

1. PLUMBING 22 00 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. All valves and fixtures shall be of one manufacturer.
4. Provide access doors at all concealed cleanouts, valves and water hammer arrestors.
5. Install water hammer arrestors at each group of fixtures.
6. Install trap primers as indicated on the contract documents and as required by local code authorities.

Fixtures shall be white and complete with chrome trim, fixture stops shall be screwdriver type where exposed, wheel handle where concealed.

1. GENERAL REQUIREMENTS 22 00 10

1. Comply with all requirements of Contract Administrator's specification.
2. This section applies to and is part of all sections of Division 22.
3. Mechanical contract price to include all necessary equipment, parts, labour and plant to ensure a complete and operational mechanical system as intended and depicted in the contract documents.
4. Contract document drawings are diagrammatic and approximately to scale. Do not scale these drawings, for exact dimensions refer to architectural and structural drawings.
5. Mechanical 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. Provide all necessary labour, materials and equipment to complete the work shown on the drawings and described in the specifications.
9. Apply for and pay for all required permits, licenses, inspections and fees necessary for a complete mechanical system.
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 guaranteed for one year from date of substantial acceptance as determined by the Contract Administrator.
12. Mechanical Contractor is responsible to co-ordinate all aspects of the mechanical installation with all other trades. There shall be no change notices issued nor changes to the building design (i.e.: lowering ceiling heights) due to routing conflicts amongst trades or lack of coordination. When required, discuss the proposed routing with the Contract Administrator prior to installation. Final responsibility remains with the Contractor.
13. Alternate products may be quoted only with prior written approval from the Contract Administrator.
14. The Mechanical Contractor is responsible to carefully examine conditions at the intended place of work. Verify all existing services and connection points. Verify all access openings to permit installation of new equipment.
15. Cutting of openings not exceeding 800mm x 800mm shall be the responsibility of the Mechanical Contractor and associated sub-trades. Opening sizes to be kept to a minimum. Patching of openings shall be the responsibility of the trades

normally engaged in installing the finishing materials (i.e. Drywall, brick, etc.). Hole penetrations for piping not exceeding 150mm shall be the responsibility of Division 22.

16. Mechanical Contractor 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 Contractor retains responsibility for all aspects of installation, performance and co-ordination.
17. Mechanical Contractor shall maintain accurate "as-built" drawings on site and shall present for review at each site review. Submit these record drawings in AUTO CADD 2006 format for review at the completion of the project. Note that changes to architectural and structural floor plans must be included. (A minimum of \$500.00 per drawing shall be held-back until all drawings are submitted and deemed complete.) 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.
18. Use only new materials under this contract unless otherwise noted on the drawings.
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.
21. Provide one set of spare filters for each filter bank.

2. DEFINITIONS

1. The term "Contract Administrator" or "The City's Representative" refers to:

MCW/AGE Consulting Professional Engineers
210 – 1821 Wellington Avenue
Winnipeg, Manitoba R3H 0G4

Phone: (204) 779 7900
Fax: (204) 779 1119
E-mail: mcw_wpg@mcw.com

2. The term "Contractor" refers to the successful bidder engaged to perform the mechanical installation and all subtrades engaged by the Mechanical "Contractor".
3. The terms, "supply", "install", and "provide" shall mean to supply install and connect to ensure a fully functional mechanical system, tested and complete in every way.
4. "Drawings" and "Specifications" are complementary to each other. What is called for by one shall be binding to both. "Contract Documents" refers to both drawings and specifications.

1. ACCEPTABLE MANUFACTURERS 22 00 15

Standard of Material & Equipment:

- Where a Manufacturer's name is mentioned, it is for the purpose of setting a standard of quality, performance, capacity, appearance and serviceability. Acceptable alternatives shown below are pre-approved and can be used in the preparation of the tender. Where no alternatives are indicated, provide the exact make specified. Requests for approval of alternatives must be submitted not less than seven days prior to closing date of the tender and submissions must be approved in writing by the engineer in an addendum, no exceptions. Approval as an alternative does not absolve the supplier of the obligation to meet all clauses of this specification (or approved equals in accordance with B6)

Description:

- 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
Hose Bibbs	Crane, Watts, Smith, Mifab
Wall Hydrants	Ancon, Zurn, Smith, Mifab
Gas Cocks	Newman/Miliken, Toyo, Crane
Plumbing Fixtures	Kohler, American Standard, Hytec, Zurn, Stern Williams, Acorn, Toto, Crane
Plumbing Brass	Kohler, Cambridge Brass, Chicago Faucets, Symmons, Zurn, Moen, Toto
Stainless Steel Sinks	K.I.L., Elkay, AMI, Kohler, Aristaline, Acorn
Mop Sinks	American Standard, FIAT, Stern Williams
Sump Pumps	Barnes, GSW, Beatty, Monarch
Toilet Seats	Olsonite, Beneke, Centoco, Bemis
Recirculation Pumps	Armstrong, B & G, ITT
Refrigerated Drinking Fountains	Elkay, Haws, Aquarius

