

HEATING, VENTILATING & AIR CONDITIONING SPECIFICATIONS

1. SCOPE OF WORK: THE SCOPE OF WORK INCLUDES THE COMPLETE REPLACEMENT OF THE HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS AS SHOWN ON THE DRAWINGS AND SPECIFIED HEREIN.

2. CODES, ORDINANCES: COMPLY WITH ALL CODES APPLYING TO THE WORK OF THIS CONTRACT INCLUDING BUT NOT LIMITED TO THE FLORIDA ENERGY EFFICIENCY CODE, FLORIDA BUILDING CODE 2007 AND FLORIDA BUILDING CODE 2007 – MECHANICAL. OBTAIN INFORMATION ON ALL CODE RESTRICTIONS AND REQUIREMENTS. IN CASE OF CONFLICT BETWEEN THE CONTRACT DOCUMENTS AND A GOVERNING CODE OR ORDINANCE, SUCH CONFLICT SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE OWNER FOR RESOLUTION. EXTRA PAYMENT WILL NOT BE ALLOWED FOR WORK REQUIRED BY CODE RESTRICTIONS EXCEPT THROUGH WRITTEN AGREEMENT WITH THE OWNER.

3. PERMITS: APPLY FOR, OBTAIN, AND PAY FOR ALL REQUIRED PERMITS AND INSPECTION CERTIFICATES. FINAL PAYMENT IS CONTINGENT UPON DELIVERY OF SUCH CERTIFICATES TO THE OWNER.

4. SUBMITTALS: SUBMIT SHOP DRAWINGS AND/OR CATALOG DATA TO THE ENGINEER FOR APPROVAL PRIOR TO THE START OF INSTALLATION. PROVIDE FOUR (4) COMPLETE SETS OF A COMPILED CATALOG DATA; INSTALLATION, OPERATING AND MAINTENANCE DATA; AND BILL OF MATERIALS FOR ALL OPERATING EQUIPMENT USED IN THE MECHANICAL WORK.

5. CONTRACTOR COORDINATION: COORDINATE LOCATION OF EQUIPMENT, PIPING, AND DUCT WORK WITH ELECTRICAL CONTRACTOR TO MAINTAIN CLEARANCE FOR EQUIPMENT MAINTENANCE, PREVENT INTERFERENCE WITH DUCT AND PIPING RUNS, AND TO PREVENT DUCTS AND PIPING FROM BEING INSTALLED OVER ELECTRICAL PANELS.

6. MECHANICAL CONTRACTOR'S WARRANTY: PROVIDE WRITTEN ONE (1) YEAR WARRANTY AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP. REPAIR ANY DEFECTS BECOMING APPARENT WITHIN THE WARRANTY PERIOD AS DIRECTED BY THE OWNER.

8. EQUIPMENT: ALL EQUIPMENT SHALL BE AS SCHEDULED ON THE DRAWINGS.

9. CONDENSATE DRAIN PIPING SHALL BE NON-INSULATED SCHEDULE 40 POLYVINYL CHLORIDE (PVC).

10. CHILLED WATER AND HOT WATER PIPING 2-1/2" AND LARGER SHALL BE ASTM A 53, SCHEDULE 40, BLACK STEEL PIPE WITH WELDED OR FLANGED JOINTS. PIPING SMALLER THAN 2-1/2" SHALL BE ASTM A 53, SCHEDULE 40, BLACK STEEL PIPE WITH THREADED JOINTS OR ASTM B 88 TYPE "L" COPPER PIPE WITH SOLDER JOINTS.

11. PIPE HANGERS:

A. PIPE HANGERS SHALL BE AUTO-GRIP, FEE AND MASON, GRINNEL, GALVANIZED STEEL CLEVIS HANGERS, ROLLER OR FIXED AS SHOWN ON DRAWINGS, SELECTED WITHIN THE MANUFACTURER'S PUBLISHED LOAD RATINGS. GALVANIZED STEEL HANGER RODS SHALL BE AT LEAST:

PIPE TO 2"

3/8" DIAMETER

2-1/2" TO 3"

1/2" DIAMETER

4" TO 5"

5/8" DIAMETER

6"

3/4" DIAMETER

8" AND LARGER

7/8" DIAMETER

B. RODS FOR TRAPEZE HANGERS SUPPORTING SEVERAL PIPES SHALL BE SIZED FOR THE EQUIPMENT LOAD. SUPPORTS FOR PIPES WITH VAPOR BARRIER TYPE COVERING SHALL NOT CONTACT THE PIPE BUT SHALL SURROUND THE UNBROKEN COVERING. PROVIDE GALVANIZED STEEL SHIELDS WITH MITERED CORNERS PROPERLY FORMED TO THE JACKET OUTSIDE DIAMETER BETWEEN HANGER CLEVISES AND THE LOWER 1/3 OF THE CIRCUMFERENCE.A.

C. Supports for pipes with vapor barrier type covering shall not contact the pipe but shall surround the unbroken covering. Provide galvanized steel shields with mitered corners properly formed to the jacket outside diameter between hanger clevises and the lower 1/3 of the circumference.

12. EQUIPMENT SUPPORTS, VIBRATION ISOLATORS, AND IDENTIFICATION:

A. EQUIPMENT SUPPORTS SHALL BE SIZED AND DESIGNED TO SUPPORT THE EQUIPMENT AND SHALL BE FABRICATED FROM GALVANIZED STEEL.

