

1. GENERAL REQUIREMENTS 22 00 05

1. Comply with all requirements of Contract Administrator's specification.
2. This section applies to and is part of all sections of Division 22 and 26. Every section of these specifications applies equally to all sections.
3. Total Bid Price to include price to include all necessary equipment, parts, labour and plant to complete the Work shown on the drawings and described in the specifications and to ensure complete and operational mechanical systems.
4. Drawings are diagrammatic and approximately to scale. Do not scale them. For exact dimensions refer to dimensioned drawings.
5. Drawings and specifications establish scope of work only and are not detailed installation instructions. Follow manufacturer's recommendations and adhere to all applicable Codes, Standards, Regulations and Bylaws, hereafter referred to as Codes.
6. Connect to equipment specified in other sections, installed by other Contractors or the City.
7. The Contract Administrator shall have the final say in matters of interpretation.
8. Use only new materials under this contract unless otherwise noted. New materials shall be free of Asbestos Containing Materials (ACM).
9. Apply for and pay for all required permits, licenses, inspections and fees. Indicate building and mechanical permit numbers on all progress draws. Where no permit was applied for indicate same on progress draw.
10. In the event of conflict between contract documents and Codes, the more stringent requirement shall be adhered to at no additional cost.
11. All work shall be executed with good workmanship, and be guaranteed for one year from substantial completion.
12. Only skilled and qualified licensed tradesmen shall perform the work. Tradesmen to provide proof of registered status as requested.
13. Install mechanical systems in a workmanlike manner, neat in appearance and to function properly to the satisfaction of the Contract Administrator.
14. Supply access doors, provide rated doors to match fire rating, at all service points for mechanical equipment. Indicate on "as-built drawings" the location of all access doors.
15. The Mechanical Subcontractor is responsible to carefully examine conditions at the intended place of Work. Verify all services, connection points, and all access openings to permit installation of new equipment.
16. Mechanical Subcontractor shall submit shop drawings for review by the Contract Administrator prior to commencing Work. Shop drawings shall be specific to the equipment and materials for this project. Changes to location and arrangement shall be reviewed prior to installation. Review of shop drawings by the Contract Administrator is for the sole purpose of ascertaining conformance to design intent. The Mechanical Subcontractor retains responsibility for all aspects of installation, performance and coordination.

17. Shop Drawing Procedures are as follows:
 1. General:
 1. Submittal routing shall be established at the beginning of each project.
 2. Generally, submittals shall be forwarded as follows: Sub-Trade to GC/GC to Contract Administrator.
 3. A transmittal listing each item of equipment shall accompany each submission.
 4. Contractor and Mechanical or Electrical Subcontractor must review, approve and stamp submittals prior to sending to Contract Administrator for review. Submittals without Contractor stamps will not be reviewed.
 5. Equipment must be labeled appropriately. Each item of equipment must bear the identifier used on the drawings, i.e. EF-1, RTU-3, etc.
 6. Data sheets must clearly indicate model and options being utilized. All information that does not apply must be crossed off.
 7. Where products have applied for and received equal approvals, proof of this shall be submitted with shop drawings.
 2. Electronic Submissions (.pdf only):
 1. Send electronic shop drawing submittals to wpg.shopdrawings@mcw.com only, please do not copy staff members directly.
 3. Hard Copy Submissions:
 1. A minimum of four (4) hard copies must be provided.
18. Mechanical Subcontractor shall maintain accurate “as-built” drawings on site and shall present for review at each Site review. Submit these record drawings in AutoCAD 2010 or newer format for review at the completion of the project. Note that changes to floor plans must be included. The Contract Administrator will not perform final inspections nor certify for occupancy until the “as-built” drawings have been received, reviewed and accepted. After acceptance of “as-built” drawings by the Contract Administrator, provide one (1) complete set on CD-ROM and three (3) sets of prints.
19. Engineering Site Reviews: Contractor’s work shall be periodically reviewed by the Contract Administrator for determining general quality of installation. Guidance will be offered as to interpretation of contract documents and to assist in performing the mechanical installation. Inspections, reviews and directives issued in no way relieve the Contractor, his agents, employees or subtrades from contractual obligations, conformance to codes or safe and recognized practices.
20. Operating and Maintenance Manuals: At the completion of work submit three (3) hard covered loose leaf binders showing all major components divided by trade sections. Manuals shall be complete with all instructions for operation, maintenance and replacement parts as required. Include performance curves, detailed drawings, part lists, supplier information and any other pertinent data. Include copies of reviewed shop drawings, Contract Administrator contact information, Contractor and Sub-contractor information. Include copies of valve tag lists, all inspection certificates, and balancing reports. The Contract Administrator will not perform final inspections nor certify for occupancy until the O&M Manuals are received, reviewed and approved.
 1. Provide manufacturers start-up reports and letters of certification that the following equipment and systems are started, commissioned and working correctly:
 1. Controls
 2. Air moving equipment
 3. Heat recovery ventilators
 4. Plumbing fixtures, mixing valves and brass.
 5. Water Treatment
21. Provide one (1) set of special tools required to service equipment as recommended by manufacturer. Provide a receipt signed by the City’s representative for each tool in each copy of the O&M Manual.
22. Provide one (1) set of spare filters for each filter bank.

