTOR'S NAME.

   C. THE SHOP DRAWINGS SHALL BE NEATLY BOUND AND SUBMITTED TO THE ENGINEER WITH A LETTER OF TRANSMITTAL. THE LETTER OF TRANSMITTAL SHALL LIST EACH ITEM SUBMITTED ALONG WITH THE MANUFACTURER'S NAME.

   D. APPROVAL RENDERED ON SHOP DRAWINGS SHALL NOT BE CONSIDERED AS A GUARANTEE OF MEASUREMENTS OR BUILDING CONDITIONS. WHERE DRAWINGS ARE APPROVED, SAID APPROVAL DOES NOT MEAN THAT DRAWINGS HAVE BEEN CHECKED IN DETAIL, SAID APPROVAL DOES NOT IN ANY WAY RELIEVE THE CONTRACTOR FROM HIS RESPONSIBILITY, OR NECESSITY OF FURNISHING MATERIAL OR PERFORMING WORK AS REQUIRED BY THE CONTRACT DRAWINGS AND SPECIFICATIONS.

7. COOPERATION WITH OTHER TRADES

   A. THE MECHANICAL CONTRACTOR SHALL GIVE FULL COOPERATION TO OTHER TRADES AND SHALL FURNISH (IN WRITING, WITH COPIES TO ENGINEER) ANY INFORMATION NECESSARY TO PERMIT THE WORK OF ALL TRADES TO BE INSTALLED SATISFACTORILY AND WITH THE LEAST POSSIBLE INTERFERENCE OR DELAY.

   B. WHERE THE WORK OF THE MECHANICAL CONTRACTOR WILL BE INSTALLED IN CLOSE PROXIMITY TO WORK OF OTHER TRADES, OR WHERE THERE IS EVIDENCE THAT WORK OF THE MECHANICAL CONTRACTOR WILL INTERFERE WITH THE WORK OF OTHER TRADES, HE SHALL ASSIST IN WORKING OUT SPACE CONDITIONS TO MAKE A SATISFACTORY ADJUSTMENT. IF SO DIRECTED BY THE ENGINEER, THE MECHANICAL CONTRACTOR SHALL PREPARE COMPOSITE WORKING DRAWINGS AND SECTIONS AT A SUITABLE SCALE CLEARLY SHOWING HOW HIS WORK IS TO BE INSTALLED IN RELATION TO THE WORK OF OTHER TRADES, HE SHALL MAKE NECESSARY CHANGES IN HIS WORK TO CORRECT THE CONDITION WITHOUT EXTRA CHARGE.

   C. THE COMPLEXITY OF EQUIPMENT AND THE VARIATION BETWEEN EQUIPMENT MANUFACTURERS REQUIRES COMPLETE COORDINATION OF ALL TRADES. THE CONTRACTOR WHO OFFERS, FOR CONSIDERATION, SUBSTITUTES OF EQUAL PRODUCTS OF RELIABLE MANUFACTURERS, HAS TO BE RESPONSIBLE FOR ALL CHANGES THAT AFFECT HIS INSTALLATION AND THE INSTALLATION EQUIPMENT OF OTHER TRADES. ALL SYSTEMS AND THEIR ASSOCIATED CONTROLS MUST BE COMPLETELY INSTALLED, CONNECTED, AND OPERATING TO THE SATISFACTION OF THE ENGINEER PRIOR TO FINAL ACCEPTANCE AND CONTRACT PAYMENT.

9. AS-BUILT DRAWINGS

   A. THE MECHANICAL CONTRACTOR SHALL MAINTAIN ACCURATE RECORDS OF ALL DEVIATIONS IN WORK AS ACTUALLY INSTALLED FROM WORK INDICATED ON THE DRAWINGS. ON COMPLETION OF THE PROJECT, TWO (2) COMPLETE SETS OF MARKED-UP PRINTS SHALL BE DELIVERED TO THE ENGINEER.