B. VIBRATION ISOLATORS FOR AIR HANDLING UNITS SHALL BE HOUSED SPRING TYPE VIBRATION ISOLATORS, SIMILAR TO KINETICS MODEL SL AND AIM, SIZED FOR EQUIPMENT LOAD, AND DESIGNED FOR 1" MAXIMUM DEFLECTION. AIR HANDLING UNITS WITH INTERNAL SPRING ISOLATION SHALL HAVE NEOPRENE INERTIA PADS, SIMILAR TO KINETICS MODEL NP OR NG, SIZED AND DESIGNED FOR UNIT LOAD.

C. ALL IDENTIFICATION LEGENDS, ARROWS AND COLOR BANDS SHALL BE STENCILED ON PRESSURE-SENSITIVE LABELING MATERIAL. LABELING MATERIAL COLORS FOR USE ON PIPING SHALL BE AS SPECIFIED IN ANSI A 13.1 LATEST REVISION.

D. VALVE TAGS SHALL BE PLASTIC, ALUMINUM OR BRASS AT LEAST 1" IN DIAMETER AND STAMPED WITH CONTRASTING COLORED FIGURES AS LARGE AS POSSIBLE. PIPE MARKERS SHALL BE SETON STYLE RPM OR APPROVED EQUAL.

13. DUCT WORK:

A. SUPPLY AIR, RETURN AIR AND OUTSIDE AIR DUCT WORK SHALL BE GALVANIZED SHEET METAL. FABRICATE SHEET METAL DUCT WORK IN ACCORDANCE WITH LATEST EDITION OF "HVAC DUCT CONSTRUCTION STANDARDS – METAL AND FLEXIBLE" AS PUBLISHED BY SMACNA AND TO MEET CONSTRUCTION REQUIREMENTS FOR THE FOLLOWING MINIMUM STATIC PRESSURES:

1. SUPPLY AIR DUCTS BETWEEN VARIABLE VOLUME AIR HANDLING UNITS AND VAV UNITS SHALL BE CONSTRUCTED FOR 3" W.G. AND SEAL CLASS "B".

2. SUPPLY AIR DUCTS AT DISCHARGE OF VAV UNITS SHALL BE CONSTRUCTED FOR 1" W.G. AND SEAL CLASS "C".

3. OUTSIDE AIR DUCTS SHALL BE CONSTRUCTED FOR 2" W.G. AND SEAL CLASS "C".

4. RETURN AIR DUCTS TO VARIABLE VOLUME AIR HANDLING UNITS SHALL BE CONSTRUCTED FOR 2" W.G. NEGATIVE AND SEAL CLASS "C".

B. FABRICATE AND SEAL DUCT JOINTS AND CONNECTIONS SUCH THAT AIR LEAKAGE DOES NOT EXCEED FIVE (5) PERCENT OF DESIGN AIR VOLUME.

14. A/C DUCT WORK ACCESSORIES:

A. MANUAL BALANCE/VOLUME DAMPERS SHALL BE OPPOSED BLADE TYPE AND SHALL BE 16 GAUGE MINIMUM GALVANIZED STEEL WITH ZINC-PLATED HARDWARE AND BRONZE OR NYLON BEARINGS. BLADES SHALL NOT BE OVER 8" WIDE NOR LESS THAN 16 GAGE GALVANIZED STEEL. MAXIMUM LEAKAGE SHALL BE LESS THAN 1% AT STATIC PRESSURE OF 4" W.G. PROVIDE LOCKING QUADRANT DAMPER OPERATORS ON MANUAL DAMPERS.

B. TURNING VANES SHALL BE FACTORY FABRICATED FULL RADIUS DOUBLE THICKNESS AIR FOIL TYPE WITH 24 GAUGE RAILS AND HOLLOW VANES.

C. EXTRACTORS AT BRANCH TAKE-OFFS SHALL BE ADJUSTABLE PUSH ROD TYPE WITH LOCKING HARDWARE. EXTRACTORS AT SIDEWALL SUPPLY GRILLES SHALL BE ADJUSTABLE BY REMOVING THE GRILLE FACE.

D. SPLITTERS SHALL BE CONSTRUCTED OF AT LEAST THE SAME GAUGE GALVANIZED STEEL AS THE DUCT WHEREIN THEY ARE USED AND SHALL NOT BE LESS THAN 24 GAUGE. BLADES SHALL BE FORMED IN TWO THICKNESS OF METAL TO PROVIDE ROUNDED NOSE TO AIR FLOW.

E. FLEXIBLE CONNECTORS SHALL MEET REQUIREMENTS OF UL 191 FOR CLASS 1 CONNECTORS.

15. INSULATION - GENERAL: ALL INSULATION MATERIALS AND COATINGS SHALL MEET FLAME SPREAD AND SMOKE DEVELOPED RATINGS PER NFPA BULLETIN 90-A WHEN TESTED IN ACCORDANCE WITH ASTM STANDARD E-84. SMOKE DEVELOPED LESS THAN OR EQUAL TO 50, AND FLAME SPREAD LESS THAN OR EQUAL TO 25. ALL COATINGS AND MASTICS SHALL BE NONFLAMMABLE IN WET STATE.

16. DUCT WORK INSULATION: FLEXIBLE EXTERNAL INSULATION SHALL BE FIBERGLASS AND SHALL HAVE AN "AS-PACKAGED" R VALUE NOT LESS THAN 25% GREATER THAN THE REQUIRED "AS-INSTALLED" VALUE AND SHALL HAVE A DUPLEX LAMINATED, REINFORCED ALUMINUM FOIL VAPOR BARRIER. DUCT INSULATION SHALL BE THE REQUIRED THICKNESS AND MATERIAL TO PROVIDE A MINIMUM THERMAL RESISTANCE "R" OF 4.2 WHEN LOCATED ON THE AIR CONDITIONED SIDE OF THE BUILDING INSULATION UNLESS OTHERWISE NOTED ON THE DRAWINGS. THIS R VALUE IS "AS-INSTALLED" MINIMUMS. INSULATION NOMINAL THICKNESS SHALL NOT EXCEED 2".

