

1. GENERAL REQUIREMENTS 15010

1. Comply with all requirements of Contract Administrator's specification.
2. This section applies to and is part of all sections of Division 15.
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 approximate 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 recommendations and adhere to all applicable code regulations and bylaws.
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.

2. ADDITIONAL REQUIREMENTS 15050

1. Provide all necessary labour, materials and equipment to complete the Work shown on the drawings and described in the specifications.
2. Apply for and pay for all required permits, licenses, inspections and fees necessary for a complete mechanical system.
3. Mechanical Subcontractor is responsible to co-ordinate all aspects of the mechanical installation with all other trades. There shall be no change notices issued due to routing conflicts amongst trades. Alter the location of ducts or pipes at the direction of the Contract Administrator without charge to the City, provided the change is made before installation and does not necessitate additional materials.
4. The Mechanical Subcontractor 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.
5. Cutting of openings not requiring structural modifications shall be the responsibility of the Mechanical Subcontractor 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 (ie. Drywall, brick, etc.) Mechanical Subcontractor to confirm and co-ordinate all cutting and patching requirements with General Contractor.
6. Mechanical Subcontractor shall submit six (6) sets of 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 co-ordination.
7. Mechanical Subcontractor shall maintain accurate "as-built" drawings on site and shall present for review at each site review. Submit these record drawings for review at the completion of the project.
8. Use only new materials under this contract unless otherwise noted on the drawings.

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9. 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 Subcontractors from contractual obligations, conformance to codes or safe and recognized practices.
 10. 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, consultant contact information, Contractor and Sub-contractor information. Include copies of valve tag lists, all inspection certificates, and balancing reports. Mechanical Subcontractor shall provide to the City operating instructions to ensure a thorough understanding of the equipment and its operation.
 11. Provide one set of special tools required to service equipment as recommended by manufacturer.
 12. Provide one set of spare filters for each filter bank.
 13. 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.
 14. 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.
 15. Identify all new piping within building installed in this contract showing service, pipe size, and flow direction. Use capital letters using either fire resistant high gloss interior enamel paint or waterproof, heat resistant plastic marker tags (similar to: W.H. Brady identification tapes, bands, markers.) Identify at maximum of every 50 ft. and at least once in each room. Locate and size lettering such that it can be seen from floor.
 16. Wherever pipes of dis-similar metals are joined the piping systems shall be protected and isolated by use of dielectric unions or brass valves.
 17. Provide and install union or flange connections at all equipment and devices to allow for ease of service or future replacement.
 18. 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
(Third Party Certified)
 3. Water Services: Ductile Iron or PVC where approved
Soft copper Type K
 19. 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 ¼ 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.

20. Hangers and Supports:

1. Provide adjustable clevis hangers equal to pipe size and of same material as piping system.
2. Use only factory made inserts, coach screw rods, c-clamps, beam clamps and expansion shields rated for the intended load.
3. “Caddy” clip or tension clip rod supports are not allowed on this project.
4. Duct hangers shall be rod or strap 2 gauges heavier than duct.

Use the following rod diameter and spacing schedule to establish minimum hanging standards for horizontal piping:

Steel Pipe

<u>Size</u>	<u>Rod Diameter</u>	<u>Maximum Spacing</u>
1-1/4” (32 mm) and smaller	3/8” (10 mm)	3’-0” (900 mm)
1-1/2” (38 mm) and 2” (50 mm)	3/8” (10 mm)	3’-0” (900 mm)
2-1/2” (65 mm) and 3” (75 mm)	1/2” (12 mm)	12’-0” (3600 mm)
4” (100 mm) and 5” (125 mm)	5/8” (19 mm)	12’-0” (3600 mm)
6” (150 mm)	3/4” (19 mm)	12’-0” (3600 mm)

Copper Pipe

<u>Size</u>	<u>Rod Diameter</u>	<u>Maximum Spacing</u>
2-1/2” (65 mm) and smaller	3/8” (10 mm)	6’-0” (1800 mm)

21. Provide and install sleeves of suitable material where piping and duct systems pass through any and all separations.
22. 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.
23. Fire stopping: fire stop all pipe and duct penetrations through rated separations.