Domestic Hot Water Heaters	Rudd, State, A.O. Smith, Bradford White
Backflow Preventer	Watts, Febco, Wilkins

2. Heat Transfer Approved List

<u>Equipment</u>	<u>Acceptable Manufacturers</u>
Hangers	Crane, Grinnell, Myatt
Pressure Gauges & Thermometers	H.O. Trerice, Weiss, Dresser, Dwyer
Forced Air Furnaces	Lennox, Engineered Air, ICG, Rheem, Trane, Carrier
Air Cooled Condensers	McQuay, Engineered Air, Carrier, Rheem, Trane, York
Wall Fin, Convectors, Force Flows, Unit Heaters	Engineered Air, Trane, McQuay Rittling, Slant Fin, Rosemax
Radiant panels	Airtex, TWA, Frenger

3. Ventilation Approved List

<u>Equipment</u>	<u>Acceptable Manufacturers</u>
Damper Hardware, Fan Connectors	Duro-Dyne, Elgin
Fire Dampers	NCA, Ruskin, Nailor
Static Pressure Monitors	Dwyer, Trerice
Filters	A.A.F., Farr, Cambridge, Flanders
Air Louvres	Price, Carnes, Penn, Westvent, Ruskin, Ventex, Nailer
Utility Fans	Trane, Penn, Greenheck, Loren Cook, Delhi
Centrifugal Fans	Twin City, Northern Blower, Trane, Barry Blower, Greenheck
Propeller Fans	Greenheck, Penn, Loren Cook
Inline Centrifugal Fans	Greenheck, Penn, Loren Cook, Delhi

Diffusers, Registers and Grilles	Titus, Price, Nailor Industries
Backdraft Dampers	Tamco, Ruskin, Price, Westvent, Nailor
Acoustic Duct Insulation	Fibreglass, J-M, Knauf, Ultralite
Fan or Duct Silencers	Vibron, Vibro Acoustics, VAW, Price
Pressure Chimney	Ampco, Metalbestos. Van Packer
Flexible Ductwork	Thermoflex, Wire-mould, Flex Master
Duct Sealer	3M, Bakelite, Duro-Dyne, United

4. Insulation Approved List

<u>Equipment</u>	<u>Acceptable Manufacturers</u>
Pipe Insulation	Fibreglass, Knauf, John Manville
External Duct Insulation	Fibreglass, Knauf, John Manville

5. Controls Approved List

<u>Equipment</u>	<u>Acceptable Manufacturers</u>
CO ₂ Sensors (with LCD displays)	Air-Test, Armstrong, Greystone, Honeywell, Vulcain, Comag IR
Level Switch (Sump Pits)	Flygt, Barnes, Myers, McDonnell Miller
Dampers	Ruskin, Ventex, Tamco, Greenheck, West Vent
Damper Motors	Honeywell, Belimo, TAC I/A, Johnson Controls

6. HVAC Balance and Testing Approved List

<u>Equipment</u>	<u>Acceptable Manufacturers</u>
HVAC Balance & Test Agency	AHS, Air Movement, DFC, Airdronics

2. PIPING & FITTINGS

1. Execute all mechanical sections by skilled and qualified tradesmen regularly employed in this type of installation. All work on heating systems shall be by

Contractors registered for heating system work by the Department of Labour. Contractor to provide proof of compliance upon demand. Tradesmen to provide proof of registered status upon demand.

2. Provide isolation valves at all fixtures.
3. Provide point of use thermostatic mixing valves set to 43°C/110°F ahead of lavatories.
4. Tag all major zone and shut off valves with 38mm (1 1/2") 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.
5. Identify all equipment with black lamacoid tags 100mm x 25mm (4"x1") with raised white lettering. Affix tags to equipment. Equipment names and number to match those listed on contract documents.
6. 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 National CSA standard. Confirm system with The City prior to tender.
7. Wherever pipes of dis-similar metals are joined the piping systems shall be protected and isolated by use of dielectric unions or brass valves. All hangers shall be of same material as piping system, or shall be isolated from the pipe.
8. Provide and install union or flange connections at all equipment and devices to allow for ease of service or future replacement.
9. Piping Systems:

1. Sanitary DWV:	Cast iron and copper DWV PVC where approved
2. Domestic Water:	Type L with wrought copper fittings and lead free solder
3. Storm System:	Cast iron PVC where approved
4. Natural Gas:	ASTM-A53 schedule Schedule 40 steel to code

10. Valves:
 1. All valves shall have a minimum certified rating of 150 psi. Ball valves and butterfly valves may be used in place of gate valves if they meet the specified rating standard.
Standard of acceptance: Jenkins, Crane, Toyo, Neuman Hattersly
 2. All drain down valves shall be complete with cap and chain.
 3. Install 1/4 turn ball valves prior to all pressure gauge devices.
 4. All gas system valves shall be CGA approved for application.
 5. Ball valves shall be used for isolation on systems 50mm (2") and under.
11. Hangers and Supports:
 1. Provide adjustable clevis hangers equal to pipe size and of same material as piping system.
 2. Provide oversized hangers on all cold water piping conveying liquid less than 21°C (70F).