17. HOT WATER PIPE INSULATION: SUPPLY AND RETURN PIPING SHALL BE INSULATED WITH 1-1/2" THICK PRE-FORMED FIBER GLASS PIPE INSULATION WITH FIRE RETARDANT JACKET AND K FACTOR NO HIGHER THAN 0.29 (BTU X INCH) / (SQ. FT. X ° F. X HR) AT 200° F.

18. CHILLED WATER PIPE INSULATION: SUPPLY AND RETURN PIPING SHALL BE INSULATED WITH PRE-FORMED RIGID CELLULAR GLASS TYPE SIMILAR TO PITTSBURGH CORNING FOAMGLAS, INSTALLED WITH CEMENT JOINTS AND IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. FINISH WITH CANVAS JACKET, SIZE FOR FINISH PAINTING. INSULATION THICKNESS SHALL BE 1-1/2" THICK FOR PIPES UP TO 2" AND 2" THICK FOR PIPES OVER 2".

19. AIR DISTRIBUTION EQUIPMENT: AIR DISTRIBUTION DEVICES SHALL BE AS SCHEDULED ON THE DRAWINGS. ALL SUPPLY DIFFUSERS SHALL BE DESIGNED TO DELIVER THE INDICATED VOLUME OF SUPPLY AIR WITHOUT EXCEEDING THE AVAILABLE THROW AND WITH AN NC RATING NOT TO EXCEED 25, INCLUDING HALF OPEN DAMPER. SUBMITTAL DATA SHALL CLEARLY INDICATE PERFORMANCE OF SELECTED DEVICES INCLUDING AIR QUANTITY, PATTERN, THROW, PRESSURE DROP, SOUND LEVEL, FINISH, DIMENSIONS AND CONSTRUCTION OF ALL AIR DISTRIBUTION DEVICES. SURFACE AND SIDEWALL SUPPLY REGISTERS SHALL, UNLESS OTHERWISE SCHEDULED, HAVE OPPOSED BLADE TYPE KEY OPERATED DAMPERS WITH A DETACHABLE KEY. ONE (1) KEY SHALL BE FURNISHED FOR EACH REGISTER.

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20. DEMOLITION: REMOVE ALL EXISTING AIR HANDLING UNITS, FAN COIL UNITS, DUCT WORK, AND PIPING RELATED TO HVAC WORK WHERE SHOWN ON DRAWINGS. MATERIALS AND ITEMS OF EQUIPMENT THAT IS TO BE REMOVED AND NOT REUSED SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER FOR INSPECTION AND DETERMINATION OF DISPOSITION. MATERIALS AND ITEMS OF EQUIPMENT DESIGNATED AS "UNREMOVABLE" BY THE OWNER SHALL BE PROMPTLY REMOVED FROM THE PREMISES, DISPOSED OF IN A COMPLETELY LEGAL MANNER, AND SHALL NOT BE RE-USED IN THE NEW WORK UNLESS SPECIFICALLY AUTHORIZED BY THE OWNER. MATERIALS AND ITEMS OF EQUIPMENT DESIGNATED AS "REMOVABLE" BY THE OWNER TO KEEP FOR THEIR FUTURE USE SHALL BE CAREFULLY REMOVED AND MADE AVAILABLE FOR PICK-UP BY OWNER'S PERSONNEL AT THE JOB SITE.

21. CUTTING AND PATCHING: CUT AND PATCH EXISTING CONSTRUCTION AS REQUIRED FOR THE PROPER INSTALLATION OF THIS WORK. CUT OPENINGS CAREFULLY WITHOUT UNDUE WEAKENING OF THE STRUCTURE OR DAMAGE TO THE BUILDING. DO NOT CUT STRUCTURAL MEMBERS WITHOUT PERMISSION AND BEING UNDER THE DIRECTION OF THE ENGINEER. PROVIDE REQUIRED BRACING, SHORING, WEATHER PROTECTION, ETC. FOR OPENINGS. PATCHING SHALL REPLACE THE WORK TO A CONDITION AT LEAST EQUAL TO ITS CONDITION BEFORE THE CUTTING WAS DONE. REPAINTING WILL NOT BE REQUIRED UNDER THIS CONTRACT FOR NORMAL CUTTING AND PATCHING. CUTTING AND PATCHING INCLUDES NECESSARY RELOCATION OF EXISTING PIPES, CONDUITS, ETC. THAT PASS THROUGH OPENINGS AND THE PROPER CLOSING OF OPENINGS IN WALLS, FLOORS, CEILINGS, ETC. WHERE ABANDONED MECHANICAL FACILITIES ARE REMOVED.

