

PART 1 - GENERAL

1.1 DESCRIPTION OF SYSTEMS

- .1 Provide complete plumbing system including:
 - .1 Compressed air piping systems including specialties and accessories.
- .2 Do all work in accordance with the 2010. Canadian Plumbing Code and the local authorities having jurisdiction.
- .3 Confirm that a minimum 50mm clearance is maintained between finished piping, including insulation.
- .4 Provide piping sleeves for piping penetrating concrete floor slabs and walls.

1.2 RELATED SECTIONS

- .1 Submittal Procedures: Section 01 33 00
- .2 Closeout Submittals: Section 01 78 00

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .2 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model

production.

.5 Certification of compliance to applicable codes.

.3 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

1.4 RELATED WORK PERFORMED BY THIS SECTION

.1 Cutting and Patching:

.1 Cutting of all openings in concrete floors and walls and patching for mechanical work included in Division 22 will be the responsibility of Division 22, unless otherwise indicated on the structural drawings.

1.5 FIXTURES AND FITTINGS

.1 Equipment assemblies comprised of electro- mechanical components to be CSA approved where possible and bear the appropriate label. If the equipment in question is not CSA approved as an assembly, the manufacturer will arrange and pay for spot approval and labelling of the equipment prior to installation.

1.6 EQUIPMENT INSTALLATION

.1 Provide unions and flanges to permit equipment maintenance and disassembly and to minimize disturbance to piping systems without interfering with other equipment.

.2 Provide means of access for servicing equipment including permanently lubricated lifetime bearings.

.3 Pipe equipment drains and condensate drains to drains.

.4 Install equipment, rectangular cleanouts and similar items parallel to or perpendicular to building lines.

1.8 ANCHOR BOLTS AND TEMPLATES

.1 Supply anchor bolts and templates as required.

1.9 TRIAL USAGE

.1 Departmental Representative may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

<u>1.10 PROTECTION OF OPENINGS</u>	.1	Protect equipment and systems openings from dirt and other foreign materials with materials appropriate to system.
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<u>1.11 EQUIPMENT SUPPORTS</u>	.1	Equipment supports supplied by equipment manufacturer: specified elsewhere in Division 22.
	.2	Equipment supports not supplied by equipment manufacturer: fabricate from structural grade steel. Submit structural calculations with shop drawings.
	.3	Pipe hangers to be as specified in Division 23.

<u>1.12 SLEEVES</u>	.1	Pipe sleeves: <ul style="list-style-type: none">.1 Through masonry, concrete or fire rated assemblies: nominal 0.912mm (20 ga.) galvanized steel..2 Through foundation walls: Schedule 40 steel pipe with annular in continuously welded at midpoint of wall..3 Provide 25mm clearance all around service piping, ducting or insulation for building settlement/movement.
	.2	Terminate pipe sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25mm above other floors.
	.3	Fill voids around pipes: <ul style="list-style-type: none">.1 Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof, fire retardant, non- hardening mastic..2 Where sleeves pass through walls or floors, provide space for firestopping to maintain fire rating integrity..3 Where sleeves pass through interior walls not fire-rated, provide acoustic caulking..4 Ensure no contact between copper tube or pipe and ferrous sleeve..5 Fill future-use sleeves with lime plaster or other easily removable filler..6 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CAN/CGSB- 1.181.

1.13 PREPARATION
FOR FIRESTOPPING

- .1 Firestopping material and installation within annular space between pipes, ducts, insulation and adjacent fire separation.
- .2 Uninsulated unheated pipes not subject to movement: no special preparation.
- .3 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe to move without damaging firestopping material.
- .4 Insulated pipes: cut back insulation at fire separation to allow proper firestopping.
- .5 Firestopping material for piping and duct penetrations to be approved by Departmental Representative.

1.14 ESCUTCHEONS

- .1 Use on pipes passing through walls, partitions, floors and ceilings in finished areas.
- .2 Chrome or nickel plated brass or Type 302 stainless steel, one piece type with set screws.
- .3 Outside diameter to cover opening or sleeve.
- .4 Inside diameter to fit around finished pipe.

1.15 TESTS

- .1 Give 24 hour written notice of date for tests.
- .2 Insulate or conceal work only after testing and approval by Departmental Representative.
- .3 Conduct tests in presence of the Departmental Representative.
- .4 Bear costs including retesting.
- .5 Piping:
 - .1 General: maintain test pressure without loss for two (2) hours unless otherwise specified.
 - .2 Test drainage, waste and vent piping to the National Building Code, the Canadian Plumbing Code, and the authorities having jurisdiction.
 - .3 Test compressed air piping at 1-1/2 times system operating pressure or minimum 862 kPa, whichever is greater.
- .6 Equipment: test as specified in relevant sections.

- .7 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures or test medium.

1.16 PAINTING

- .1 Apply at least one (1) coat of corrosion resistant primer paint to ferrous supports and site fabricated work.
- .2 Prime and touch up marred finished paintwork.
- .3 Finishes which have been damaged too extensively to be merely primed and touched up to be painted.
- .4 Painting to be approved by Departmental Representative.

1.18 DIELECTRIC COUPLINGS

- .1 General:
 - .1 To be compatible with and to suit pressure and temperature rating of piping system.
 - .2 Where pipes of dissimilar metals are joined.
- .2 Pipes 50mm (NPS 2) and under: isolating unions.
- .3 Pipes 63mm (NPS 2-1/2) and over: isolating flanges.

1.19 DRAIN VALVES

- .1 Locate at low points and at section isolating valves unless otherwise specified.
- .2 Minimum 19mm (NPS 3/4) unless otherwise specified: bronze, ball valve with hose end male thread, complete with cap and chain.
- .3 No water from any drain or relief valve shall discharge on the floor. Pipe drains to hub drains or funnel floor drains.