24. Install mechanical systems in a workmanlike manner, neat in appearance and to function properly to the satisfaction of the Contract Administrator. The Mechanical Subcontractor shall install heating, air conditioning, ventilation, and plumbing systems in complete accordance with the recommendations of the Ashrae, National Warm Air Standards, SMACNA latest edition duct standards, and local plumbing codes.
25. Repair or replace all Work unsatisfactory to the Contract Administrator at no extra cost.
26. Ceiling mounted components shall be installed as per reflected ceiling plan. Devices installed in "T-bar" (removable) ceiling grids shall be installed tight to grid. Extra T-bar by ceiling grid supplier, coordinated by the Mechanical Subcontractor.
27. Primer paint all miscellaneous metal supports channels and angle iron prior to installation.
28. Pipe all discharge from relief valves and equipment drains to nearest floor drain or suitable receptacle.
29. Install all valves, strainers, equipment, specialties, filters and the like to permit ease of operation and full access.
30. Acceptable joining systems include mechanical joints (sanitary) soldering, silver soldering, threaded joints, welding, socket welding, grooved Victaulic (black) and grooved copper Victaulic.

NOTE: Tee drilling, flexible tubing and Press-fit systems are not acceptable on this project.
31. All Work shall comply in every respect with all local and provincial by-laws and codes, which shall be considered part of this specification.
32. All wiring and supply and installation of disconnect switches for equipment specified herein shall be performed by the Electrical Subcontractor, unless otherwise noted. Co-ordinate the electrical requirements of all mechanical equipment with Division 16 Electrical.
33. 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.
34. 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.
35. 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.
36. Supply and install flexible duct connections at all air-handling equipment.
37. Scheduling of all Work shall be arranged with the City, and the City shall be notified and his approval obtained prior to shutting off existing services for purposes of connecting new Work. Work within the building may have to be performed during non-regular working hours and must conform to work rules of the building as directed by the City.
38. Prior to submitting Bid price, contractor shall examine the site and conditions affecting work, method of connection and location of all services involved under this contract. Failure to make this visit in no way alleviates the Mechanical Subcontractor from responsibility for completing the mechanical work of this contract in a workmanlike manner. No allowance will be made after contract award for any expense incurred through a failure to make this examination and investigation.

39. The contractor shall at his own expense, provide temporary heating as required for the proper progress of the Work.
40. Pipe hangers where required shall be Grinnell Fig. 65 for steel pipe and Fig. 117 expansion case set in holes drilled in concrete or attached to Fig. 225 or 227 clamp attached to floor joist and roof joist. For insulated piping, provide protection Fig. 167 saddles size hanger to accommodate insulation where applied. (No perforated type strap hangers are to be used as any form of support method.)
41. Verify sizes, invert elevations, and locations of all services prior to any commencement of any installation work.
42. Hoisting of all mechanical equipment shall be by the Mechanical Subcontractor.
43. Assume full responsibility for laying out all work and ensuring that no damage is caused to the City's equipment and premise due to improper location and execution of Work in this contract. Protect and maintain all Work until Work has been completed and accepted by the City and Contract Administrator. Store all materials as required, and clean up refuse caused by all Work.
44. 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.

3. INSULATION 15180

1. Supply and install 25mm (1") thick piping insulation on all domestic cold, hot, and recirculation piping complete with vapour barrier. (Branch runouts to fixtures will be insulated.)
2. Insulate all plumbing vents with 25mm (1") thick rigid pipe insulation with vapour barrier 3m (10') back from roof penetration or from point of penetration to conditioned space.
3. Provide 1" thick flexible foil back insulation on all supply air ductwork within ceiling spaces where ceiling space is not used for return air plenum.
4. Insulate entirely all exhaust ductwork with 25mm (1") insulation complete with vapour barrier from exhaust fan outlet connection up to roof/wall penetration roof jack location.
5. Insulate all fresh air ductwork with 50mm (2") insulation complete with vapour barrier jacket.
6. All piping shall be insulated in exposed areas. Exposed insulation in all areas including Mechanical Rooms and Electrical Rooms shall be canvas covered.
7. Supply ducts exposed to the elements shall be insulated with 100mm (4") complete with metal jacket cover and weatherproof finish.

4. AIR BALANCING 15250

8. Prime Mechanical Subcontractor to engage a recognized testing and balancing firm for this work.
9. Test all fire dampers, stops and flaps 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.
10. 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.
11. Set maximum and minimum flows for all new air handling equipment.

12. Arrange with Mechanical Subcontractor to have any necessary modifications performed at no extra cost to the City.
13. Provide three (3) written reports consisting of all testing and balancing data, system schematics showing device locations and air flows.