22. INSTALLATION OF THE WORK:

A. ARRANGE THE WORK ESSENTIALLY AS SHOWN, EXACT LAYOUT TO BE MADE ON THE JOB TO SUIT ACTUAL CONDITIONS. CONFER AND COOPERATE WITH OTHER TRADES ON THE JOB SO ALL WORK WILL BE INSTALLED IN PROPER RELATIONSHIP AND COORDINATE PRECISE LOCATION OF PARTS WITH THE WORK OF OTHERS. INDICATED EQUIPMENT CONNECTIONS ARE NECESSARILY BASED ON EQUIPMENT OF A GIVEN MANUFACTURE. ASSUME RESPONSIBILITY FOR PROPER ARRANGEMENT OF PIPES, DUCTS, ETC. TO CONNECT APPROVED EQUIPMENT IN A PROPER AND APPROVED MANNER. FOLLOW EQUIPMENT MANUFACTURER'S DETAILED INSTRUCTIONS AND RECOMMENDATIONS IN THE INSTALLATION AND CONNECTION OF ALL EQUIPMENT. IN CASE OF CONFLICT BETWEEN MANUFACTURER'S INSTRUCTIONS AND THE CONTRACT DOCUMENTS, NOTIFY THE OWNER BEFORE PROCEEDING. NO EQUIPMENT INSTALLATION OR CONNECTIONS SHALL BE MADE IN A MANNER THAT VOIDS THE MANUFACTURER'S WARRANTY.

B. DUCT WORK SHOWN ON DRAWINGS IS DESIGNED TO PRODUCE REQUIRED AIR QUANTITY AT ESTIMATED PRESSURE DROP WHICH IS USED FOR AIR HANDLING UNIT AIR QUANTITY, PRESSURE, AND MOTOR HORSEPOWER. ACTUAL FIELD INSTALLATION MAY RESULT IN LOWER OR HIGHER PRESSURE DROP AT THE DESIGN AIR QUANTITY WHICH MAY REQUIRE ADJUSTMENT OF FAN SPEED. TAKE RESPONSIBILITY FOR THIS ADJUSTMENT INCLUDING REPLACEMENT OF FAN SHEAVE, IF REQUIRED, TO OBTAIN REQUIRED AIR QUANTITY AND MAINTAIN REQUIRED DUCT STATIC PRESSURE.

23. INSTALL ALL CHILLED WATER AND HOT WATER PIPING SYSTEMS IN SUCH A MANNER THAT SYSTEMS CAN BE DRAINED OR VENTED COMPLETELY BY PROVIDING VENTS AND DRAIN VALVES AT ALL HIGH AND LOW POINTS. PITCH ALL DRAIN PIPING AT LEAST 1/4" PER FOOT UNLESS OTHERWISE NOTED. EXTEND PIPING TO ALL EQUIPMENT FROM THE MAINS AS INDICATED ON THE DRAWINGS AND INSTALL VALVES ON ALL BRANCHES AT THE MAIN. AFTER COMPLETION OF ENTIRE SYSTEM AND BEFORE ANY PIPE IS COVERED, TEST THE ENTIRE PIPING SYSTEM TO ASSURE THAT IT IS ABSOLUTELY TIGHT. FILL SYSTEM WITH WATER AND APPLY A HYDROSTATIC PRESSURE OF 125 PSIG. HOLD TEST PRESSURE FOR AT LEAST 2 HOURS, REMAKE ALL LEAKING JOINTS AND RETEST. AFTER SYSTEM IS PROVED TIGHT, FLUSH WITH CLEAN WATER UNTIL ALL FOREIGN MATERIAL IS REMOVED AND FILL SYSTEM.

24. CONDENSATE DRAIN PIPE INSTALLATION: PROVIDE A VALVE, FEMALE HOSE CONNECTION WITH ROSE THREAD CAP AND RUBBER WASHER, AND 4" DEEP TRAP TO PREVENT BACK SUCTION INTO THE AIR UNIT AS DETAILED ON DRAWINGS. RUN CONDENSATE DRAIN LINE FROM EACH A/C UNIT AS NOTED ON THE DRAWINGS.

25. PIPE ASSEMBLY

A. THREADED JOINTS IN STEEL PIPE: CUT PIPE TO ACCURATE LENGTH, REAM THE ENDS, AND REMOVE BURRS. USE CLEAN, SHARP DIES. IMPERFECTLY FORMED OR TORN THREADS WILL BE REJECTED. USE APPROVED DOPE ON MALE THREADS ONLY AND CLEAN AWAY EXCESS DOPE.

B. SWEAT JOINTS IN COPPER PIPE (OTHER THAN REFRIGERANT PIPING): CUT PIPE SQUARELY TO ACCURATE LENGTH FOR FULL PENETRATION INTO FITTINGS. REMOVE BURRS FROM ENDS, CLEAN SOLDERING SURFACE THOROUGHLY, FLUX, ASSEMBLE AND SOLDER BEFORE SURFACES OXIDIZE. USE APPROVED NON-CORROSIVE FLUX. USE SUFFICIENT HEAT FOR COMPLETE PENETRATION OF SOLDER AND WIPE AWAY EXCESS FLUX AND SOLDER.

C. SOLVENT WELD JOINTS IN PVC PIPE: CUT PIPE SQUARELY TO ACCURATE LENGTH FOR FULL PENETRATION INTO FITTINGS. REMOVE BURRS FROM ENDS, CLEAN JOINING SURFACES THOROUGHLY AND FORM ALL JOINTS IN ACCORDANCE WITH THE PIPE MANUFACTURER'S RECOMMENDATIONS.