10. INSPECTION AND CERTIFICATES

   A. ON THE COMPLETION OF THE ENTIRE INSTALLATION, THE APPROVAL OF THE ENGINEER AND OWNER SHALL BE SECURED, COVERING THE INSTALLATION THROUGHOUT. THE CONTRACTOR SHALL OBTAIN AND PAY FOR CERTIFICATE OF APPROVAL FROM THE PUBLIC AUTHORITIES HAVING JURISDICTION. A FINAL INSPECTION CERTIFICATE SHALL BE SUBMITTED TO THE ENGINEER PRIOR TO FINAL PAYMENT. ANY AND ALL COST INCURRED FOR FEES SHALL BE PAID FOR BY THE CONTRACTOR.

11. TESTS

   A. THE RIGHT IS RESERVED TO INSPECT AND TEST ANY PORTION OF THE EQUIPMENT AND/OR MATERIALS DURING THE PROGRESS OF ITS ERECTION.

   B. THE CONTRACTOR SHALL TEST THE ENTIRE SYSTEM IN THE PRESENCE OF THE ENGINEER WHEN THE WORK IS FINALLY COMPLETED TO ENSURE THAT ALL PORTIONS ARE FREE OF FAULTS. ALL EQUIPMENT NECESSARY TO CONDUCT THESE TESTS SHALL BE FURNISHED AT THE CONTRACTOR'S EXPENSE.

12. EQUIVALENTS

   A. WHEN MATERIAL OR EQUIPMENT IS MENTIONED BY NAME, IT SHALL FORM THE BASIS OF THE CONTRACT. WHEN APPROVED BY THE ENGINEER IN WRITING, OTHER MATERIAL AND EQUIPMENT MAY BE USED IN PLACE OF THOSE SPECIFIED, BUT WRITTEN APPLICATION FOR SUCH SUBSTITUTIONS SHALL BE MADE TO THE ENGINEER AS DESCRIBED IN THE BIDDING DOCUMENTS. THE DIFFERENCE IN COST OF SUBSTITUTE MATERIAL OR EQUIPMENT SHALL BE GIVEN WHEN SUCH REQUEST IS MADE. APPROVAL OF SUBSTITUTE IS, OF COURSE, CONTINGENT ON SAME MEETING SPECIFIED REQUIREMENTS AND BEING OF SUCH DESIGN AND DIMENSIONS AS TO COMPLY WITH SPACE REQUIREMENTS.

13. DUCTWORK GENERAL

   A. DUCTWORK SHALL BE FABRICATED TO CONFORM ACCURATELY TO THE REQUIRED DIMENSIONS AND SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER. ALL DUCTWORK SHALL BE COORDINATED WITH THE WORK OF OTHER TRADES.

   B. DUCTWORK SHALL BE ANCHORED SECURELY TO THE BUILDING STRUCTURE IN AN APPROVED MANNER AND SHALL BE INSTALLED SO AS TO BE COMPLETELY FREE FROM VIBRATION UNDER ALL CONDITIONS OF OPERATION.

   C. DUCTWORK SHALL BE SUPPORTED INDEPENDENTLY BY THE BUILDING STRUCTURE. DUCTWORK SHALL NOT BE SUPPORTED BY OR FROM PIPING, OTHER DUCTWORK, CONDUIT, CABLE TRAY, BUSS DUCT, FANS, AIR HANDLING UNITS, OR OTHER EQUIPMENT OR COMPONENTS.

14. MATERIALS

   A. UNLESS OTHERWISE SPECIFIED, ALL DUCTWORK, INCLUDING ALL JOINT AND SEAM CONNECTORS, DRIVES, SLIPS, ETC., FURNISHED AND INSTALLED UNDER THIS SPECIFICATION, SHALL BE CONSTRUCTED OF LOCKFORMING QUALITY, GALVANIZED STEEL SHEETS WITH MINIMUM GALVANIZED COATING OF 1.25 OUNCES PER SQUARE FOOT. GALVANIZED STEEL SHEETS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A525, COATING G90.

   B. ALL FASTENERS SHALL BE CADMIUM PLATED OR GALVANIZED STEEL.

   C. ALL REINFORCING MEMBERS, STIFFENERS, HANGERS AND SUPPORTS FOR GALVANIZED DUCTWORK SHALL ALSO BE GALVANIZED STEEL.

   D. WHERE USED, CAULKING SHALL BE ALUMINUM PIGMENTED, NON-HARDENING TYPE.

   E. DUCT SEALER SHALL BE FAST SETTING, NON-HARDENING, THIXOTROPIC PASTE TYPE AND HARDCAST TAPE #AFT-1403 – 3 INCHES WIDE.

   F. AFTER WELDING, ALL STEEL WORK SHALL BE PAINTED TO PREVENT RUSTING WITH AN APPROVED ZINC RICH PAINT OR OTHER RUST INHIBITOR.