5. PLUMBING 15400

1. Supply and install fixtures indicated under contract documents to provide a complete and functional plumbing system. Provide complete functional plumbing system comprised of domestic water piping, vents, and sanitary drainage piping, etc. Connect all new building plumbing piping services to existing building services. Confirm and co-ordinate exact service connection locations, invert elevations, sizes, etc. on site with existing site conditions.
2. Use only lead free solders when joining piping components. Use 95.5 tin antinoy brazing solder on all hot and cold water piping. Use non-corrosive non-leaded flux.
3. All valves and fixtures shall be of one manufacturer. Standard of Acceptance Toyo (Red and White).
4. Provide access doors at all concealed cleanouts, valves and water hammer arrestors.
5. Install water hammer arrestors at each group of fixtures.
6. All water piping above ground inside building shall be type L hard copper – 3rd party certified.
7. Drains and vent piping below ground inside building shall be DWV copper, cast iron or PVC plastic pipe (where applicable by code). Joints shall be soldered for copper and solvent cement for PVC pipe.
8. Fixtures shall be white and complete with chrome trim, fixture stops shall be screwdriver type where exposed, wheel handle where concealed. Fixture List as per schedules.
9. Drains and vent piping below ground outside building shall be cast iron class 4000, or SDR-35 PVC plastic. Fittings shall be mechanical joist for cast iron or solvent cement for PVC.
10. Mechanical Subcontractor shall verify on site all connections points to existing services. Co-ordinate all new piping run routing on site with Contract Administrator.
11. Mechanical Subcontractor shall allow for in Bid quotation any additional labour, materials, etc. deemed necessary due to exact site conditions which have not been reflected in mechanical drawing or in mechanical specification. Notify Contract Administrator of all discrepancies prior to Bid close.
12. On completion, all piping systems shall be cleaned and flushed out to remove any foreign material in the piping.
13. Mechanical Subcontractor shall perform all required plumbing service hook ups to equipment being provided by others.
14. All plumbing fixtures, domestic hot water tank, etc. for building areas are all being supplied and installed by Plumbing Subcontractor including all plumbing service connection hook ups to equipment.

6. FIRE PROTECTION 15500

1. Provide fire extinguishers within washroom area and electrical room. Provide one 10 lb multi-purpose type fire extinguishers c/w wall mounting bracket in each washroom area and electrical room. Provide one additional 10 lb CD carbon dioxide fire extinguishers c/w wall mounting bracket within electrical room. All installations as per NFPA codes and regulations.

7. HEATING AND COOLING 15700

1. Supply and install all heating equipment, devices, etc. for a complete and fully operational system.
2. For equipment start-up, follow manufacturer's instructions and have manufacturer's representative present to certify the installation and procedures. Provide manufacturer's certification to O & M Manuals.
3. Mount all devices to permit ease of operation, service and replacement.
4. Maintain all required clearances as indicated on manufacturer's cut sheets and as required by code authority having jurisdiction.
5. Install all automatic control valves as supplied by Controls Division 15900.

8. VENTILATION 15800

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 and installation standards and requirements. Provide supply air, exhaust air, and return air duct systems from air handling fan coil units, exhaust fans, etc. as shown.
2. System shall include all ducts, fire dampers, transfer air openings, fans, balance dampers, grilles, diffusers and turning vanes indicated on drawings and as required by code.
3. Assist with air balancing as required (scaffolds ladders, operation, etc.).
4. Provide and install all automatic dampers as supplied by Division 15900 Controls.
5. Provide access doors on both sides of fire dampers, control dampers and all coils. Access doors constructed of 22-gauge material with flat iron framing complete with sash lock latching.
6. Provide acoustic insulation where indicated on drawings 1" thick, 3.0 lbs./ft. density fiberglass with Neoprene coating. Note: 2" thick for outdoor installation (Increase duct sizes accordingly).
7. Provide ULC labelled fire dampers and flaps where indicated on drawings and at all rated separations.
8. Provide splitter and quadrant dampers as indicated on drawings or as necessary to balance system and reduce objectionable noise. Balancing dampers shall be constructed from galvanized steel 2 gauges heavier than the ductwork in which they are installed c/w locking quadrant and indicating device.
9. Provide flexible connections at all air handling equipment.
10. Provide and install drip pans constructed of galvanized iron with soldered joints lined with mastic as required by drawings and equipment schedule.
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 duct system with water based approved sealant. All new ductwork shall be sealed using duct bond II high pressure, non-toxic duct sealer throughout all seams and joints.
14. This contractor shall supply and install all ductwork as shown including appurtenances, hangers, dampers, turning vanes, etc. all exposed round ductwork shall be round spiral conduit

constructed of zinc coated steel. Acceptable product: United Sheet Metal Co. Shop fabricated ductwork and fittings constructed in a manner similar to the factory type specified will be accepted.