26. VALVE INSTALLATION: INSTALL ALL VALVES WITH THE STEMS OR SPINDLE ABOVE THE HORIZONTAL WHERE POSSIBLE AND EXERCISE UTMOST CARE NOT TO INSTALL VALVES OVER ELECTRICAL EQUIPMENT. LOCATE BALL VALVES AT ALL AUTOMATIC VALVES, CHECK VALVES, AT ALL EQUIPMENT SO THEY CAN BE ISOLATED FOR REPAIRS, AT ALL BRANCH LINES CONNECTING MAINS, AND ELSEWHERE AS SHOWN ON DRAWINGS. INSTALL CHILLED AND HOT WATER CONTROL VALVES IN ACCORDANCE WITH VALVE MANUFACTURER'S INSTRUCTIONS AND UNDER THE DIRECT SUPERVISION OF THE BAS INSTALLATION CONTRACTOR.

27. STRAINERS: LOCATE STRAINERS AHEAD OF EACH AUTOMATIC CONTROL VALVE, SUCTION SIDE OF EACH PUMP AND ELSEWHERE AS SHOWN ON DRAWINGS.

28. PIPE HANGER INSTALLATION:

A. SPACE HANGERS FOR HORIZONTAL PIPE AS FOLLOWS:

PVC PIPE

4' ON CENTER MAXIMUM

COPPER PIPE

6' ON CENTER MAXIMUM

1/2" AND SMALLER

8' "

3/4" TO 1-1/2"

12' ON CENTER MAXIMUM

STEEL PIPE

B. ATTACH HANGER RODS TO SUFFICIENTLY RIGID STRUCTURAL BUILDING MEMBERS. IF HANGERS SHALL BE ATTACHED TO EITHER THE TOP CHORD OR BOTTOM CHORD OF STEEL BAR JOIST, ATTACH THE RODS BY CLAMP AT THE PANEL POINTS. DO NOT UNDER ANY CIRCUMSTANCES BURN OR DRILL HOLES IN EITHER CHORD. PROVIDE ADDITIONAL HANGERS OR ANCHORING DEVICES NECESSARY FOR PROPER SUPPORT OF PIPING AT CORNERS, TOPS OF RISERS, ETC. PROVIDE GALVANIZED STEEL SHIELDS OVER PIPE INSULATION AT PIPE SUPPORTS.

29. CHEMICAL WATER TREATMENT: AFTER CHILLED AND HOT WATER PIPING HAS BEEN COMPLETED AND TESTED, FLUSH ALL PIPING AND REFILL SYSTEMS WITH WATER CONTAINING WATER TREATMENT CHEMICALS AS APPROVED BY THE OWNER.

30. HVAC DUCT WORK

A. INSTALL ALL DUCT WORK IN ACCORDANCE WITH SMACNA STANDARDS. INSTALL EXTRACTORS AND AIR BALANCE DAMPERS IN ALL BRANCH TAKE OFFS INCLUDING TAKE OFFS TO SUPPLY DIFFUSERS. PAINT INSIDE OF DIFFUSERS AND DUCT VISIBLE THROUGH DIFFUSERS FLAT BLACK.

B. SUPPORT DUCT FROM BUILDING STRUCTURE WITH STRAPS, RODS, OR ANGLES AS DETAILED IN "HVAC DUCT CONSTRUCTION STANDARDS – METAL AND FLEXIBLE" AS PUBLISHED BY SMACNA. HORIZONTAL AND DIAGONAL JOIST BRIDGING SHALL NOT BE CONSIDERED PART OF BUILDING STRUCTURE FOR DUCT SUPPORTING PURPOSES. WHERE JOIST ARE LOCATED TOO FAR APART FOR DUCT SUPPORT OR DUCT RUNS ARE PARALLEL TO JOIST, PROVIDE ANGLES BETWEEN JOIST DESIGNED TO SUPPORT DUCT WITHOUT SAGGING.

31. BALANCE DAMPERS

A. INSTALL BALANCE DAMPERS AT ALL BRANCH CONNECTIONS AND OTHER LOCATIONS SHOWN ON DRAWINGS. INSTALL BALANCE DAMPERS AT ALL FLEX DUCT CONNECTIONS FOR DIFFUSERS EXCEPT WHERE ONLY ONE DIFFUSER IS CONNECTED TO BRANCH DUCT.

B. INSTALL AUTOMATIC/MOTOR OPERATED VOLUME DAMPERS WHERE SHOWN ON DRAWINGS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTION.

32. CONTROLS: FURNISH ALL CONTROLS AND CONTROL WIRING TO PROVIDE FOR PROPER PERFORMANCE OF EQUIPMENT AS REQUIRED BY THE OWNER.

A. INSTALL ROOM TEMPERATURE SENSORS WHERE SHOWN ON DRAWINGS AND 48" ABOVE THE FLOOR UNLESS OTHERWISE NOTED ON DRAWINGS. INSTALL HUMIDISTATS WHERE SHOWN ON DRAWINGS NEXT TO THERMOSTATS.

B. INSTALL SMOKE DETECTORS IN SUPPLY AIR DUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. LOCATE SMOKE DETECTORS IN SUPPLY DUCTS UP-STREAM FROM FIRST DIFFUSER OR BRANCH DUCT CONNECTION. CONNECT SMOKE DETECTORS TO AIR HANDLING UNITS AS REQUIRED TO TURN OFF SUPPLY AIR FAN AND ASSOCIATED EQUIPMENT WHEN SMOKE IS DETECTED. REMOTE STATIONS SHALL BE FLUSH MOUNTED IN 4" SQUARE BOX, AND LOCATED IN A NORMALLY OCCUPIED AREA GENERALLY AS INDICATED ON DRAWINGS.

