

# MECHANICAL SPECIFICATIONS

| SECTION   |  |
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| 23 00 00<br>BASIS<br>MECHANICAL<br>REQUIREMENTS           | <ol style="list-style-type: none"> <li>ALL WORK TO BE DONE AND MATERIALS FURNISHED COMPLYING WITH APPLICABLE LAWS AND REGULATIONS, INCLUDING THE 2012 MICHIGAN MECHANICAL CODE (M.M.C.), ASHRAE 90.1-2007 "ENERGY STANDARDS FOR BUILDINGS EXCEPT LOW-RISE RESIDENTIAL BUILDINGS", ASHRAE 62.1-2007 VENTILATION FOR ACCEPTABLE INDOOR AIR QUALITY, 2012 INTERNATIONAL PLUMBING CODE (M.P.C.), CURRENTLY ENFORCED MICHIGAN BUILDING CODE (M.B.C.), AND LOCAL, STATE, AND FEDERAL FIRE SAFETY CODES (NFPA).</li> <li>ALL MATERIALS USED SHALL BE NEW AND UNDAMAGED.</li> <li>ALL WORK PERFORMED SHALL BE IN ACCORDANCE WITH CURRENT CONSTRUCTION INDUSTRY STANDARDS AND WORKMANSHIP.</li> <li>CONTRACTOR TO PROVIDE ACCESS DOORS (RATED OR NON-RATED AS REQUIRED) WHERE VALVES OR EQUIPMENT ARE CONCEALED BEHIND A NON-ACCESSIBLE CEILING OR WALL.</li> <li>FURNISH STEEL SLEEVES WHERE PIPES PENETRATE RATED WALLS. PROVIDE FIRESTOPPING MATERIALS AND SYSTEM TO MAINTAIN THE REQUIRED RATING OF THE WALL PENETRATED. PROVIDE SHOP DRAWINGS SHOWING LISTING AND RATING OF FIRESTOPPING MATERIALS.</li> <li>ALL MANUFACTURED EQUIPMENT, ACCESSORIES AND MATERIALS SHALL BE USED AS INTENDED BY THE MANUFACTURER, IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS.</li> <li>THE CONTRACTOR SHALL PROVIDE, IN ADDITION TO ANY OTHER WARRANTIES SPECIFIED, A ONE (1) YEAR FULL LABOR AND MATERIAL WARRANTY ON ALL WORKMANSHIP, MATERIAL AND EQUIPMENT FURNISHED FOR THIS PROJECT.</li> <li>THE MECHANICAL CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL OPENINGS AND REQUIRED LINTELS NEEDED FOR THE INSTALLATION OF MECHANICAL EQUIPMENT.</li> <li>THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING DETAILS AND TEMPLATES OF ALL OPENINGS NECESSARY FOR MECHANICAL EQUIPMENT INSTALLATION INCLUDING: HOUSING, ACCESS DOORS, INSPECTION DOORS, AND PASSAGEWAYS FOR MECHANICAL EQUIPMENT.</li> <li>THE CONTRACTOR IS RESPONSIBLE FOR SEALING CRACKS AND FINISHING ROUGH EDGES LEFT FOLLOWING MECHANICAL INSTALLATION.</li> <li>THE USE OF THE MECHANICAL EQUIPMENT FOR HEATING, COOLING, OR DRYING DURING CONSTRUCTION IS PROHIBITED, UNLESS APPROVED BY WRITTEN DOCUMENTATION BY THE OWNER.</li> <li>THE CONTRACTOR SHALL ARRANGE TO MEET AND INSTRUCT THE OWNER IN THE USE AND MAINTENANCE OF SYSTEMS AND EQUIPMENT. THIS INSTRUCTION SHALL BE FOR A MINIMUM OF (4) HOURS. AN ADDITIONAL (2) HOURS OF INSTRUCTION FOR THE OWNER WILL BE GIVEN IN THE OPERATION OF THE TEMPERATURE CONTROLS BY THE INSTALLER OF THE TEMPERATURE CONTROLS.