   G. WHERE DISSIMILAR METALS ARE USED OR COME INTO CONTACT WITH DUCTWORK, NEOPRENE OR RUBBER GASKETS, ZINC CHROMATE PAINT, ASPHALT IMPREGNATED PAPER, BITUMINOUS PAPER, OR OTHER APPROVED MATERIAL SHALL BE FURNISHED AND INSTALLED TO PROVIDE DIELECTRIC ISOLATION.

15. LOW PRESSURE HVAC DUCTWORK

   A. GENERAL

   LOW PRESSURE DUCTWORK SHALL INCLUDE ALL DUCTWORK WITH A STATIC PRESSURE OF 2 IN. WG. OR LESS AND AIR VELOCITIES OF 2500 FEET PER MINUTE OR LESS.

   B. FABRICATION

   ROUND BRANCH DUCT TO RECTANGULAR DUCT CONNECTIONS LOW PRESSURE DUCTWORK SHALL BE FABRICATED IN ACCORDANCE WITH THE REQUIREMENTS AND RECOMMENDATIONS OF THE SMACNA LOW PRESSURE DUCT CONSTRUCTION STANDARDS, FIFTH EDITION (1976), WITH THE EXCEPTIONS AND CLARIFICATIONS SPECIFIED HEREIN. TABLES, PAGES, AND/OR FIGURE NUMBERS REFERENCED IN THIS SECTION OF THE SPECIFICATION REFER TO TABLES, PAGE NUMBERS, AND/OR FIGURE NUMBERS IN THE SMACNA LOW PRESSURE DUCT CONSTRUCTION STANDARDS.

   C. SEALING

   ALL LOW PRESSURE DUCTWORK, BOTH RECTANGULAR AND ROUND, REGARDLESS OF PRESSURE CLASSIFICATION SHALL BE SEALED TO PREVENT AIR LEAKAGE IN ACCORDANCE WITH THE REQUIREMENTS OF SMACNA SEAL CLASS B (SMACNA MANUAL 15D, 1985).

   D. RECTANGULAR DUCTWORK

      1. GAUGES

      SHEET METAL GAUGES FOR RECTANGULAR DUCTWORK SHALL BE AS SHOWN IN TABLE 1-5, PAGE 1-17 (SMACNA), EXCEPT NO THICKNESS LESS THAN 24 GAUGE SHALL BE USED.

      2. JOINTS, SEAMS AND REINFORCING

      JOINTS, SEAMS, AND REINFORCING FOR RECTANGULAR DUCTWORK SHALL BE IN ACCORDANCE WITH PAGES 1-17 THROUGH 1-23 AND PAGES 1-25 THROUGH 1-38 (SMACNA), EXCEPT THAT JOINT "L-2" SHALL NOT BE USED. FOR CORNER CLOSURES OF POCKET LOCK JOINTS, FABRICATE AS SHOWN IN FIG. 1-6 OR FIG. 1-7, SPOT WELDING OR RIVETING THE METAL. DO NOT STAPLE. IF ANGLE REINFORCED POCKET LOCKS OR COMPANION ANGLES ARE USED, MITER THE ANGLES AT CORNERS AND WELD.

      3. ELBOWS

      A. RADIUS ELBOWS FOR RECTANGULAR DUCTWORK SHALL BE FABRICATED IN ACCORDANCE WITH FIG. 2-1, PAGE 2-2 (SMACNA). WHERE POSSIBLE, ELBOWS SHALL BE FULL RADIUS TYPE WITH CENTERLINE RADIUS EQUAL TO 1.5 TIMES THE DUCT WIDTH.