23. Prior to requesting any Substantial Performance site review, all aspects of the mechanical systems shall be complete and operational. Testing and balancing shall be complete along with valve and equipment identification, equipment startups.
24. Each of the Contractors shall instruct the City of Winnipeg Staff on the operation, maintenance, and adjustment of equipment and/or system that they have installed or set. Provide sign off sheets for training indicating who was trained and number of hours of training.
25. Use of Equipment before occupancy by the City:
 1. The Contractor may operate equipment for testing and balancing only. The use of equipment for any other purpose must be approved by the City in writing prior to use. Approval must indicate who is paying for utilities used.
 2. Any equipment that is placed in use for any reason prior to the beginning of the guarantee period shall be cleaned and provide with whatever maintenance and repair is required so that its condition is equal to that of new equipment, or it shall be replaced, at no cost to the City.
26. Prior to final inspection or certification provide the following:
 - Fire damper certification
 - Copies of manufacturer's startup or certification reports
 - TAB reports.
 - Training sign off sheets.
 - Receipts or transmittals indicating the City has received all special tools and spare sets of filters.
27. Mechanical subcontractor is to review and approve all requests for information (RFI's) from Contract Administrator and Contractor is to review and approve all mechanical RFI's prior to submittal to ensure information is not already included in contract documents or cannot be reasonably inferred from contract documents.
28. Contractor is to review and approve all mechanical change pricing and credits prior to submitting to Contract Administrator, approval to state that the Contractor believes the pricing is fair and reasonable.
29. Mechanical change pricing will only be reviewed if it includes a complete breakdown of items of material, labour hours, labour rates and markups. This review period will start when the information indicated above is received.
30. Mechanical progress claims will only be reviewed if they provide a complete breakdown by trade and sub trade and list all major equipment complete with costs.

2. ACCEPTABLE MANUFACTURERS 22 00 10

Standard of Material & Equipment:

1. Where a Manufacturer's name is mentioned, it is for the purpose of setting a standard of quality, performance, capacity, appearance and serviceability. Manufacturers shown below are pre-approved if their products are equal in performance to the specified ones, and the products can be used in the preparation of the Bid. Where no approved manufacturer's are provided, provide the exact make specified. Requests for approval must be submitted to the Contract Administrator not less than two full working days prior to the issuance of the last addendum and must be approved in writing by the Contract Administrator in an addendum, no exceptions. Approval does not absolve the supplier and Contractor of the obligation to meet all clauses of this specification. Where approved products have different power requirements, controls, weights, dimensions, or features, it is the responsibility of the bidder to include all costs associated with this in their bid.