</li> <li>APPROVED EQUALS: MECHANICAL EQUIPMENT MANUFACTURED BY A COMPANY OTHER THAN THAT WHICH WAS SPECIFIED IN THE SCHEDULE MAY BE SUBSTITUTED BY APPROVED SHOP DRAWINGS CONTINENT UPON MEETING THE DESIGN, APPEARANCE, AND FUNCTIONAL STANDARDS ESTABLISHED BY THE ORIGINALLY SPECIFIED ITEM(S). THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING DIMENSIONS, CLEARANCES, ASSEMBLY, FIT, ETC. OF THE APPROVED EQUAL(S) AND THEIR AFFECT ON OTHER EQUIPMENT FIT AND OPERATION. THE CONTRACTOR IS LIABLE FOR ANY ADDED COSTS TO HIMSELF OR OTHERS CAUSED BY THE APPROVED EQUALS.</li> <li>SUBMITTALS             <ol style="list-style-type: none"> <li>FURNISH SHOP DRAWINGS TO ARCHITECT PRIOR TO PLACING DELIVERY ORDERS. PROVIDE SHOP DRAWINGS OF ALL MANUFACTURED EQUIPMENT AND MATERIALS EXCEPT PIPE, PIPE FITTINGS, AND GALVANIZED DUCTWORK.</li> <li>AT SUBSTANTIAL COMPLETION OF CONSTRUCTION, FURNISH AS-BUILT PLANS TO ARCHITECT FOR APPROVAL WITHIN 90 DAYS AFTER THE DATE OF SYSTEM ACCEPTANCE. APPROVED AS-BUILT PLANS SHALL BE PROVIDED TO THE BUILDING OWNER. RECORD DRAWINGS SHALL INCLUDE, AS A MINIMUM, THE LOCATION AND PERFORMANCE DATA ON EACH PIECE OF EQUIPMENT, GENERAL CONFIGURATION OF DUCT AND PIPE DISTRIBUTION SYSTEM INCLUDING SIZES, AND THE TERMINAL AIR OR WATER DESIGN FLOW RATES.</li> <li>AN OPERATING MANUAL AND MAINTENANCE MANUAL SHALL BE PROVIDED TO THE BUILDING OWNER WITHIN 90 DAYS OF SYSTEM ACCEPTANCE. THESE MANUALS SHALL BE IN ACCORDANCE WITH INDUSTRY-ACCEPTED STANDARDS AND SHALL INCLUDE, AT THE MINIMUM:                     <ol style="list-style-type: none"> <li>SUBMITTAL DATA STATING EQUIPMENT SIZE AND SELECTED OPTIONS FOR EACH PIECE OF EQUIPMENT REQUIRING MAINTENANCE.</li> <li>OPERATION AND MAINTENANCE MANUALS FOR EACH PIECE OF EQUIPMENT REQUIRING MAINTENANCE. REQUIRED ROUTINE MAINTENANCE ACTIONS SHALL BE CLEARLY IDENTIFIED.</li> <li>NAMES AND ADDRESSES OF AT LEAST ONE SERVICE AGENCY.</li> <li>HVAC CONTROLS SYSTEM MAINTENANCE AND CALIBRATION INFORMATION, INCLUDING WIRING DIAGRAMS, SCHEMATICS, AND CONTROL SEQUENCE DESCRIPTIONS. DESIRED OR FIELD-DETERMINED SET POINTS SHALL BE PERMANENTLY RECORDED ON CONTROL DRAWINGS AT CONTROL DEVICES OR IN PROGRAMMING COMMENTS.</li> </ol> </li> </ol> </li> </ol> |
| 23 05 93<br>TESTING,<br>ADJUSTING,<br>AND<br>BALANCING    | <ol style="list-style-type: none"> <li>THE MECHANICAL CONTRACTOR SHALL SUBCONTRACT A TEST AND BALANCE CONTRACTOR TO BALANCE THE SYSTEMS DESCRIBED BELOW.</li> <li>THE BALANCING SHALL BE COMPLETED BY AN INDEPENDENT TEST AND BALANCE CONTRACTOR WHO IS NOT AN EMPLOYEE OF THE MECHANICAL CONTRACTOR.