      B. STANDARD 90 DEG. MITERED ELBOWS FOR RECTANGULAR DUCTWORK SHALL BE PROVIDED WITH SINGLE THICKNESS TURNING VANES WHICH SHALL BE CONSTRUCTED IN ACCORDANCE WITH FIG. 2-3, PAGE 2-4 AND FIG. 2-4, PAGE 2-5 (SMACNA). AS AN ALTERNATE, THE SUBCONTRACTOR MAY USE FACTORY MANUFACTURED TURNING VANES AND RUNNERS. FACTORY MANUFACTURED VANES SHALL BE SINGLE THICKNESS TYPE WITH MATCHING RUNNERS. FACTORY MANUFACTURED TURNING VANES AND RUNNERS SHALL BE INSTALLED IN ACCORDANCE WITH FIG. 2-3 AND 2-4 (SMACNA).

      4. CONNECTIONS

      BRANCH DUCT CONNECTIONS SHALL BE FABRICATED AND INSTALLED IN ACCORDANCE WITH FIG. 2-5, 2-6 AND 2-10 (SMACNA), WITH THE FOLLOWING EXCEPTIONS AND CLARIFICATIONS:

      A. STRAIGHT TAP CONNECTIONS AS SHOWN IN FIG. 2-5 AND 2-10 (SMACNA) SHALL NOT BE USED FOR RECTANGULAR BRANCH DUCT CONNECTIONS, BUT MAY BE USED FOR DUCT MOUNTED REGISTERS AND GRILLES. RECTANGULAR BRANCH DUCT CONNECTIONS SHALL BE MADE USING A 45 DEG. ENTRY AS SHOWN IN FIG. 2-5 AND 2-10 (SMACNA).

      B. SPIN-IN FITTINGS AND DOVETAIL JOINTS AS SHOWN IN FIG. 2-10, PAGE 2-11 (SMACNA) SHALL NOT BE USED.

      SHALL BE MADE USING CONICAL BELLMOUTH, OR FLANGED CONNECTIONS AS SHOWN IN FIG. 2-10 (SMACNA).

      C. AIR EXTRACTORS AS SHOWN IN FIG. 2-5 AND 2-10 (SMACNA) SHALL NOT BE USED.

      5. TRANSITIONS AND OFFSETS

      TRANSITIONS AND OFFSETS SHALL BE FABRICATED AND INSTALLED IN ACCORDANCE WITH FIG. 2-7, PAGE 2-8 (SMACNA).

      6. SUPPORTS

      A. SUPPORTS FOR RECTANGULAR DUCTWORK SHALL BE FABRICATED AND INSTALLED IN ACCORDANCE WITH SECTION V OF THE SMACNA LOW PRESSURE DUCT CONSTRUCTION STANDARDS, FIFTH EDITION (1976), WITH EXCEPTIONS AND CLARIFICATIONS AS SPECIFIED HEREIN.

      B. ALL NECESSARY MATERIALS AND COMPONENTS, INCLUDING MISCELLANEOUS STEEL, REQUIRED FOR PROPER SUPPORT OF ALL DUCTWORK SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR.

      C. THE UPPER ATTACHMENT OF EACH TRAPEZE SUPPORT TO THE BUILDING STEEL, OR THE MISCELLANEOUS STEEL FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR, SHALL BE SIMILAR TO TYPE 4A AS SHOWN IN FIG. 5-4, PAGE 5-5 (SMACNA). ALL CLAMPS SHALL INCORPORATE SUBSTANTIAL RETAINING CLIPS.

      D. THE LOWER HANGER ATTACHMENT SHALL BE AS SHOWN FOR TRAPEZE HANGERS IN FIG. 5-4, PAGE 5-7 (SMACNA), AND SHALL INCLUDE THREADED HANGER RODS, SUPPORT ANGLES AND HARDWARE. THE DIAMETER OF THE HANGER RODS SHALL BE AS SHOWN IN TABLE 5-1, PAGE 5-8 (SMACNA). ACTUAL LOADS ON SUPPORT ANGLES SHALL NOT EXCEED THE ALLOWABLE LOADS SHOWN IN TABLE 5-3, PAGE 5-10 (SMACNA). LENGTH OF TRAPEZE SUPPORT ANGLES SHALL NOT EXCEED DUCT WIDTH BY MORE THAN 6 INCHES.