Description:

1. Plumbing and Drainage Approved List

| <u>Equipment</u> | <u>Acceptable Manufacturers</u> |
|----------------------------------|--|
| Hangers and Supports | Crane, Grinnell, Myatt |
| Drainage Specialties | Ancon, Smith, Zurn, Mifab, Watts |
| Shock Absorbers | Ancon, Smith, Zurn, PPP, Watts |
| Gauges and Thermometers (swivel) | Dresser, Trerice, Weiss, Dwyer |
| Wall Hydrants | Ancon, Zurn, Smith, Mifab, Watts |
| Plumbing Fixtures | Kohler, American Standard, Toto, Crane, Sloan |
| Plumbing Brass | Kohler, Delta Commercial, Chicago Faucets, Zurn, Moen, Toto, Sloan |
| Flush Valves | Sloan, Delta Commercial, Crane, Kohler, Toto |
| Thermostatic Mixing Valves | Powers, Leonard |
| Mop Sinks | American Standard, Fiat, Stern Williams |
| Toilet Seats | Olsonite, Beneke, Centoco |
| Domestic Hot Water Heaters | RHEEM, State, A.O. Smith, Bradford White |

2. Ventilation Approved List

| <u>Equipment</u> | <u>Acceptable Manufacturers</u> |
|----------------------------------|--|
| Damper Hardware, Fan Connectors | Duro-Dyne, Elgin |
| Fire Dampers | NCA, Ruskin, Nailor Industries |
| Static Pressure Monitors | Dwyer, Trerice |
| Filters | A.A.F., Farr, Cambridge, Flanders |
| Inline Centrifugal Fans | Greenheck, Penn, Loren Cook, Delhi |
| Diffusers, Registers and Grilles | Titus, Price, Nailor Industries, Tuttle and Bailey |
| Backdraft Dampers | Tamco, Ruskin, Price, Westvent, Nailor Industries |
| Acoustic Duct Insulation | Owens Corning, J-M, Knauf, Ultralite |
| Flexible Ductwork | Thermoflex, Wire-mould, Flex Master |
| Electric Duct Heaters | Thermolec, PM Wright |

| <u>Equipment</u> | <u>Acceptable Manufacturers</u> |
|---------------------------|-------------------------------------|
| Heat Recovery Ventilators | Lifebreath, VenMar, Renewaie, Vanee |

3. Controls Approved List

| <u>Equipment</u> | <u>Acceptable Manufacturers</u> |
|------------------|--|
| Control Dampers | Ruskin, Ventex, Tamco, Greenheck, Westvent |
| Damper Motors | Honeywell, Belimo, TAC I/A, Johnson Controls |

3. PIPING and FITTINGS 22 00 20

1. Provide isolation valves at all fixtures, appliances and equipment.
2. Provide check stops at all mixing valves.
3. Allow for thermal expansion on all piping systems conveying hot or cold vapour or liquid.
4. Provide point of use thermostatic mixing valves set to 43°C (110°F) for lavatories where indicated.
5. Tag all major zone and shut off valves with 38mm (1½”) diameter brass tags. Index and list valves, insert list in each O&M Manual also frame and mount copy of list in a conspicuous area of the mechanical Room.
6. Identify all equipment with black lamacoid tags 100mm x 25mm (4”x1”) with white lettering. Mechanically affix tags to equipment. Equipment names and number to match those listed on contract documents.
7. Identify all piping with stenciled lettering and directional arrows at intervals no greater than 6m (20’) and at every change in direction. Labeling and identification to either the City’s standard or the CSA standard. Confirm system with the City prior to Bid.
8. Wherever pipes of dis-similar metals are joined the piping systems shall be protected and isolated by use of dielectric unions or brass valves.
9. Provide and install union or flange connections at all equipment and devices to allow for ease of service or future replacement.
10. Piping Systems:
 1. Sanitary Drainage - Above Ground: Cast iron and copper. PVC DWV as permitted by the 2010 NPC.
 2. Domestic Hot & Cold Water: Type L copper with wrought copper fittings and lead free solder; CPVC Dr11 Pipe and fittings as permitted by the 2010 NPC. PEX as permitted by the 2010 NPC.
 3. Building Water Services: Soft copper Type K, PVC or HDPE to approval of authorities having jurisdiction
 4. Sanitary Drainage - Buried: PVC DWV as permitted by the 2010 NPC. PVC Sewer Pipe as permitted by the 2010 NPC.
11. Valves:
 1. Isolate all serviceable equipment, using ball and butterfly valves where possible.
 2. All valves shall have a minimum certified rating of 150 psi.
 3. All drain valves shall be complete with cap and chain.

