

15000 MECHANICAL SPECIFICATION

1.0 General

- .1 Visit jobsite during bid opportunity. Drawings indicate approximate location of existing mechanical equipment and services. Verify exact locations of existing mechanical equipment and services and allow for necessary relocating of noted services (or reconnection to existing services) to suit new construction.
- .2 All Work shall conform to Manitoba Building Code and local authorities. Apply for, obtain and pay for all necessary permits.
- .3 Coordinate installation with all related trades, Architectural drawings and reflected ceiling plans. Verify all dimensions and locations of existing equipment and services prior to proceeding with Work.
- .4 Submit shop drawings for all equipment to Contract Administrator.
- .5 Provide one year guarantee for all equipment.
- .6 All connections to existing building mechanical services shall be coordinated with the City's representative.
- .7 All necessary cutting and patching shall be performed by competent sub-trades employed by Contractor to satisfaction of City's representative.
- .8 Refer to Instructions to Bidders for requirements regarding project phasing, working hours, shut-down procedures, access, etc.
- .9 Provide separate prices as indicated on drawings.
- .10 Provide Milcor access doors in drywall ceilings and walls for access to mechanical equipment. Minimum size 24" x 18".
- .11 All interior space power hammering, drilling and other noisy Work shall be performed between hours of 6:00 p.m. and 8:00 a.m.
- .12 Bid Opportunity quotations shall be based on the use of specified equipment, unless acceptance for the use of equal manufacturers is obtained from the Contract Administrator prior to submission of bids. Alternate manufacturers may be quoted as an increase or decrease amount to the bid price, without prior acceptance of the Contract Administrator.
- .13 Furnish to the City three (3) complete sets of manufacturer's operating and maintenance instructions for all equipment requiring maintenance. Review instructions with City's representative to ensure a thorough understanding of the equipment and its operation.
- .14 Provide a mark-up of the contract drawings for record "As-Built" drawings, revised as required to show any changes from that originally shown.
- .15 Provide as-built drawing in Autocad format, complete with disk paid for by Mechanical Subcontractor.
- .16 All ductwork and piping to be installed straight, parallel to the building walls.
- .17 Where pipes or ducts go through an exterior roof or wall, they should be boxed-in, flashed and waterproofed. Allow for expansion and contraction of pipe.
- .18 Pipe hangers shall be Grinnell Fig. 65 for steel pipe and Fig. CT65 for copper pipe, all with Fig. 140 threaded rod attached to Fig. 117 expansion case set in holes drilled in concrete, or attached to Fig. 225 or 227 clamp attached to joists or beams.

- .19 Treated wood sleepers (4" x 4") and flashing for equipment installed on roof to be provided by the Contractor.
 - .20 All extraneous material in ceiling space unrelated to new and revised Work shown, including piping, control tubing, ductwork, etc. shall be removed.
 - .21 Provide firestopping for all openings in fire separations for passage of pipes, ducts, etc. to maintain integrity of fire separations as per manufacturer's published recommendations.
 - .22 Installation of Work shall be coordinated with the Contractor and shall be scheduled so as not to endanger or disturb the City or users of the building. Shutdown of existing building systems shall be coordinated with the City's Representative.
 - .23 All wiring for equipment specified herein shall be by the Electrical Subcontractor, unless otherwise noted.
 - .24 Contractor shall review all equipment requiring electrical hook-up with Electrical Subcontractor and electrical drawings prior to ordering equipment. Ensure proper electrical characteristics are determined for all affected and related Work.
 - .25 Prior to installation of the ceiling, notify the Contract Administrator and arrange for a final review of the Work. For undertaking this review, the following shall be completed:
 - .1 All systems to be fully operational, as-built drawings supplied and Operating and Maintenance Manuals submitted. Two (2) days notification (in writing) is required to be given to the Contract Administrators prior to reviews being undertaken.
 - .2 All deficiencies shall be completed within two (2) weeks of an agreed period of time after final review and a letter shall be submitted to the Contract Administrator within that time advising of such. Failure to complete Work may result in Work being done by the City and the costs deducted from final payment.
 - .26 Where mechanical services are concealed within walls, floors or ceilings and cannot be visually identified, provide electronic scanning devices or other approved means to locate and identify concealed services prior to Work start. Make good any damage to existing mechanical services at no cost to the Contract.
- 2.0 Insulation
- .1 All cold piping insulation shall be c/w with vapour barrier.
 - .2 All exhaust ducts for distance of 6'-0" back from wall or roof outlet to have 2" Fibreglas RFFRK.
 - .3 Acoustic insulation on supply ductwork, where shown on the drawings, shall be 1" thick fibreglass rigid coated duct liner. The duct sizes shown on the drawing represents the final internal size required. Impale on welded studs spaced 16" O.C. Paint breaks and joints with BF-60-30N fire retardant mastic. Coat exposed edges with adhesive. Projecting fasteners and ends cut off vertically flush.
- 3.0 Ventilation
- .1 Ductwork
 - .1 Galvanized iron schedule:

