

SECTION 230500 - GENERAL MECHANICAL

1.1 WORK INCLUDES ALL LABOR, MATERIAL, AND EQUIPMENT NECESSARY FOR THE INSTALLATION OF ALL HVAC SYSTEMS, INCLUDING ALL EQUIPMENT DUCTWORK, CONTROLS, AND RELATED ITEMS AS REQUIRED OR SPECIFIED.

1.2 ALL WORK SHALL CONFORM TO THE CURRENT STATE AND LOCAL CODES AND AS APPROVED BY THE AUTHORITY HAVING JURISDICTION. CONTRACTOR SHALL OBTAIN ALL PERMITS AND PAY ALL FEES FOR THE WORK INCLUDED.

1.3 PROJECT SUBMITTALS, IF REQUESTED CONTRACTOR SHALL SUBMIT FOR APPROVAL ON ALL MATERIALS AND METHODS SHOWN IN THESE PLANS.

1.4 ALL SUBSTITUTIONS SHALL BE SUBMITTED IN WRITING AND APPROVED BY THE OWNER OR THE OWNER'S REPRESENTATIVE. A CONTRACTOR OFFERING A SUBSTITUTION SHALL ACCEPTS RESPONSIBILITY FOR COORDINATING WITH ALL OTHER TRADES AND ANY ADDITIONAL ENGINEERING REQUIRED. ALL COSTS AND CHARGES RESULTING FROM THE INCLUSION OF SUBSTITUTIONS SHALL BE PAID BY THE CONTRACTOR WHO REQUESTED THE SUBSTITUTION.

1.5 IF THE CONTRACTOR FINDS DISCREPANCIES, OR OMISSIONS OR IS IN DOUBT AS TO THE EXACT MEANING OF THE PLANS OR SPECIFICATIONS, THEY SHALL, BEFORE STARTING WORK, CONTACT THE OWNER OR ENGINEER FOR CLARIFICATION.

DUCT INSULATION

2.1 INSULATE ALL DUCTWORK IN COMPLIANCE WITH ALL APPLICABLE CODES AND ASHRAE STANDARD 90.1.

HVAC TESTING AND BALANCE

3.1 HVAC SYSTEM SHALL BE BALANCED AND TESTED IN ACCORDANCE WITH SECTION 230593 TO ACHIEVE DESIGN AIRFLOW SPECIFIED ON DRAWINGS.

CLOSEOUT

4.1.1 THE HVAC CONTRACTOR SHALL INSTRUCT THE OWNER IN PROPER OPERATION AND MAINTENANCE OF ALL EQUIPMENT. THE CONTRACTOR SHALL PROVIDE TWO BOUND COPIES OF AN OPERATIONS MANUAL UPON COMPLETION. SAID MANUAL SHALL INCLUDE ALL EQUIPMENT OPERATIONS MANUAL, "CUT" SHEETS OF ALL CONTRACTOR SUPPLIED ITEMS USED ON THE PROJECT AND WARRANTY CERTIFICATES.

GUARANTEE

5.1.1 HVAC CONTRACTOR SHALL GUARANTEE IN WRITING, ALL LABOR AND MATERIALS FURNISHED AND INSTALLED UNDER THIS SECTION FOR A PERIOD OF ONE YEAR. COVERING MATERIALS AND WORKMANSHIP IN FULLY EXCLUDED FROM THIS GUARANTEE IS OWNER SUPPLIED EQUIPMENT.

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

A. SECTION INCLUDES:  
1. BALANCING AIR SYSTEMS;  
2. CONSTANT-VOLUME AIR SYSTEMS.

B. AABC ASSOCIATED AIR BALANCE COUNCIL.  
C. TAB TESTING, ADJUSTING, AND BALANCING.  
D. TAB TESTING, ADJUSTING, AND BALANCING.  
E. TAB SPECIALIST- AN ENTITY ENGAGED TO PERFORM TAB WORK.

PART 2 - PRODUCTS

A. TAB CONTRACTOR QUALIFICATIONS- ENGAGE A TAB ENTITY CERTIFIED BY NEBB OR TABA.  
1. TAB FIELD SUPERVISOR- EMPLOYEE OF THE TAB CONTRACTOR AND CERTIFIED BY NEBB OR TABA AS A TAB TECHNICIAN.  
2. TAB TECHNICIAN- EMPLOYEE OF THE TAB CONTRACTOR AND WHO IS CERTIFIED NEBB OR TABA AS A TAB TECHNICIAN.

B. CERTIFY TAB FIELD DATA REPORTS AND PERFORM THE FOLLOWING:  
1. REVIEW FIELD DATA REPORTS TO VALIDATE ACCURACY OF DATA AND TO PREPARE CERTIFIED TAB REPORTS.  
2. CERTIFY THAT THE TAB TEAM COMPLIED WITH THE APPROVED TAB PLAN AND THE PROCEDURES SPECIFIED AND REFERENCED IN THIS SPECIFICATION.