4. Install ¼ turn ball valves prior to all pressure gauge devices.
 5. PVC ball valves, double backing with union ends, solvent weld, pressure rated at 230 psi (1580kPa) at 79°F (23°C).
12. Hangers and Supports:
1. All hangers shall be of same material as piping system, or shall be isolated from the pipe.
 2. Provide adjustable clevis hangers equal to pipe size and of same material as piping system.
 3. Provide oversized hangers on all cold water piping conveying liquid less than 21°C (70°F).
 4. Use only factory made inserts, coach screw rods, c-clamps, beam clamps and expansion shields rated for the intended load.
 5. "Caddy" clip or tension clip rod supports are not allowed on this project.
 6. Duct hangers shall be rod or strap 2 gauges heavier than duct.
13. Provide and install sleeves of suitable material where piping and duct systems pass through any and all separations.
14. Supply and install thermostats and gauges at all major pieces of equipment and where indicated on the drawings. (Note PSN-B Snubbers required at all gauges.) Mount all gauges and thermostats vertically and place so that ease of reading is ensured. Pressure and temperature ranges shall be suitable for the application.
15. Primer paint all miscellaneous metal supports channels and angle iron prior to installation.
16. Pipe all water discharge from relief valves and equipment drains to nearest floor drain or suitable receptacle. Confirm locations with Contract Administrator prior to installation.
17. Install all valves, strainers, equipment, specialties, filters and the like to permit ease of operation and full access.
18. Acceptable joining systems include mechanical joints (sanitary) soldering, silver soldering, threaded joints, welding, grooved Victaulic (black) and grooved copper Victaulic. NOTE: Tee drilling and Press-fit systems are not acceptable on this project.
19. Test all systems to 1½ times working pressure for a minimum of two hours. All tests shall be recorded and independently witnessed. Submit recorded data for Contract Administrator's review prior to substantial completion and include in O&M Manuals.
20. Metal to PVC thread connections shall be stainless steel reinforced SCH 80, PVC female adaptors.

4. INSULATION 22 07 10

1. Definitions:
 1. The word "exposed" where used in this Section means any work, which is not concealed in wall, shaft, or ceiling cavities or spaces. Work in mechanical rooms, utility spaces, behind doors in closets or cupboards or under counters is considered exposed.
2. Flexible Duct Insulation (FDI):
 1. R-24 flexible blanket with foil jacket, pin at 400mm on centre and tape all joints with aluminum tape.
3. Pre-molded Pipe Insulation (PPI):
 1. Provide ULC listed sectional fiberglass pipe insulation in compliance with ASTM C335-84 in pre-molded sections 900mm (36") long, split and ready for application with a minimum Thermal Conductivity of 0.033 W/m deg C at 24°C (75°F) mean temperature and be capable of use on service from -40°C to 260°C (-40°F to 500°F) and with factory applied

vapour seal jacket of vinyl coated foil Kraft laminate with reinforcing of open mesh glass fibre.

4. Rigid Duct Insulation (RDI):
 1. Rigid board: 72kg/m³ (4.5 lbs/ft³) density ULC listed glass fibre board with glass fibre reinforced aluminum foil vapour seal facing and minimum thermal conductivity of 0.035 W/m deg C at 24 deg C mean temperature.
5. Non-Pre-molded Pipe Insulation (FPI):
 1. 12g/M³ (0.75 lb/ft³) 20mm (¾") thick ULC listed fiberglass flexible blanket with glass fibre reinforced aluminum foil vapour seal facing with thermal conductivity of 0.036 W/m deg C.
6. Finishes & Protective Coverings:

| | |
|---|---|
| C | Canvas: 170 g/m ² with lagging adhesive, ULC labeled. |
| P | 20 mil PVC, high impact, UV resistant, solvent welded, rated for 0-150°F (-17 to 65°C). |