C. PROVIDE SEQUENCE OF OPERATION FOR OWNER'S APPROVAL.

33. EQUIPMENT INSTALLATION

A. INSTALL ALL EQUIPMENT IN ACCORDANCE TO EQUIPMENT MANUFACTURER'S INSTRUCTIONS. INSTALL ALL EQUIPMENT TO PERMIT REMOVAL OF COILS, FAN SHAFTS AND WHEELS, FILTERS, BELT GUARDS, SHEAVES AND DRIVES, AND ALL OTHER PARTS REQUIRING PERIODIC REPLACEMENT OR MAINTENANCE.

B. ARRANGE EQUIPMENT TO PERMIT READY ACCESS TO VALVES, COCKS, TRAPS, STARTERS, MOTORS AND CONTROL COMPONENTS, AND TO CLEAR THE OPENINGS OF SWINGING AND OVERHEAD DOORS AND OF ACCESS PANELS.

C. INSTALL SPRING TYPE VIBRATION ISOLATORS UNDER AIR HANDLING UNITS WHERE SHOWN ON DRAWINGS. INSTALL NEOPRENE INERTIA PADS UNDER FLOOR-MOUNTED AIR HANDLING UNITS WITH INTERNAL SPRING ISOLATION.

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34. IDENTIFICATION OF EQUIPMENT

A. SECURELY ATTACH MANUFACTURER'S NAMEPLATE TO ALL EQUIPMENT GIVING DATA AS TO DESIGN AND OPERATING CHARACTERISTICS.

B. SECURELY ATTACH NAMEPLATES TO ALL SWITCHES, STARTERS, GAUGES, CONTROL DEVICES, INCLUDING THERMOSTATS, AND SIMILAR ITEMS, GIVING THE NAME AND NUMBER OF THE ITEM OF EQUIPMENT TO WHICH IT IS CONNECTED.

C. IDENTIFY ALL PIPING THROUGHOUT THE BUILDING WITH A LEGEND GIVING THE NATURE OF THE SERVICE AND DIRECTION OF FLOW. USE CHARACTERS OF SUFFICIENT SIZE TO BE READ FROM THE FLOOR LEVEL BELOW THE PIPING. PLACE LEGENDS AND ARROWS ADJACENT TO EACH CHANGE OF DIRECTION AND INTERMEDIATELY AS NECESSARY FOR PROPER IDENTIFICATION FROM REASONABLE ACCESS POINTS.

D. ATTACH IDENTIFICATION TAGS ON EACH VALVE WITH "S" HOOKS OR CHAINS. VALVE TAGS ARE TO CONTAIN THE VALVE NUMBER, LETTER, OR OTHER REQUIRED IDENTIFICATION.

35. INSULATION - GENERAL

A. USE APPLICATION DETAILS IN ACCORDANCE WITH THE INSULATING MATERIAL SUPPLIER'S RECOMMENDATIONS EXCEPT WHERE A HIGHER STANDARD IS SPECIFIED HEREIN. CLEAN EXTERIOR OF ALL PIPING AND DUCT WORK OF FOREIGN SUBSTANCES, INCLUDING MOISTURE, PRIOR TO APPLICATION OF INSULATION. APPLY INSULATION TO PIPING AND DUCT WORK WITH ALL JOINTS TIGHTLY FITTED TO ELIMINATE VOIDS. REPLACE BROKEN OR DAMAGED INSULATION WITH NEW INSULATION AND JOINT MATERIAL.

B. REPLACE OR REPAIR ALL EXISTING INSULATION DISTURBED BY NEW WORK AND REFINISH TO MATCH ADJACENT INSULATION.

36. PIPING INSULATION - GENERAL: RUN COVERING FOR PIPING UNBROKEN THROUGH HANGER CLEVISES, SLEEVES, ETC. AVOID METAL-TO-METAL CONTACT BETWEEN PIPES AND HANGERS. PROVIDE AN INSERT, NOT LESS THAN 6" LONG, OF THE SAME THICKNESS AND CONTOUR AS ADJOINING INSULATION, BETWEEN SUPPORT SHIELD AND PIPING, BUT UNDER THE FINISH JACKET, ON PIPING 2" OR LARGER, TO PREVENT INSULATION FROM SAGGING AT SUPPORT POINTS. USE HEAVY DENSITY INSULATING MATERIALS SUITABLE FOR THE SPECIFIED TEMPERATURE RANGE AND STRONG ENOUGH TO PREVENT CRUSHING. COVER FITTINGS, VALVES, IRREGULAR SURFACES, ETC., WITH SAME INSULATION SPECIFIED FOR PIPING INCLUDING JACKET. CUT JACKET TO FIT WITHOUT WRINKLES OR FOLDS.

37. HOT WATER PIPING INSULATION: INSULATE ALL HOT WATER SUPPLY AND RETURN PIPING WITH INSULATION TYPE SPECIFIED. COVER INSULATION WITH ALL SERVICE JACKETING. APPLY ALL SERVICE JACKET IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS INSURING MINIMUM 2" LAP AT ALL LONGITUDINAL JOINTS. BUT ALL CIRCUMFERENTIAL JOINTS TIGHTLY TOGETHER AND COVER WITH 3" WIDE BUTT STRIPS. SEAL ALL LAPS AND BUTT STRIPS OR USE ADHESIVE FACED (SELF-SEAL) MATERIAL.

38. CHILLED WATER PIPING INSULATION: INSULATE ALL CHILLED WATER SUPPLY AND RETURN PIPING WITH INSULATION TYPE SPECIFIED. COVER INSULATION WITH ALL SERVICE JACKETING. APPLY ALL SERVICE JACKET IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS INSURING MINIMUM 2" LAP AT ALL LONGITUDINAL JOINTS. BUT ALL CIRCUMFERENTIAL JOINTS TIGHTLY TOGETHER AND COVER WITH 3" WIDE BUTT STRIPS. SEAL ALL LAPS AND BUTT STRIPS OR USE ADHESIVE FACED (SELF-SEAL) MATERIAL.