16. DUCTWORK ACCESSORIES

   A. MANUAL VOLUME DAMPERS

   MANUAL VOLUME DAMPERS SHALL BE OPPOSED BLADE TYPE. DAMPERS SHALL BE CONSTRUCTED OF GALVANIZED STEEL AND SHALL HAVE MINIMUM 16 GAUGE HAT CHANNEL FRAME. DAMPER AXLES SHALL BE 1/2" PLATED STEEL HEX AND BEARINGS SHALL BE STAINLESS STEEL OR OIL-IMPREGNATED BRONZE. DAMPER BLADES SHALL BE WITH 14 GAUGE EQUIVALENT THICKNESS. DAMPER BLADES SHALL NOT EXCEED 6" IN WIDTH OR 54" IN LENGTH. WHERE REQUIRED DAMPER BLADE LENGTH EXCEEDS 54", DAMPER SHALL BE FURNISHED AS A FACTORY FABRICATED AND ASSEMBLED MULTI-SECTION ASSEMBLY WITH HEAVY DUTY JACKSHAFT FOR OPERATION OF THE ENTIRE ASSEMBLY AS A SINGLE UNIT. DAMPERS SHALL BE LOW LEAKAGE TYPE AND SHALL BE PROVIDED WITH EXTRUDED VINYL BLADE EDGE SEALS AND FLEXIBLE METAL COMPRESSION TYPE JAMB SEALS. DAMPER LEAKAGE RATE, FOR A 48" WIDE DAMPER AT A DIFFERENTIAL PRESSURE OF 1 INCH WATER GAUGE, SHALL NOT EXCEED 3 CUBIC FEET OF AIR PER MINUTE PER SQUARE FOOT OF DAMPER AREA WHEN TESTED IN ACCORDANCE WITH AMCA STANDARD 500. EACH MANUAL VOLUME DAMPER SHALL BE PROVIDED WITH A HEAVY DUTY, 90 DEG. MANUAL LOCKING QUADRANT OPERATOR.

17. FLEXIBLE DUCTWORK (HVAC)

   A. CONSTRUCTION

   FLEXIBLE DUCTWORK SHALL CONSIST OF A CORROSION RESISTANT, VINYL COATED SPRING STEEL WIRE HELIX WITH ACOUSTICALLY TRANSPARENT LINER OR PERFORATED ALUMINUM INNER LINER, A MINIMUM ONE (1) INCH THICK FIBERGLASS INSULATION WRAPPING, AND A CLASS 1 VINYL VAPOR BARRIER. THE MAXIMUM LENGTH OF FLEX DUCT ALLOWED WILL BE 48".

   B. RATING

   FLEXIBLE DUCTWORK, INCLUDING INSULATION AND VAPOR BARRIER, SHALL BE LISTED AND LABELED AS A CLASS 1 AIR DUCT IN ACCORDANCE WITH UL STANDARD 181.

   FLEXIBLE DUCTWORK, INCLUDING INSULATION AND VAPOR BARRIER, SHALL HAVE A MAXIMUM FLAME SPREAD RATING OF 25 AND A MAXIMUM SMOKE DEVELOPED RATING OF 50. FLEXIBLE DUCTWORK SHALL BE RATED FOR AN OPERATING PRESSURE UP TO 2.0 IN. WG., A VELOCITY OF 1500 FEET PER MINUTE, AND AN OPERATING TEMPERATURE OF 0 DEG. F. TO 180 DEG. F.

   THE THERMAL CONDUCTANCE OF FLEXIBLE DUCTWORK INSULATION SHALL NOT EXCEED 0.23 BTU-IN/HR-SQ.FT.-DEG.F.

18. INSULATION

   A. GENERAL

   THE MECHANICAL CONTRACTOR SHALL HAVE AN INSULATION SUBCONTRACTOR FURNISH AND INSTALL INSULATION AND ACCESSORY MATERIALS AND COMPONENTS AS SPECIFIED HEREIN.

   B. SCOPE

   FURNISH AND INSTALL INSULATION AND ACCESSORY MATERIALS INCLUDING, BUT NOT LIMITED TO, ADHESIVE, MASTICS, SEALERS, WELD PINS, COATINGS, VAPOR BARRIERS, AND TAPES, AS REQUIRED TO MEET THE SOUND LEVEL REQUIREMENTS SPECIFIED HEREIN, PREVENT SURFACE CONDENSATION, PROVIDE PERSONNEL PROTECTION, AND PROVIDE ENERGY EFFICIENT THERMAL COVERING SYSTEMS FOR ALL DUCTWORK, PIPING, EQUIPMENT AND APPURTENANCES FURNISHED AND INSTALLED UNDER THIS SPECIFICATION.