1.20 OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble- shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .2 Provide demonstrations and instructions in conjunction with the appropriate equipment manufacturer's representatives.

- .3 Use operation and maintenance manual, record drawings, audio visual aids, etc. as part of instruction materials.
- .4 Give instructions in maintenance and operating of the following equipment by factory trained personnel and for the time period specified. The time specified does not include the time for start-up of systems and equipment:
 - .1 Give instruction on the operation and maintenance of all mechanical components including but not limited to pumps, fixtures and domestic hot water system. The instruction period will be for a period of not less than two (2) working days. Review with instructors for an additional 90 days after the acceptance of the building by the Departmental Representative.
 - .2 Where more detailed instructions for some equipment or systems are called for in other sections of the specifications, those sections of the specifications will take precedence over this section.

1.21 OPERATION AND
MAINTENANCE MANUAL

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 Closeout Submittals.
- .2 Operation and maintenance manual to be approved by and final copies deposited with Departmental Representative before final inspection.
- .3 Operation data to include:
 - .1 Description of each system and its controls.
 - .2 Operation instruction for each system and each component.
 - .3 Description of actions to be taken in event of equipment failure.
 - .4 Valve schedule and flow diagram.
 - .5 Colour coding chart; identification system.
- .4 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .5 Performance data to include:
 - .1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.

- .3 Special performance data as specified elsewhere.
- .4 Refer to Paragraph 1.27 this Section.

- .6 Additional data: Prepare and insert into operation and maintenance manual when need for same becomes apparent during demonstrations and instructions specified above.

1.22 RECORD DRAWINGS

- .1 Refer to Paragraph 1.27 this Section.

1.23 WARRANTIES

- .1 Make good all defects other than normal wear and tear during the life of the warranty period. Warrant all work and installed equipment to operate quietly and satisfactorily and to accomplish the Work for which it was installed during the life of the warranty. At any time during this period, make any necessary changes and adjustments, or replacements, to accomplish this at no additional cost to the project.
- .2 Submit written extended Warranties in Maintenance Manual.

1.24 PERMITS AND REGULATIONS

- .1 Comply with all regulations and authorities having jurisdiction where applicable, including but not limited to the following:
 - .1 Department of Labour and Workforce Development.
 - .2 Fire Marshall.
 - .3 Plumbing Inspector.
 - .4 Provincial Board of Insurance Under-writers.
 - .5 National Building Code.
 - .6 Occupational Health & Safety Act.
- .2 Obtain and pay for any permits required by local codes and regulations and arrange for inspections applicable.
- .3 Any additional materials or labour required to conform to any of these rules and regulations will be furnished under the Contract with no additional cost to the project.

1.25 REFERENCE STANDARDS

- .1 Use the following latest editions and amendment of reference standards in effect on date of tender call:

ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration & Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
AST	American Society of Testing & Materials Welding Society
AWS	American
AWWA	American Water Works Association
CEMA	Canadian Electrical Manufacturers Association
CGSB	Canadian Government Specification Board
CFUA	Canadian Fire Underwriters' Association
CHVAC	Canadian Heating, Ventilation & Air Conditioning Code (NCR) Fire Underwriters
CMB	Construction Materials Board
CSA	Canadian Standards Association
CUA	Canadian Underwriters Association
HRA	Heating, Refrigeration & Air Conditioning Institute of Canada
NBC	National Building Code of Canada
NBFU	National Board of Fire Underwriters'
NBS	National Bureau of standards
NFPA	National Fire Protection Association
TIMA	Thermal Insulation Manufacturers Association
UL	Underwriters' Laboratories
ULC	Underwriters' Laboratories of Canada

<u>1.26 ELECTRICAL</u>	.1	Electrical Work to conform to Division 26 including the following: .1 Control wiring and conduit is specified in Division 26. Refer also to Division 26 and for wiring associated with control systems.
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<u>1.27 CLOSEOUT SUBMITTALS</u>	.1	Submit in accordance with Section 01 78 00 - Closeout Submittals.
	.2	Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
	.3	.1 Operation and maintenance manual approved by, and

final copies deposited with, Departmental Representative before final inspection.

- .4 .1 Operation data to include:
- .5 .1 Control schematics for systems including environmental controls.
- .6 .2 Description of systems and their controls.
- .7 .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .1 Operation instruction for systems and component.
 - .2 Description of actions to be taken in event of equipment failure.
 - .3 Valves schedule and flow diagram.
 - .4 Colour coding chart.
- .1 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .2 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .4 Testing, adjusting and balancing reports as specified.
- .3 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
 - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .4 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .5 Site records:
 - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for

- each service.
- .4 Make available for reference purposes and inspection.
- .6 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows:
 - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
 - .3 Submit to Departmental Representative for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .7 Submit copies of as-built drawings for inclusion in final TAB report.

1.28 MAINTENANCE
MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers.

1.29 DELIVERY,
STORAGE AND
HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan Waste Reduction Workplan related to Work of this Section.

- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PAINTING REPAIRS AND RESTORATION

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Repair finishes which have been damaged.
- .3 Painting and repairs to be approved by Departmental Representative.

3.3 SYSTEM CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling equipment.

3.4 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports.

3.5 DEMONSTRATION

- .1 Departmental Representative may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .4 Instruction duration time requirements as specified in appropriate sections.
- .5 Departmental Representative may record these demonstrations on video tape for future reference.

3.6 CLEANING

- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Waste Management: separate waste materials for reuse and recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

<u>3.7 PROTECTION</u>	.1	Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.
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