<u>Max. Side</u>	<u>Gauges (USSG)</u>	<u>Bracing</u>
Up to 24"	24	None

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| | 25 to 30" | 24 | 1" x 1" x 1/8" angle,
4' from joint. |
| | 31 to 40" | 22 | 1" x 1" x 1/8" angle,
4' from joint. |
| | Round duct up to 19" | 26 | None |
- .2 Where duct width exceeds 18" in largest dimension, stiffen by breaking sheets diagonally.
 - .3 Duct sizes shown are inside dimensions. If ducts are acoustically lined, outside duct size to be increased to suit.
 - .4 Ductwork shall be constructed as recommended in SMACNA guide.
 - .5 Seal all joints (new and existing) airtight with Duro-Dyne S-2 duct sealer or equal, in strict accordance with manufacturer's published recommendations. Prior to application, ductwork to be dry and free of grease, etc. Use 1/4" bead of material along joints. Material, when dry, to have 1/8" depth extending 1" on each side of joint or seam.
 - .6 Where ductwork conflicts with mechanical piping and it is not possible to divert ductwork or piping to stay within allowable space limitations, provide duct easements. Easements not required on pipes 100mm (4") and smaller outside dimension, unless this exceeds 20% of duct area. Hangers and stays in ductwork to be parallel to air flow. If easement exceeds 20% of duct area, duct to be split into two ducts with original duct area being maintained. Easements to be approved by Contract Administrator before installation.
 - .7 Size round ducts, installed in place of rectangular ducts, from ASHRAE table of equivalent rectangular and round ducts.
 - .8 Prior to fabrication of ductwork, check all ceiling spaces and heights for confliction with other trades.
 - .9 Duct and Equipment Supports, Hangers and Inserts
 - .1 Support horizontal ducts on maximum 8'-0" centres by non-perforated galv. steel, rivetted strap for ductwork 36" (either dimension) or less, and minimum 1" x 1" x 1/8" galv. iron passing under ducts 37" or over (either dimension) with 3/8" diam. threaded rods suspending angles from structure.
 - .2 For inserts in existing concrete, use Hilti H.K.D. steel anchors.
 - .10 Manual Volume Dampers to be #16 ga. galv. steel, stiffened. Dampers hardware to be Duro-Dyne KS-145, KS-385 or KS-12 as recommended by manufacturer.
 - .11 Fire dampers shall conform to Manitoba Fire Code and local authorities. All fire dampers to be type 'B', i.e. blades out of air stream.
 - .12 Provide insulated access doors at all fire dampers, coils, and where noted.
 - .13 Electric Duct Heaters
 - .1 Thermolec Model SC electric duct heaters, open coil element supported by refractory porcelain insulators. 1.2mm (18 ga.) galv. steel frame, flanged. Insertion type coil to slide out duct side. Fit with CSA approved protective inlet screen.

- .2 Equip with both manual reset and automatic recycling type high limit thermostats. Heaters shall be CSA approved. Minimum air velocities to conform to manufacturers minimum requirements.
- .3 Watt density not to exceed 242 Kw/sq.m (22.6 Kw per sq. ft.).
- .4 Heaters shall include contactors, control transformers, air switches, manual and automatic high limit thermostats shall all be factory wired to terminal blocks. External connections required shall be limited to duct mounting, power connections (by Div. 16), and an unpowered contact on/off input provided by control sub-trade. Contactor coil voltage requirements shall be co-ordinated with controls and electrical sub-contractors. Mount contactor, transformer, air switch, etc. within an enclosure integral with heater.