   C. QUALITY ASSURANCE

   ALL INSULATION AND ACCESSORY MATERIALS, AND THE INSTALLATION THEREOF, SHALL MEET THE REQUIREMENTS OF THE CODES, STANDARDS, REGULATIONS, AND OTHER DOCUMENTS REFERENCED IN THIS SPECIFICATION.

   D. FLAME SPREAD AND SMOKE DEVELOPED RATINGS

   ALL INSULATION AND ACCESSORY MATERIALS WHICH ARE FURNISHED AND INSTALLED UNDER THIS SPECIFICATION, SHALL HAVE A FLAME SPREAD RATING OF NOT MORE THAN 25 AND A SMOKE DEVELOPED RATING OF NOT MORE THAN 50 WHEN TESTED IN ACCORDANCE WITH THE REQUIREMENTS OF NFPA 255, ASTM E-84, OR UL 723.

   MATERIALS THAT ARE FACTORY APPLIED SHALL BE TESTED AS ASSEMBLED AND SHALL BE CERTIFIED BY THE MANUFACTURER TO MEET THESE STANDARDS. MATERIALS WHICH ARE FIELD APPLIED MAY BE TESTED INDIVIDUALLY. NO FUGITIVE OR CORROSION TREATMENTS SHALL BE EMPLOYED TO IMPART FLAME RESISTANCE.

   E. INSULATION THICKNESS

   INSULATION THICKNESSES SHALL BE EQUAL TO OR GREATER THAN THAT REQUIRED BY THE MORE STRINGENT OF THE FOLLOWING REQUIREMENTS:

      1. THE INSULATION THICKNESSES NECESSARY TO MEET THE REQUIREMENTS OF SECTION 20 BELOW.

      2. THE INSULATION THICKNESSES NECESSARY TO MEET THE REQUIREMENTS OF ASHRAE STANDARD 90A.

      3. THE INSULATION THICKNESSES NECESSARY TO MEET THE ENERGY PERFORMANCE REQUIREMENTS OF THE STATE OF NORTH CAROLINA.

19. GENERAL REQUIREMENTS

   A. ALL INSULATION SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS AND AS SPECIFIED HEREIN.

   B. NO INSULATION SHALL BE APPLIED TO ANY PIPING, DUCTWORK, EQUIPMENT, OR APPURTENANCE UNTIL THE WORK IS TO BE INSULATED AND INSPECTED BY THE OWNER'S REPRESENTATIVE AND RELEASED FOR INSULATION. ALL SURFACES TO BE INSULATED SHALL BE PROPERLY CLEANED BY THE MECHANICAL CONTRACTOR PRIOR TO INSPECTION BY THE OWNER'S REPRESENTATIVE.

   C. INSULATION SHALL BE APPLIED TO CLEAN, DRY SURFACES AFTER TESTS AND APPROVALS REQUIRED BY THIS SPECIFICATION HAVE BEEN COMPLETED.

   D. ALL INSULATION SHALL BE KEPT DRY AND PROTECTED FROM DAMAGE BOTH BEFORE AND DURING APPLICATION. ANY INSULATION WHICH BECOMES WET PRIOR TO APPLICATION SHALL BE DISCARDED. ANY INSULATION WHICH BECOMES WET AFTER APPLICATION SHALL BE REMOVED AND REPLACED.

   E. WHERE STICK CLIPS ARE USED IN LIEU OF WELD PINS FOR THE ATTACHMENT OF INSULATION TO THE SURFACES TO BE INSULATED, THE MECHANICAL CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR CLEANING THE SURFACES TO BE INSULATED OF ALL OIL, SILICONE, OR OTHER SUBSTANCES WHICH MAY INTERFERE WITH THE PROPER ADHESION OF THE STICK CLIPS TO THE SURFACE TO BE INSULATED.