APPLICATION SCHEDULE

| Ductwork | Thickness | Type | Finish |
|---|----------------------------------|---------|--------|
| 1. Supply ductwork concealed | 25mm (1") | All FDI | None |
| 2. Supply ductwork exposed | 25mm (1") | All RDI | C |
| 3. Outside air intake ducts | 50mm (2") | All FDI | None |
| 4. Rectangular ducts penetrating an exterior building surface | 38mm (1½") for the last 3m (10') | All RDI | None |
| 5. Exhaust ducts | 38mm (1½") for last 3m (10') | All FDI | None |

**** All exposed insulated ducts in mechanical room service rooms or in occupied spaces are to be type 'C' finish.**

| Piping (Provide canvas finish where exposed): | Thickness | Type | Finish |
|---|-------------------------|---------|--------|
| 1. Domestic cold water | 38mm (1½") | All PPI | |
| 2. Domestic hot | 25mm (1") | All PPI | |
| 3. Plumbing vents | 12mm (½") last 3m (10') | All PPI | |
| 4. Equipment: <ul style="list-style-type: none"> ▪ Water meter | 25mm (1") | All FPI | C |

**** All exposed insulated piping in mechanical rooms, service rooms or visible in occupied spaces are to be Type 'C' or 'P' Finish.**

5. CHEMICAL TREATMENT 22 31 20

1. Work Performed by this Section:
 1. Supervision of all degreasing procedures.

2. Submission of a report for the following:
 - Results of degreasing.
2. Sanitizing – Domestic Water:
 1. Potable water supply systems:
 1. Thoroughly flush and disinfect (chlorinate) water supply systems in accordance with municipal requirements and AWWA C601-68. The rates of chlorine application to be proportional to the rate of water entering the pipe.
 2. Flush domestic water piping prior to introducing chlorine with a sufficient flow to produce a velocity of 1 meter per second for ten minutes, or until all foreign materials have been removed and the flushed water is clear. Provide connections and pumps as required.
 3. Arrange and pay for water quality tests to be performed by an independent testing laboratory acceptable to the Contract Administrator.
 2. Cleanup:
 1. Leave systems operating with work areas clean to acceptance of the City and Contract Administrator.

6. TESTING AND BALANCING (TAB) 22 08 10

1. Contractor shall be members of AABC.
2. Balance all supply air outlets and main ducts conveying 25% or more of system volume to $\pm 5\%$ of design. Allow to replace belts and sheaves on new and existing equipment to meet air balance volumes.
3. Balance all air moving equipment to $\pm 5\%$.
4. Balance all branch ductwork to $\pm 10\%$.
5. Test all fire dampers to industry standards. Tag each device listing company information and testing information.
6. The reports to contain recorded data and schematics and be formatted as per AABC.
7. Advise ventilation contractor where balancing dampers are required to facilitate balancing of ventilation system.
8. Arrange with Mechanical Subcontractor to have any necessary modifications to achieve the design and flow rates at no extra cost to the City.
9. Three (3) copies of the TAB report, including certification of fire dampers, stops and flanges shall be provided directly to the Contract Administrator prior to certification for occupancy. Include drawings, room numbers and identification numbers of fire dampers, types, and flaps on the schematics.
10. TAB report shall include schematic drawings identifying all fire dampers and circuit balancing valve locations.
11. Allow for an additional Site review and adjustments at the request of the Contract Administrator after submission of final report.

7. PLUMBING 22 10 05

1. Supply and install fixtures indicated under contract documents to provide a complete and functional plumbing system.
2. Use only lead free solders when joining piping components.