C. TAB REPORT FORMS- USE STANDARD TAB CONTRACTOR'S FORMS APPROVED BY ARCHITECT.  
D. INSTRUMENTATION TYPE, QUANTITY, ACCURACY, AND CALIBRATION- AS DESCRIBED IN ASHRAE 111, SECTION 5, "INSTRUMENTATION".

E. EXAMINATION  
1. EXAMINE THE CONTRACT DOCUMENTS TO BECOME FAMILIAR WITH PROJECT REQUIREMENTS AND TO DISCOVER CONDITIONS IN SYSTEMS' DESIGNS THAT MAY PRECLUDE PROPER TAB OF SYSTEMS AND EQUIPMENT.  
2. EXAMINE SYSTEMS FOR INSTALLED BALANCING DEVICES, SUCH AS TEST PORTS, BALANCING VALVES AND FITTINGS, AND MANUAL VOLUME DAMPERS. VERIFY THAT LOCATIONS OF THESE BALANCING DEVICES ARE ACCESSIBLE.

C. EXAMINE THE APPROVED SUBMITTALS FOR HVAC SYSTEMS AND EQUIPMENT.  
D. EXAMINE DESIGN DATA INCLUDING HVAC SYSTEM DESCRIPTIONS, STATEMENTS OF DESIGN ASSUMPTIONS FOR ENVIRONMENTAL CONDITIONS AND SYSTEMS' OUTPUT, AND STATEMENTS OF PHILOSOPHIES AND ASSUMPTIONS ABOUT HVAC SYSTEM AND EQUIPMENT CONTROLS.

E. EXAMINE CEILING PLENUMS AND UNDERFLOOR AIR PLENUMS USED FOR SUPPLY, RETURN, OR RELIEF AIR TO VERIFY THAT THEY MEET THE LEAKAGE CLASS OF CONNECTED DUCTS AS SPECIFIED IN DIVISION 23 SECTION "METAL DUCTS" AND ARE PROPERLY SEPARATED FROM ADJACENT AREAS. VERIFY THAT PENETRATIONS IN PLENUM WALLS ARE SEALED AND FIRE-STOPPED IF REQUIRED.

F. EXAMINE EQUIPMENT PERFORMANCE DATA INCLUDING FAN AND PUMP CURVES.  
1. RELATE PERFORMANCE DATA TO PROJECT CONDITIONS AND REQUIREMENTS, INCLUDING SYSTEM EFFECTS THAT CAN CREATE UNDESIRED OR UNPREDICTED CONDITIONS THAT CAUSE REDUCED CAPACITIES IN ALL OR PART OF A SYSTEM.  
2. CALCULATE SYSTEM-EFFECT FACTORS TO REDUCE PERFORMANCE RATINGS OF HVAC EQUIPMENT WHEN INSTALLED UNDER CONDITIONS DIFFERENT FROM THE CONDITIONS USED TO RATE EQUIPMENT PERFORMANCE. TO CALCULATE SYSTEM EFFECTS FOR AIR SYSTEMS, USE TABLES AND CHARTS FOUND IN AMCA 201, "FANS AND SYSTEMS," OR IN SMACNA'S "HVAC SYSTEMS AND DUCT DESIGN." COMPARE RESULTS WITH THE DESIGN DATA AND INSTALLED CONDITIONS.

G. EXAMINE SYSTEM AND EQUIPMENT INSTALLATIONS AND VERIFY THAT FIELD QUALITY-CONTROL TESTING, CLEANING, AND ADJUSTING SPECIFIED IN INDIVIDUAL SECTIONS HAVE BEEN PERFORMED.

H. EXAMINE TEST REPORTS SPECIFIED IN INDIVIDUAL SYSTEM AND EQUIPMENT SECTIONS.  
1. EXAMINE HVAC EQUIPMENT AND FILTERS AND VERIFY THAT BEARINGS ARE GREASED, BELTS ARE ALIGNED AND TIGHT, AND EQUIPMENT WITH FUNCTIONING CONTROLS IS READY FOR OPERATION.  
J. EXAMINE TERMINAL UNITS, SUCH AS VARIABLE-AIR-VOLUME BOXES, AND VERIFY THAT THEY ARE ACCESSIBLE AND THEIR

CONTROLS ARE CONNECTED AND FUNCTIONING.  
K. EXAMINE OPERATING SAFETY INTERLOCKS AND CONTROLS ON HVAC EQUIPMENT.  
L. REPORT DEFICIENCIES DISCOVERED BEFORE AND DURING PERFORMANCE OF TAB PROCEDURES. OBSERVE AND RECORD SYSTEM REACTIONS TO CHANGES IN CONDITIONS AT DEFAULT SET POINTS IF DIFFERENT FROM INDICATED VALUES.