4.0 Testing and Balancing

- .1 Air systems shall be balanced and tested by an independent air balance agency (AABC) to provide air quantities as shown. Provide air balance report for review by the Contract Administrator. Submit two copies for review upon completion. Provide damper sticker upon final balancing completion.
- .2 Air balance agency shall test all fire dampers and provide a report for review by the Contract administrator. Submit two copies for review upon completion. This Work shall include the following:
 - .1 Provide inspection, verification and testing of all fire dampers, fire/smoke dampers, smoke control dampers and ceiling fire stops after installation. Coordinate the Work with Ventilation and Controls Contractor(s).
 - .2 Provide detailed verification report to include all fire protection devices noted. Report shall list each device and verification of its operation and installation per the requirements specified.
 - .3 Provide two copies of completed draft verification report to Contract Administrator for review.
 - .4 Incorporate comments or changes requested by Contract Administrator and provide sufficient number of copies of final report to Mechanical Subtrade for inclusion in Operating & Maintenance Manuals.
 - .5 Testing shall be performed after air balancing has been completed.
 - .6 Test shall include following:
 - .1 Visual inspection of each device:
 - .1 Confirm appropriately rated device installed and CSA/ULC label affixed and visible through duct/ceiling access door.
 - .2 Confirm appropriate duct and/or ceiling access door provided to permit servicing of device. Confirm duct access door openable without interference from adjacent ceiling, pipes, ducts, etc.
 - .3 Confirm device has been installed in accordance with requirements of the specifications, manufacturer's instructions and codes.
 - .4 Confirm proper installation, clearances, use of proper angle framing, use of proper fasteners, use of fire rated material in wall opening, location of breakaway joints etc.

- .5 Confirm that device has not been painted.
- .2 Operational inspection of each device to include:
 - .1 Manual release of fusible link allowing device to close. Confirm tight fit closure without binding.
 - .2 Confirm that appropriate fusible link is installed.
 - .3 Re-open device and reset fusible link connection.
- .7 Verification report shall indicate general location (e.g. room number or description) and specific location (e.g. north wall above ceiling) of access door to device. Report shall include itemized verification of following, as appropriate, for each device:
 - .1 Device is fully accessible.
 - .2 Device has been properly installed
 - .3 Device has been successfully tested.
 - .4 Device has been reset.
 - .5 Name of tester.
 - .6 Date device tested successfully.

5.0 Controls

- .1 Provide three hard cover copies of information pertaining to temperature control system for City's permanent record. Include schematic drawings and control sequence write-ups of all control systems.
- .2 Provide all labour, material, plant, tools, equipment, and services necessary and reasonably incidental to completion of temperature controls systems as noted herein and/or shown on drawings.
- .3 All new Work related to new and existing controls shall be performed by a qualified Controls Subcontractor.
- .4 Provide new thermostat to match existing as indicated.
- .5 Provide complete system of Johnson automatic controls for systems indicated.
- .6 Provide all necessary dampers, damper operators, thermostats, valves, valve operators, controllers, indication, relays, cumulators, positioners, pneumatic electric switches, solenoid valves, switches, clocks, transformers, etc., to make complete and operable system.
- .7 Mechanical sub-trade to distribute and mount all pipe connected equipment.
- .8 Mechanical Subcontractor to distribute and mount all motorized dampers in their respective locations.
- .9 Electrical Subcontractor to supply and install all conduit, wire and connections from distribution panels to line side of magnetic starters and thermal overload switches, and from load side of starters and switches to motors.
- .10 Control Contractor shall supply and install all conduit, wire, electric relays, connections and other devices required for control circuit wiring for systems as specified herein whether line or low voltage. Electrical wiring shall be installed in conformance with CSA, ULC, Manitoba Building Code and Electrical Division electrical requirements.