   F. ALL INSULATION SHALL BE APPLIED IN A WORKMANLIKE MANNER BY SKILLED WORKMEN REGULARLY ENGAGED IN THIS TYPE OF WORK. ANY INSULATION WORK, WHICH IN THE OPINION OF THE OWNER'S REPRESENTATIVE, IS NOT IN ACCORDANCE WITH THE BEST PREVAILING TRADE PRACTICE SHALL BE REMOVED AND REPLACED AT NO COST TO THE OWNER.

   G. ON COLD SURFACES WHERE A VAPOR BARRIER MUST BE MAINTAINED TO PREVENT CONDENSATION, INSULATION SHALL BE APPLIED WITH A CONTINUOUS, UNBROKEN MOISTURE AND VAPOR SEAL. ALL HANGERS, SUPPORTS, ANCHORS, OR OTHER PROJECTIONS THAT ARE IN CONTACT WITH COLD SURFACES SHALL BE INSULATED AND VAPOR SEALED TO PREVENT CONDENSATION.

   H. ALL SURFACE FINISHES SHALL BE EXTENDED IN SUCH A MANNER AS TO PROTECT ALL RAW EDGES, ENDS, AND SURFACES OF INSULATION.

   I. ALL PIPE OR DUCT INSULATION SHALL BE CONTINUOUS THROUGH WALLS, CEILING OR FLOOR OPENINGS, AND/OR SLEEVES, EXCEPT WHERE FIRE DAMPERS OR FIRESAFING MATERIALS ARE REQUIRED.

20. INSULATION FOR HVAC DUCTWORK

   A. GENERAL

   THE INSULATION SUBCONTRACTOR SHALL APPLY INSULATION ON CLEAN, DRY SURFACES AFTER THE DUCTWORK HAS BEEN TESTED, INSPECTED AND RELEASED FOR INSULATION APPLICATION.

   B. INSULATION

   DUCT WRAP SHALL BE FLEXIBLE FIBERGLASS INSULATION WITH A FACTORY APPLIED FSK EXTERIOR FACING. DUCT WRAP SHALL HAVE A THICKNESS OF 2" WITH A DENSITY OF 3/4 POUNDS PER CUBIC FOOT AND SHALL BE SUITABLE FOR TEMPERATURES UP TO 250 DEG. F. UNLESS OTHERWISE REQUIRED BY CODES, STANDARDS, REGULATIONS, AND OTHER DOCUMENTS REFERENCED HEREIN, DUCT WRAP SHALL HAVE A MAXIMUM THERMAL CONDUCTIVITY OF 0.24 BTU-IN/HR-FT-SQ-OF AT 75 DEG. F. MEAN TEMPERATURE. EXTERIOR FACING SHALL HAVE A MAXIMUM VAPOR TRANSMISSION RATE OF 0.02 PERMS (GRAINS/HR-FT-SQ-IN. HG) WHEN TESTED IN ACCORDANCE WITH ASTM E96, PROCEDURE A OR EQUIVALENT.

21. GUARANTEE

   THE MECHANICAL CONTRACTOR SHALL GUARANTEE, BY HIS ACCEPTANCE OF THE CONTRACT, THAT ALL WORK INSTALLED WILL BE FREE FROM DEFECTS IN WORKMANSHIP AND MATERIALS. IF DURING THE PERIOD OF ONE YEAR, OR AS OTHERWISE SPECIFIED, FROM DATE OF CERTIFICATE OF COMPLETION AND ACCEPTANCE OF WORK, ANY SUCH DEFECTS IN WORKMANSHIP, MATERIALS OR PERFORMANCE APPEAR, THE CONTRACTOR SHALL, WITHOUT COST TO THE OWNER, REMEDY SUCH DEFECTS WITHIN A REASONABLE TIME TO BE SPECIFIED IN NOTICE FROM ENGINEER. IN DEFAULT, THE OWNER MAY HAVE SUCH WORK DONE AND CHARGE COST TO CONTRACTOR.

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PUBLICATION OR REUSE OF THESE DRAWINGS OR ANY DETAILS THEREFROM MUST BE WITH THE WRITTEN CONSENT OF THE ARCHITECT

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MECHANICAL SPECIFICATIO[N]

HISTORIC SPENCER SHOPS
YARD OFFICE

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 31024 SAMUEL E. COLLINS, III 6-4-19

S. E. COLLINS, INC. PROFESSIONAL ENGINEERING CORPORATION C-2809

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