3.2 PREPARATION  
A. PREPARE A TAB PLAN THAT INCLUDES STRATEGIES AND STEP-BY-STEP PROCEDURES.  
B. COMPLETE SYSTEM-READINESS CHECKS AND PREPARE REPORTS. VERIFY THE FOLLOWING:  
1. PERMANENT ELECTRICAL-POWER WIRING IS COMPLETE.  
2. AUTOMATIC TEMPERATURE-CONTROL SYSTEMS ARE OPERATIONAL.  
3. EQUIPMENT AND DUCT ACCESS DOORS ARE SECURELY CLOSED.  
4. BALANCED SMOKE AND FIRE DAMPERS ARE OPEN.  
5. CEILINGS ARE INSTALLED IN CRITICAL AREAS WHERE AIR-PATTERN ADJUSTMENTS ARE REQUIRED AND ACCESS TO BALANCING DEVICES IS PROVIDED.  
6. WINDOWS AND DOORS CAN BE CLOSED SO INDICATED CONDITIONS FOR SYSTEM OPERATIONS CAN BE MET.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. PERFORM TESTING AND BALANCING PROCEDURES ON EACH SYSTEM ACCORDING TO THE PROCEDURES CONTAINED IN NEBB'S "PROCEDURAL STANDARDS FOR TESTING, ADJUSTING, AND BALANCING OF ENVIRONMENTAL SYSTEMS AND IN THIS SECTION."  
1. COMPLY WITH REQUIREMENTS IN ASHRAE 62.1-2004, SECTION 7.2.2, "AIR BALANCING."  
B. CUT INSULATION, DUCTS, AND EQUIPMENT CABINETS FOR INSTALLATION OF TEST PROBES TO THE MINIMUM EXTENT NECESSARY FOR TAB PROCEDURES.  
C. MARK EQUIPMENT AND BALANCING DEVICES, INCLUDING DAMPER-CONTROL POSITIONS, VALVE POSITION INDICATORS, FAN-SPEED-CONTROL LEVERS, AND SIMILAR CONTROLS AND DEVICES, WITH PAINT OR OTHER SUITABLE, PERMANENT IDENTIFICATION MATERIAL TO SHOW FINAL SETTINGS.  
D. MAKE AND REPORT TESTING AND BALANCING MEASUREMENTS IN INCH-POUND (IP) UNITS.

END OF SECTION 230593

SECTION 230600 - HVAC DUCTWORK

1.1 SUMMARY  
A. SECTION INCLUDES:  
1. RECTANGULAR DUCTS AND FITTINGS.  
2. ROUND DUCTS AND FITTINGS.  
3. SHEET METAL MATERIALS.  
4. DUCT LINER.  
5. HANGERS AND SUPPORTS.  
B. RELATED SECTIONS:  
1. 230593 "TESTING, ADJUSTING, AND BALANCING FOR HVAC"  
2. 230700 "HVAC DUCT ACCESSORIES" FOR DAMPERS, SOUND-CONTROL DEVICES, DUCT-MOUNTING ACCESS DOORS AND PANELS, TURNING VANES, AND FLEXIBLE DUCTS.  
C. PERFORMANCE REQUIREMENTS  
1. DELICATELY BUILT DESIGN: DUCT CONSTRUCTION, INCLUDING SHEET METAL THICKNESS, SEAM AND JOINT CONSTRUCTION, REINFORCEMENTS, AND HANGERS AND SUPPORTS, SHALL COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE" AND PERFORMANCE REQUIREMENTS AND DESIGN CRITERIA INDICATED IN "DUCT SCHEDULE" ARTICLE.  
B. STRUCTURAL PERFORMANCE- DUCT HANGERS AND SUPPORTS AND SEISMIC RESTRAINTS SHALL WITHSTAND THE EFFECTS OF GRAVITY AND SEISMIC LOADS AND STRESSES WITHIN LIMITS AND UNDER CONDITIONS DESCRIBED IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE" AND "DUCT SCHEDULE" ARTICLE.  
C. DELGATED-DESIGN SUBMITTAL:  
1. SHEET METAL THICKNESSES.  
2. JOINT AND SEAM CONSTRUCTION AND SEALING.  
3. REINFORCEMENT DETAILS AND SPACING.  
4. MATERIALS, FABRICATION, ASSEMBLY, AND SPACING OF HANGERS AND SUPPORTS.