39. DUCT WORK INSULATION: INSULATE ALL SHEET METAL SUPPLY AIR, OUTSIDE AIR AND RETURN AIR DUCT WORK WITH FLEXIBLE EXTERNAL INSULATION. INSULATE BACKS AND NECKS OF ALL DIFFUSERS AND RETURN GRILLES WITH FLEXIBLE EXTERNAL INSULATION.

40. AIR AND WATER SYSTEM TEST AND BALANCE

A. PLACE ALL HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS AND EQUIPMENT INTO FULL OPERATION AND MAINTAIN OPERATION DURING TEST AND BALANCE OPERATION. MAKE ANY CHANGES REQUIRED FOR CORRECT BALANCE AS REQUIRED. SUCH CHANGES MAY ENCOMPASS BUT ARE NOT LIMITED TO PULLEYS, BELTS, DUCT WORK, DAMPERS, OR THE ADDITION OF DAMPERS AND ACCESS DOORS.

B. MARK ALL DUCT TRAVERSE POINTS AND OTHER INFORMATION ON SET OF REPRODUCIBLE HVAC DRAWINGS. ASSIGN ID NUMBERS TO ALL DIFFUSERS AND GRILLES, NOTE ID NUMBERS ON REPRODUCIBLE HVAC DRAWING, AND USE ID NUMBERS IN TAB REPORT.

C. BEFORE COMMENCING TEST AND BALANCE WORK, VERIFY THAT SYSTEMS ARE COMPLETE AND OPERABLE. ENSURE THE EQUIPMENT IS OPERABLE AND IN A SAFE AND NORMAL CONDITION. TEMPERATURE CONTROL SYSTEMS ARE INSTALLED COMPLETE AND OPERABLE. PROPER THERMAL OVERLOAD PROTECTION IS IN PLACE FOR ELECTRICAL EQUIPMENT, FINAL FILTERS ARE CLEAN AND IN PLACE. CORRECT FAN ROTATION, DUCT SYSTEMS ARE CLEAN OF DEBRIS AND DUCT SYSTEM LEAKAGE HAS BEEN MINIMIZED.

D. ADJUST ALL AIR AND WATER SYSTEMS TO THE DESIGN VALUES. TEST AND RECORD ALL ACTUAL MOTOR CURRENTS AND NOTE CORRESPONDING NAMEPLATE FULL LOAD AMPERES. TEST AND ADJUST EACH DIFFUSER, GRILLE AND REGISTER TO WITHIN 5% OF DESIGN REQUIREMENTS AND IDENTIFY AND LIST EACH GRILLE, DIFFUSER AND REGISTER. USE MANUFACTURER'S RATINGS ON ALL EQUIPMENT FOR REQUIRED CALCULATIONS.

E. RECORDED DATA SHALL REPRESENT ACTUALLY MEASURED, OR OBSERVED CONDITIONS. PERMANENTLY MARK SETTINGS OF DAMPERS AND OTHER ADJUSTMENT DEVICES ALLOWING SETTINGS TO BE RESTORED. SET AND LOCK MEMORY STOPS. AFTER ADJUSTMENT, TAKE MEASUREMENTS TO VERIFY BALANCE HAS NOT BEEN DISRUPTED OR THAT SUCH DISRUPTION HAS BEEN RECTIFIED.

F. LEAVE SYSTEMS IN PROPER WORKING ORDER, REPLACING BELT GUARDS, CLOSING ACCESS DOORS, CLOSING DOORS TO ELECTRICAL SWITCH BOXES, AND RESTORING THERMOSTATS TO SPECIFIED SETTINGS.

G. UPON COMPLETION OF TEST AND BALANCE WORK, INSERT ALL DATA, INCLUDING COPY OF MARKED-UP HVAC DRAWING, INTO A COMPLETE TYPEWRITTEN REPORT AND SUBMIT SIX (6) COPIES OF THIS REPORT TO THE OWNER.

41. INSTRUCTION OF OWNER'S REPRESENTATIVE: AFTER FINAL ACCEPTANCE OF ALL WORK AND OCCUPANCY OF BUILDING, PROVIDE SERVICE TO MAKE SYSTEM ADJUSTMENTS TO SUIT CONDITIONS CREATED BY THE OCCUPANCY; INSTRUCT OWNER'S OPERATING PERSONNEL IN OPERATION ADJUSTMENT AND MAINTENANCE PROCEDURES OF SYSTEM COMPONENTS, ACQUAINT THEM WITH LOCATIONS AND FUNCTIONS OF VALVES, CONTROL DEVICES, ETC., IN THE SYSTEM, AND INSTRUCT THEM IN THE OPERATION OF THE HVAC CONTROL SYSTEM.

42. CLEANING AND RUBBISH

A. DURING THE WORK, KEEP THE PREMISES CLEAR OF RUBBISH CREATED AS A RESULT OF THE WORK. PROTECT AND PREVENT UNNECESSARY INDUCTION OF DIRT AND THOROUGHLY CLEAN ALL EQUIPMENT USED FOR TEMPORARY HEAT AND/OR VENTILATION.