3. Use only factory made inserts, coach screw rods, c-clamps, beam clamps and expansion shields rated for the intended load.
4. "Caddy" clip or tension clip rod supports are not allowed on this project.
5. Duct hangers shall be rod or strap 2 gauges heavier than duct.

12. Provide and install sleeves of suitable material where piping and duct systems pass through any and all separations.

13. 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.

14. Fire stopping: fire stop all pipe and duct penetrations through rated separations.

15. Install mechanical systems in a workmanlike manner, neat in appearance and to function properly to the satisfaction of the Contract Administrator.

16. Repair or replace all work unsatisfactory to the Contract Administrator at no extra cost.

17. Ceiling mounted components shall be installed as per reflected ceiling plan.

18. Primer paint all miscellaneous metal supports channels and angle iron prior to installation.

19. Install all equipment to Code and to permit ease of operation and full access.

20. Acceptable joining systems include mechanical joints (sanitary) soldering, silver soldering, threaded joints, welding, grooved Victaulic (black) and grooved copper Victaulic.

NOTE: Tee drilling, flexible tubing and Press-fit systems are not acceptable on this project.

21. Where passing through roof structures all piping must extend through the side of pitch boxes. (Exception – plumbing vents) Refer to Architectural details for coordination.

22. Supply and install rated access doors at all service points for mechanical equipment. Indicate on "as-built drawings" the location of all access doors. Arrange with drywaller for special framing required for access doors in drywall surfaces at no extra cost.

23. Test all systems to 1 ½ 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 and include in O & M Manuals.

24. Provide vibration isolation as manufactured by Vibro-Acoustics; Vibron, KM Industries, or Air Master for all pieces of equipment that may cause objectionable vibration or noise.

25. Supply and install flexible duct connections at all air-handling equipment.

Prior to requesting any substantial completion inspection, all aspects of the mechanical systems shall be complete and operational. Air and water balance shall be complete along with valve and equipment identification, equipment start-ups, O & M Manuals, and record drawings.

1. 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. 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 (-40F to 500F) and with factory applied vapour seal jacket of vinyl coated foil Kraft laminate with reinforcing of open mesh glass fibre.

3. 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.

4. Non-Pre-molded Pipe Insulation (FDI):

1. 12g/M³ (0.75 lb/ft³) 20mm (3/4") 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.

5. Low Temperature Insulation (LT):

1. Low temperature: 20mm (3/4") fire retardant closed cell Armaflex in sheet form or pre-formed for piping.

6. Finishes & Protective Coverings:

C	Canvas: 170 g/m ² with lagging adhesive, ULC labeled.
A	Protective covering (aluminum): 020 Childers corrugated aluminum pre-formed covering complete with strapping and seals.
M	Trowelled-on weather protective coating: Bakor 110-14 asphalt mastic vapour barrier coating.

APPLICATION SCHEDULE

1. 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. Combustion air ducts	50mm (2")	All RDI	None
5. Ducts penetrating an exterior building surface	38mm (1 1/2") for the last 3m (10')	All RDI	None
6. Exhaust ducts	38mm (1 1/2") for last 3m (10')	All FDI	None
7. Relief air ducts	38mm (1 1/2") for the last 3m (10')	All FDI	None
8. Chimneys (single wall)	50mm (2")	All RDI	C
9. Ducts mounted outside	100mm (4")	All RDI	A

2. Piping (Provide canvas finish where exposed):

	Thickness	Type	Finish
1. Domestic cold water in air conditioned spaces	25mm (1")	All PPI	
2. Domestic cold water in non-air conditioned spaces.	38mm (1 ½ ")	All PPI	
3. Domestic hot, recirculation & tempered	25mm (1")	All PPI	
4. Refrigerant suction lines	25mm (1")	All LT	
5. Plumbing vents	12mm (½") in attic last 3m (10')	All PPI	
6. Rain water leaders & drain bodies	25mm (1")	All PPI	

1. AIR AND WATER BALANCING 22 08 10

1. Prime Mechanical Contractor to engage a recognized testing and balancing firm for this work.
2. Test all fire dampers to industry standards. Tag each device listing company information and testing information. Successful fire damper tests and certification shall be provided to the Contract Administrator prior to certification for occupancy.
3. Balance all new and modified air systems to +/- 10% of design. Balance all supply air outlets and main ducts conveying 25% or more of system volume. Allow to replace belts and sheaves on new and existing equipment to meet air balance volumes.
4. Set maximum and minimum flows for each new and existing VAV box.
5. Arrange with Mechanical Contractor to have any necessary modifications performed at no extra cost to The City.
6. Provide three (3) written reports consisting of all testing and balancing data, system schematics showing device locations and air flows.