<u>Conduit Size</u>	<u>Gauge of Metal</u>
8" and smaller	26
9" to 22"	24
24" to 36"	22

Rectangular ductwork shall be constructed from galvanized sheet metal of the following U.S. standard gauges.

Ducts up to 12" on longest dimension 26 GA.
Ducts 13" to 28" on longest dimension 24 GA.
Ducts 29" to 48" on longest dimension 22 GA.

9. CONTROLS

1. All controls shall be supplied by this section. Provide all wiring diagrams for line voltage wiring by Division 16 Electrical Subcontractor. Coordinate all requirements of Div. 16 with Electrical Subcontractor prior to submitting bid.
2. All thermostats in exposed areas shall be complete with lockable Lexcan vandal resistant guards. Thermostats shall be 7-day programmable with night set back functions, sub-bases and 3-hour override function. Thermostat to be complete with remote sensor device c/w lockable vandal proof metal cover.
3. Provide all control dampers for installation by Ventilation 15800 Subcontractor.
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. All wiring to meet Div.16 specification requirements as well as all applicable codes and by-laws.
7. Refer to drawings for sequence of operations of each system.

MECHANICAL EQUIPMENT

A. DOMESTIC HOT WATER HEATER & TANK SCHEDULE

Domestic hot water heater HWT-1 shall be Rheem/Ruud or approved equal in accordance with B7, model RE4 @ 3.3 imp. Gallons storage capacity c/w 1.5 kw electric heater, T & P relief valve piped to drain to funnel floor drain.

B. PLUMBING FIXTURE SCHEDULE

P-1 Water Closet

1. American Standard model 2093.100 Glenwall pressure assisted vitreous china wall mounted toilet c/w lined tank, tank cover with locking device, elongated bowl, open front, elongated seat & cover.
2. 3/8" c.p. angle supply pipe with screwdriver stop.
3. Zurn model Z-1203 fixture carrier.

P-2 Wall Hung Lavatory

1. Crane 1-208 Norwich 20x18 wall hung lavatory basin with supply opening on 4" centres and front overflow.
2. Delta Model 591T0225 electronic eye flush device (electric) c/w mixing valve mounted in Electrical Room.
3. Offset waste open grid assembly with 1 1/4" tailpipe.
4. Cambridge Brass 1 1/4" cast brass adjustable P trap with deep flange and C.O, chrome plated finish.
5. 1 pair of 3/8" angle C.P. supplies and R-19 C.P. angle stops, C.P. escutcheons.
6. Zurn wall mounted concealed arm carrier.
7. Water filler faucet shall be Delta model W 6685 wall mount bracket c/w Delta model gooseneck & Delta model gooseneck & Delta model W6629 valve with index button; Self-closing Gooseneck spout to be centred on lavatory.

P-3 Floor Drain

1. Zurn ZN-211B5, lacquered cast iron floor drain with type 'A' model bronze strainer

P-4 Funnel Floor Drain

1. Zurn ZN-211BF5 lacquered cast iron floor drain with oval funnel.

C. EXHAUST FAN SCHEDULE

Exhaust fan EF-1 shall be Greenheck or approved equal in accordance with B7, Model SP-7-00QD @ 95 CFM, 1000 RPM, 5/8" E.S.P. c/w 80 watt motor, motion detector switch control, integral grille, insulated exhaust ductwork, roof jack & two sets of backdraft dampers – one @ fan outlet & one @ roof jack (2 zones).

D. FAN COIL UNIT SCHEDULE

Fan coil unit FCP-1 shall be Lennox First Co. HXB-19, @ 600 cfm, c/w 1/8 hp. motor, 1/2" E.S.P., c/w 8 kw electric heating coil, plenum enclosure, heating/cooling programmable thermostat c/w sub-base. Thermostat c/w remote sensor device mounted within lockable vandal proof metal cover. (Thermostat mounted within electrical room – remote sensor mounted within washroom area.)

E. GRILLE SCHEDULE

Based on E.H. Price or approved equal in accordance with B7. All final colour selections to be confirmed with Contractor Administrator.

Type A – E.H. Price model CL-272S sidewall supply c/w balance damper

Type B – E.H. Price model F530 sidewall transfer air

Type C – E.H. Price model wire mesh transfer air c/w metal frame border

Louvers shall be Air-O-Lite model K609 c/w birdscreen.

- END OF SECTION -