</li> <li>PER COMPLIANCE WITH ASHRAE 90.1-2007, THE BALANCER SHALL SUBMIT AN AIR BALANCE REPORT TO THE ENGINEER AND STATE OR COUNTY INSPECTOR.</li> <li>THE BALANCE REPORT SHALL SHOW PROOF THAT THE SYSTEM HAS BEEN BALANCED TO +/- 10% OF THE DESIGNED FLOW RATE. IT IS THE MECHANICAL CONTRACTOR AND TEST AND BALANCER'S DUTY TO PROVIDE ACCURATE DATA, SO AREAS OF INCORRECT FLOW MAY BE DISCLOSED TO THE ENGINEER, INSPECTOR, AND OWNER.</li> <li>ALL AIRSIDE SYSTEMS, COMPONENTS, ETC., INCLUDING SUPPLY, RETURN, OUTDOOR, AND EXHAUST AIR SYSTEMS SHALL BE BALANCED. THE BALANCER SHALL PROVIDE SHEAVES AND BELTS AS NEEDED TO PROPERLY BALANCE EQUIPMENT TO +/- 10% OF THE DESIGNED AIRFLOWS.             <ol style="list-style-type: none"> <li>ALL DIFFUSERS, REGISTERS, GRILLES, AND LOUVERS SHALL BE INDIVIDUALLY BALANCED AND LISTED IN THE BALANCE REPORT.</li> <li>ALL AIRSIDE EQUIPMENT, SUPPLY, RETURN, AND OUTDOOR AIR FLOWRATES SHALL BE LISTED IN THE BALANCE REPORT.</li> </ol> </li> <li>ALL HVAC MOTOR DATA INCLUDING FREQUENCY (RPM), AMP DRAW, HORSEPOWER, EXTERNAL STATIC PRESSURE, HEAD PRESSURE, ETC., SHALL BE INCLUDED IN THE BALANCE REPORT.</li> </ol>  |
| 23 07 13<br>DUCT<br>INSULATION                            | <ol style="list-style-type: none"> <li>ALL DUCTWORK SHALL BE INSULATED PER ASHRAE 90.1-2007 TABLE 6.8.2.B.             <ol style="list-style-type: none"> <li>MINIMUM SUPPLY AIR DUCT INSULATION: NONE REQUIRED.</li> <li>MINIMUM RETURN AIR DUCT INSULATION: NONE REQUIRED.</li> <li>MINIMUM EXHAUST AIR DUCT INSULATION: NONE REQUIRED.</li> </ol> </li> <li>WHERE DESIGNATED, SUPPLY AND RETURN AIR DUCTWORK SHALL BE LINED WITH 1" ACOUSTICAL DUCT LINER. OVERSIZE DUCTWORK AS REQUIRED AS DIMENSIONS SHOWN ON PLAN ARE INTERIOR DUCT DIMENSIONS!!!</li> <li>ALL INSULATION MATERIALS TO HAVE A FLAME SPREAD RATING OF 25 OR LESS AND SMOKE DEVELOPMENT RATING OF 50 OR LESS AS TESTED BY ASTM E-84, UL-723, NFPA 90A-90B.</li> </ol>  |
| 23 09 00<br>INSTRUMENTATION<br>AND<br>CONTROL FOR<br>HVAC | <ol style="list-style-type: none"> <li>THE CONTRACTOR SHALL FURNISH AND INSTALL ALL NECESSARY THERMOSTATS, CONTROL RELAYS, SENSORS, CONTROL WIRING, DAMPERS, ACTUATORS, ETC., REQUIRED TO PROVIDE A FULLY OPERATIONAL HVAC SYSTEM.</li> <li>THE THERMOSTAT SHALL BE DIGITAL-ELECTRONIC, WITH BACKLIT LCD DISPLAY, 7-DAY PROGRAMMABLE, WITH PROGRAMMABLE OCCUPIED AND UNOCCUPIED "CONTINUOUS FAN" AND "AUTO FAN" FUNCTIONALITY, 2-STAGE HEAT, 2-STAGE COOLING.</li> <li>THE FURNACE(S) AND CONDENSING UNIT(S) SHALL ALL UTILIZE THERMOSTAT CONTROL SYSTEM FURNISHED AS PART OF THE UNIT(S), OR SPECIFIED TO BE PROVIDED AS OPTIONS OR ACCESSORIES BY THE MANUFACTURER OF THE UNIT(S). ALL WIRING WILL BE DONE IN ACCORDANCE WITH APPROVED SHOP DRAWINGS FURNISHED BY THE MANUFACTURER.</li> </ol>   |