B. USE AND MAINTAIN ADEQUATE FILTERS IN ALL FAN COIL EQUIPMENT USED FOR TEMPORARY HEAT AND/OR VENTILATION. REPLACE WITH NEW FILTERS AFTER CONSTRUCTION AND BEFORE UNIT IS SERVICED. CLOSE ALL AIR DUCT OPENINGS TO EFFECTIVELY PREVENT THE ENTRANCE OF DUST AND CONSTRUCTION DEBRIS DURING CONSTRUCTION.

C. ON COMPLETION OF THE WORK, REMOVE ALL RUBBISH AND DEBRIS RESULTING FROM THE WORK AND DISPOSE OF SAME. THOROUGHLY CLEAN AND LEAVE IN A SATISFACTORY CONDITION FOR USE ALL EQUIPMENT, PIPE, FIXTURES, DUCT WORK, ETC.

43. COMPLETE SYSTEMS

A. LEAVE ALL SYSTEMS COMPLETELY OPERATIVE IN ALL DETAILS AND IN SATISFACTORY WORKING CONDITION, AS DETERMINED BY THE OWNER. FURNISH AND INSTALL AS PART OF THIS CONTRACT ALL APPARATUS AND MATERIAL OBVIOUSLY A PART OF THE SYSTEMS AND NECESSARY FOR THEIR OPERATION.

B. COORDINATE WORK SPECIFIED HEREIN AND SHOWN ON MECHANICAL DRAWINGS AND INSURE COMPLETION IN A TIMELY AND PROPER MANNER. PRIOR TO REQUESTING "SUBSTANTIAL COMPLETION INSPECTION", PROVIDE THE OWNER WITH LETTER STATING ALL REQUIREMENTS OF THIS SECTION HAVE BEEN MET. LETTER SHALL CONTAIN ITEMIZED LIST INDICATING EACH ITEM HAS BEEN PERSONALLY CHECKED BY THE SUPERINTENDENT AND THAT IT IS READY FOR INSPECTION. WITH LETTER, PROVIDE REPORTS, SCHEDULES, ETC., AS REQUIRED. THIS SECTION IS INTENDED AS A CHECKLIST TO INSURE ITEMS SPECIFIED ARE PROPERLY INSTALLED AND TO INSURE AGAINST PREMATURE "SUBSTANTIAL COMPLETION INSPECTION" REQUESTS.

C. CHECK AIR DISTRIBUTION SYSTEMS AND INSURE SYSTEMS ARE PROPERLY TESTED AND BALANCED. CHECK FILTERS AND, IF DIRTY, INSTALL NEW FILTERS IN UNITS WITH DISPOSABLE TYPE FILTERS AND REMOVE, WASH AND REINSTALL FILTERS IN UNITS WITH PERMANENT TYPE FILTERS. DIRTY FILTERS SHALL BE DEFINED AS PRESSURE DROP EXCEEDING 0.5" W.G. PROVIDE ONE ADDITIONAL SET OF DISPOSABLE AND/OR METAL, WASHABLE, PERMANENT, TYPE FILTERS AS APPLICABLE FOR EACH UNIT. LUBRICATE FANS, MOTORS, AND ALL OTHER MOVING EQUIPMENT REQUIRING LUBRICATION. PROVIDE A MAINTENANCE SCHEDULE LISTING EACH PIECE OF EQUIPMENT REQUIRING LUBRICATION, POINTS TO BE LUBRICATED, PRODUCT AND DEVICE TO BE USED, AND FREQUENCY OF LUBRICATION REQUIRED.

D. CHECK AND INSURE ALL EQUIPMENT IS PROPERLY INSTALLED, MOUNTED AS SPECIFIED OR SHOWN AND IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. AT EQUIPMENT START-UP, INSURE CONTROLS, POWER WIRING, AND INTERLOCKS ARE COMPLETE. CHECK ALIGNMENT OF MOTORS AND DRIVES. VERIFY OVERLOAD HEATERS ARE PROPERLY SIZED AND INSTALLED. CHECK FOR PROPER MOTOR ROTATION. PROVIDE SPECIFIED SYSTEM IDENTIFICATION.

E. PROVIDE FOR THOROUGH CLEANING OF INSTALLATION. CLEANING SHALL INCLUDE REMOVING TEMPORARY COVERS; REMOVING ADHESIVE APPLIED STICKERS EXCEPT THOSE GIVING SPECIFIC MAINTENANCE INSTRUCTIONS WHICH WERE INTENDED TO REMAIN ON EQUIPMENT; REMOVING CORO AND MIRE AFFIXED TAGS; REMOVING PAINT, COATING AND ADHESIVE SPATTERS; AND VACUUMING INSIDE AIR HANDLING UNIT PLENUMS.

F. PROVIDE FOR TOUCH-UP PAINTING OF FACTORY FINISHED EQUIPMENT. TOUCH-UP PAINTING IS INTENDED TO COVER MINOR DENTS, SCRATCHES, AND SUFF MARKS. PREPARE SURFACE BY LIGHT SANDING OR REMOVE RUST WITH CHEMICAL COMPOUNDS DESIGNED FOR APPLYING AND COAT SURFACE WITH PRIMER FOLLOWED BY FINISH COAT. WHERE EQUIPMENT HAS MAJOR SURFACE DAMAGE AND/OR RUSTING, REFINISH ENTIRE EQUIPMENT SURFACES AS DIRECTED BY THE OWNER.

G. PROVIDE ALL SPECIFIED OPERATION AND MAINTENANCE MANUALS TO THE OWNER.

END OF SPECIFICATION

2/16/12
1402M6SPEC

2/17/12
NA
RLH
1402
M-6
6 SHEETS

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