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS  
A. GENERAL FABRICATION REQUIREMENTS: COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE" BASED ON INDICATED STATIC-PRESSURE CLASS UNLESS OTHERWISE INDICATED.  
B. TRANSVERSE JOINTS- SELECT JOINT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 1-4, "TRANSVERSE (GIRTH) JOINTS" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
C. LONGITUDINAL SEAMS- SELECT SEAM TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 1-5, "LONGITUDINAL SEAMS - RECTANGULAR DUCTS" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
D. ELBOWS, TRANSITIONS, AND OTHER DUCT CONNECTIONS- FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 1-6, "ELBOWS, TRANSITIONS, AND OTHER DUCT CONNECTIONS" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
E. HANGERS AND SUPPORTS  
1. HANGER RODS FOR NONCORROSIVE ENVIRONMENTS- CADMIUM-PLATED STEEL RODS AND STRAP AND ROD SIZES- COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 1-7, "HANGER RODS AND STRAP AND ROD SIZES" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
2. HANGERS AND SUPPORTS FOR GALVANIZED-STEEL DUCTS- GALVANIZED STEEL COMPLYING WITH ASTM A 663.  
3. STANDARD SIZES FOR GALVANIZED-STEEL DUCTS- GALVANIZED STEEL COMPLYING WITH ASTM A 492.  
4. AIR BALANCE INC., A DIVISION OF MESTEK, INC.  
5. AMERICAN WARMING AND VENTILATING, A

2.2 FLEXIBLE,  
A. GENERAL FABRICATION REQUIREMENTS: COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," CHAPTER 3, "ROUND, OVAL, AND FLEXIBLE DUCTS" BASED ON INDICATED STATIC-PRESSURE CLASS UNLESS OTHERWISE INDICATED.  
1. MANUFACTURERS' SUBJECT TO COMPLIANCE WITH REQUIREMENTS FOR STATIC-PRESSURE CLASS UNLESS OTHERWISE INDICATED.  
2. SUPPORTS FOR GALVANIZED-STEEL DUCTS: GALVANIZED-STEEL SHAPES AND PLATES.  
3. SUPPORTS FOR ALUMINUM DUCTS: ALUMINUM OR GALVANIZED STEEL COATED WITH ZINC CHROMATE.  
4. DIVISION OF MESTEK, INC.  
5. FLEXMASTER USA, INC.  
6. MCGILL AIRFLOW LLC.  
7. MCGLIL AIRFLOW LLC.  
8. SPIRAL MANUFACTURING CO., INC.  
9. TRANSVERSE JOINTS- SELECT JOINT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-2, "TRANSVERSE JOINTS - ROUND DUCT" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
10. LONGITUDINAL SEAMS- SELECT SEAM TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-1, "SEAMS - ROUND DUCT" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
11. TEES AND LATERALS- SELECT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-4, "90 DEGREE TEES AND LATERALS," AND FIGURE 3-5, "CONICAL TEES" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
12. TRANSVERSE JOINTS- SELECT JOINT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-2, "TRANSVERSE JOINTS - ROUND DUCT" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
13. TEES AND LATERALS- SELECT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-4, "90 DEGREE TEES AND LATERALS," AND FIGURE 3-5, "CONICAL TEES" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
14. TRANSVERSE JOINTS- SELECT JOINT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-2, "TRANSVERSE JOINTS - ROUND DUCT" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
15. TEES AND LATERALS- SELECT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-4, "90 DEGREE TEES AND LATERALS," AND FIGURE 3-5, "CONICAL TEES" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
16. TRANSVERSE JOINTS- SELECT JOINT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-2, "TRANSVERSE JOINTS - ROUND DUCT" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
17. TEES AND LATERALS- SELECT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-4, "90 DEGREE TEES AND LATERALS," AND FIGURE 3-5, "CONICAL TEES" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
18. TRANSVERSE JOINTS- SELECT JOINT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-2, "TRANSVERSE JOINTS - ROUND DUCT" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
19. TEES AND LATERALS- SELECT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-4, "90 DEGREE TEES AND LATERALS," AND FIGURE 3-5, "CONICAL TEES" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
20. TRANSVERSE JOINTS- SELECT JOINT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-2, "TRANSVERSE JOINTS - ROUND DUCT" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
21. TEES AND LATERALS- SELECT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-4, "90 DEGREE TEES AND LATERALS," AND FIGURE 3-5, "CONICAL TEES" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
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23. TEES AND LATERALS- SELECT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-4, "90 DEGREE TEES AND LATERALS," AND FIGURE 3-5, "CONICAL TEES" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
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25. TEES AND LATERALS- SELECT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-4, "90 DEGREE TEES AND LATERALS," AND FIGURE 3-5, "CONICAL TEES" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
26. TRANSVERSE JOINTS- SELECT JOINT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-2, "TRANSVERSE JOINTS - ROUND DUCT" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
27. TEES AND LATERALS- SELECT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-4, "90 DEGREE TEES AND LATERALS," AND FIGURE 3-5, "CONICAL TEES" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
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34. TRANSVERSE JOINTS- SELECT JOINT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-2, "TRANSVERSE JOINTS - ROUND DUCT" FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."  
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