| 23 11 00<br>FACILITY FUEL<br>PIPING                       | <ol style="list-style-type: none"> <li>GAS PIPING SHALL COMPLY WITH THE CURRENTLY ENFORCED VERSION OF THE INTERNATIONAL FUEL GAS CODE (I.F.G.C.).</li> <li>GAS SERVICE: THE CONTRACTOR SHALL ARRANGE WITH THE GAS UTILITY CO. TO PROVIDE GAS SERVICE AND METER TO THE INDICATED LOCATION WITH SHUT-OFF VALVE AT METER. THE CONTRACTOR SHALL CONSULT WITH THE UTILITY COMPANY AS TO THE EXTENT OF ITS WORK, COSTS FEES AND PERMITS. THE CONTRACTOR SHALL OBTAIN THE REQUIRED PERMITS AND PAY ALL COSTS ASSOCIATED WITH THE SERVICE.</li> <li>ABOVE GROUND GAS PIPING SHALL BE SCHEDULE 40, BLACK IRON WITH MALLEABLE IRON THREADED FITTINGS.</li> <li>SUPPORT PIPING WITH ADJUSTABLE BAND TYPE PIPE HANGERS, EQUAL TO ITT-GRINNEL FIG. 97.</li> <li>INSTALL DRIP LEG WITH UNION AND VALVE AT CONNECTION TO EACH PIECE OF EQUIPMENT.</li> <li>PROVIDE VALVE ON DISCHARGE OF METER. GAS SHUT-OFF VALVES SHALL BE 150 PSI, NON-SHOCK WOG, BRONZE BODY, STRAIGHT CONFIGURATION, AND/OR SHALL COMPLY WITH I.F.G.C TABLE 409.1.1 AND SHALL MEET ANSI Z21.15, CSA REQUIREMENT 3-88, ASME B16.44, ASME B16.33.</li> <li>INSTALL AND TEST PIPING IN COMPLIANCE WITH UTILITY COMPANY REGULATIONS AND THE NATIONAL FUEL GAS CODE, NFPA NO. 54.</li> </ol>  |
| 23 31 00<br>HVAC DUCTS<br>AND CASINGS                     | <ol style="list-style-type: none"> <li>ALL DUCTWORK SHALL BE FABRICATED AND INSTALLED IN COMPLIANCE WITH 2012 M.M.C. CHAPTER 6, AND SMACNA HVAC DUCT CONSTRUCTION STANDARDS. ALL DUCTWORK SHALL BE SEAMED AND INSULATED IN ACCORDANCE WITH ASHRAE 90.1-2007.</li> <li>DUCTWORK SHALL BE GALVANIZED STEEL FOR DUCTS: HOT-DIPPED GALVANIZED STEEL SHEET, ASTM A653/A653M F5 TYPE B, WITH G60/Z180 COATING.</li> <li>JOINTS SEALERS AND SEALANTS: NON-HARDENING, WATER RESISTANT, MILDEW AND MOLD RESISTANT.             <ol style="list-style-type: none"> <li>TYPE: HEAVY MASTIC OR LIQUID USED ALONE OR WITH TAPE, SUITABLE FOR JOINT CONFIGURATION AND COMPATIBLE WITH SUBSTRATES, AND RECOMMENDED BY MANUFACTURER FOR PRESSURE CLASS OF DUCTS.</li> <li>SURFACE BURNING CHARACTERISTICS: FLAME SPREAD OF ZERO, SMOKE DEVELOPED OF ZERO, WHEN TESTED IN ACCORDANCE WITH ASTM E84.</li> </ol> </li> <li>HANGER ROD: ASTM A36/A36M, STEEL, GALVANIZED; THREADED BOTH ENDS, THREADED ONE END, OR CONTINUOUSLY THREADED.</li> <li>ROUND FLEX DUCT SHALL BE USED FOR DIFFUSER-GRILLE CONNECTIONS ABOVE LAY-IN CEILINGS. FLEX DUCT MAY BE USED IN OTHER AREAS WHERE THE DUCT AND GRILLE ARE PERMANENTLY AND REASONABLY ACCESSIBLE. MAXIMUM FLEX DUCT LENGTH IS 6'-0". PERFORMANCE OF FLEXIBLE DUCT SHALL MEET OR EXCEED THE RIGID DUCTWORK.