3. Provide access doors at all concealed cleanouts, valves and water hammer arrestors.
4. Install water hammer arrestors at each group of fixtures.
5. Install trap primers as indicated on the contract documents and as required by local code authorities.
6. Fixtures shall be white and complete with chrome trim, fixture stops shall be screwdriver type where exposed, wheel handle where concealed.
7. Water closet MAP test minimum: 800 grams.
8. Water closets ball pass test: 2 $\frac{1}{8}$ " (54mm) glazed, minimum.

8. VENTILATION 22 30 10

1. Supply and install a complete ventilation system as indicated on the drawings and as required by local Codes and authorities. Do all work to latest SMACNA Standards for applicable duct velocity.
2. On exposed ducts in occupied areas use stainless steel aircraft wire to support ducts.
3. System shall include all ducts, fire dampers, transfer air openings, fans, balance dampers, grilles, diffusers and hoods indicated on drawings and as required by Code.
4. Install all control dampers.
5. Provide access doors to comply with Code on both sides of fire dampers, control dampers and all coils. Access doors shall be constructed of 22-gauge material with flat iron framing complete with sash lock latching and seal.
6. Provide 1" thick acoustic insulation where indicated on drawings. Minimum 3-5 lbs per cubic foot density with Neoprene coating. Seal all joints and seams.
7. Provide ULC labelled fire dampers where indicated on drawings and at all rated separations. Protect ceiling diffusers with CK 2000 thermal blanket.
8. Provide locking splitter and quadrant dampers as indicated on drawings or as necessary to balance system and reduce objectionable noise.
9. Supply and install flexible duct connections at all air-handling equipment.
10. All open belt drives shall be complete with factory manufactured belt guards.
11. Protect and keep closed open ends of duct systems while under construction to prevent dust and debris penetration.
12. Provide baffles to reduce objectionable noise as directed by the Contract Administrator at no additional cost.
13. Seal all joints in supply, outside and exhaust duct systems with approved water based sealant, including all longitudinal and vertical seams. On exposed ducts, tape both sides of each seam prior to sealing and remove tape after sealant dries for an even, uniform sealant line.
14. Ceiling mounted components shall be installed in accordance with reflected ceiling plan. Coordinate with all ceiling mounted equipment.

9. CONTROLS 22 09 10

1. All controls shall be supplied by this section. Provide all wiring diagrams for line voltage wiring by Division 26. Coordinate all requirements of Division 26 with Electrical Subcontractor prior to submitting bid.
2. All thermostats in exposed areas shall be complete with lockable Lexan vandal resistant guards. Thermostats shall be 7-day programmable with night set back functions and 3-hour override function.
3. Provide all control dampers for installation by Ventilation Subcontractor. Intake and exhaust dampers to be insulated low leak type equivalent to Tamco 9000. Return air dampers to be Tamco 1000 or an approved equal in accordance with B7.
4. System shall be complete with all necessary wiring, interlocks, devices and software necessary to ensure a complete and operational system.
5. Set, operate and co-ordinate all devices for fully functional system.
6. Sequence of operations:
 1. Supply Fan/Heating coil with HRV Interlock and Pre-heat coil (F-1, HRV-1, HC-1, PHC-1)
 1. The supply fan shall run continuously. The heating coil shall be controlled from a 7 day digital programmable thermostat and modulate to maintain thermostat set point. The HRV fan shall start/stop based on the occupied/unoccupied schedule.
Occupied Mode:
 - a. During occupied mode the HRV outdoor air and exhaust air dampers shall open and the HRV fans enabled. Heating coil shall energize as required to maintain space temperature at set point. The Pre heat coil shall energize as required to maintain a minimum of 17°F air entering HRV.
Unoccupied Mode:
 - b. During unoccupied mode the supply fan shall remain running continuously. The HRV outdoor air and exhaust air dampers shall be closed and the HRV fans disabled. Should the space temperature fall below the night set-back set point the supply fan shall cycle on and the heating coil stage to maintain space temperature at the night setback set point. The HRV shall remain disabled.
 2. HRV with Pre-heat coil (HRV-2, PHC-2)
 1. The HRV shall run continuously. The Pre heat coil shall energize as required to maintain a minimum of 45.5°F air entering HRV.

END OF SECTION