</li> <li>UNLESS OTHERWISE NOTED ON PLANS, ALL SUPPLY AND RETURN DUCTWORK LOCATED WITHIN TEN (10) FEET OF THE EQUIPMENT FAN SHALL BE LINED WITH 1" ACOUSTICAL DUCT LINER. DUCT DIMENSIONS SHOWN ON MECHANICAL PLANS ARE INTERIOR DIMENSIONS.</li> <li>ALL DUCT LINER SHALL HAVE A FLAME SPREAD AND SMOKE DEVELOPMENT 25 OR LESS AND 50 OR LESS WHEN TESTED BY ASTM E-84 (NFPA 255) METHOD.</li> </ol>  |
| 23 54 00<br>FURNACES AND<br>CONDENSING<br>UNITS           | <ol style="list-style-type: none"> <li>THE MECHANICAL CONTRACTOR SHALL FURNISH AND INSTALL FURNACE(S) AND CONDENSING UNIT(S) AS SHOWN AND SCHEDULED. THE UNIT(S) SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS, AND SHALL PERFORM AT THE CONDITIONS SCHEDULED.</li> <li>THE MECHANICAL CONTRACTOR SHALL PROVIDE TWO (2) SETS OF FILTERS FOR EACH FURNACE AND SHALL BE RESPONSIBLE FOR CHANGING FILTERS WITHIN TWO (2) WEEKS OF START-UP.</li> <li>THE CONDENSING UNIT SHALL UTILIZE R-410A (PURON) REFRIGERANT. INCLUDE INSULATED REFRIGERANT LINESETS. SEAL ALL LINESET WALL PENETRATIONS WITH CLOSED-CELL, FOAM INSULATION AND 100% SILICONE CAULK.</li> <li>IF INSTALLED ON THE GROUND, THE CONDENSING UNIT SHALL BE INSTALLED ON A PREFABRICATED MOLDED PLASTIC HOUSEKEEPING PAD, INSTALL ON LEVEL EARTH.</li> <li>IF THE CONDENSING UNIT IS INSTALLED DURING THE HEATING SEASON, THE CONTRACTOR SHALL PROVIDE A REFRIGERANT CHARGE THE FOLLOWING COOLING SEASON.</li> </ol>   |
| 23 82 40<br>ELECTRIC<br>HEATING<br>UNITS                  | <ol style="list-style-type: none"> <li>THE MECHANICAL CONTRACTOR SHALL FURNISH AND INSTALL ELECTRIC HEATING UNITS INCLUDING: ELECTRIC WALL HEATERS, ELECTRIC CEILING HEATERS, ELECTRIC RADIANT PANELS, AND ELECTRIC BASEBOARD. THE UNIT(S) SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS, AND SHALL PERFORM AT THE CONDITIONS SCHEDULED. ALL UNITS SHALL BE UL RATED.</li> <li>THE ELECTRIC HEATING UNITS SHALL INCLUDE ONE OR MORE OF THE FOLLOWING SAFETY DEVICES AS LISTED IN THE ELECTRIC HEATING SCHEDULE: THERMAL SAFETY CUT-OFF CONTROL WITH AUTO RESET FUNCTION, THERMAL SAFETY CUT-OFF WITH MANUAL RESET FUNCTION, AIR-PROOF SWITCH. EACH TYPE OF THERMAL SAFETY DEVICE SHALL SHUT DOWN THE ELECTRIC HEATING SYSTEM WHEN THE UNITS TEMPERATURE EXCEEDS THE FACTORY SET HIGH LIMIT.</li> <li>THE ELECTRIC HEATING UNIT SHALL BE OF THE WATTAGE AND VOLTAGE AS SCHEDULED.</li> <li>THE ELECTRIC HEATING CABINET SHALL BE OF THE COLOR SCHEDULED. IF NO COLOR IS SCHEDULED, STANDARD WHITE SHALL BE PROVIDED. THE UNIT SHALL BE SURFACE MOUNT OR RECESSED AS SCHEDULED. IF SURFACE MOUNTED, PROVIDE UL RATED SURFACE MOUNT BOX.</li> </ol>   |

