

**Part 1 General**

**1.1 RELATED GENERAL PROVISION**

- .1 This section covers items common to all sections of Division 22 and is intended only to supplement the requirements of Division 1.

**1.2 DESCRIPTION OF WORK**

- .1 Work under this division covers all labour, materials and equipment required for installing and placing in operation the mechanical systems as specified herein and as shown on the drawings.

**1.3 RESPONSIBILITY FOR TRIAL USAGE**

- .1 Obtain written permission from Departmental Representative to start and test permanent equipment and equipment and systems prior to acceptance by Owner.
- .2 Comply with the requirements of Departmental Representative in connection with the use of these systems and equipment.
- .3 Such use of permanent equipment and systems shall in no way prejudice the period of guarantee of all equipment and systems which shall commence upon the acceptance of the building by the Owner as substantially complete.
- .4 Owner may use equipment and systems for test purposes prior to acceptance. Supply labour, materials and instruments required for testing.
- .5 Such tests shall not be construed as evidence of acceptance of any part of the contract and it is agreed and understood that no claim for damage will be made for any injury or breakage to any part or parts of the tested equipment due to the aforementioned tests.

**1.4 EXAMINATION OF SITE AND DRAWINGS**

- .1 Examine the site and local conditions affecting the work of this contract prior to submitting tender.
- .2 Examine the mechanical drawings and determine that the work under this contract can be carried out without changes to the building as it is shown on these drawings.
- .3 Before commencing any work, examine the work of other trades and report at once any defects or interference affecting the work of this division.
- .4 Notes on the drawings are intended to form a part of this specification.
- .5 The mechanical drawings do not show all structural details of the building. Any information involving accurate dimensions of the building shall be taken from the figured dimensions on the architectural drawings or by measurements taken on site.

- .6 The contractor shall make, without additional charge, any necessary changes to accommodate structural conditions as built or existing.
- .7 As work progresses and before installing fixtures, fittings, or equipment which may interfere with the interior treatment or use of the building, consult with the Departmental Representative on the exact location of such equipment.
- .8 The drawings indicate the general location and route of pipes, ducts, etc. Where required piping, etc., are not shown, or shown diagrammatically, they shall be installed to conserve head room and space.
- .9 The plans do not necessarily show all valves, unions, etc. The Contractor shall not avail himself to these obvious omissions but shall install the work complete in essential details that it will function properly and so that repairs or removal of equipment can easily be accomplished.
- .10 The drawings are intended to serve as a guide to the Contractor. The number, location and distribution of electrical services must be located on site.
- .11 Bidders finding discrepancies in, or omissions from the drawings, specifications, or other documents, or having any doubts as to the intent or meaning of any part thereof, shall immediately notify the Departmental Representative who will send written instructions or explanations to all bidders. Neither the Consultant, the Departmental Representative or the Owner will be responsible for oral instructions.

## **1.5 COOPERATION OF CONTRACTORS**

- .1 Coordinate the mechanical work with the work of other trades to facilitate the progress of the work as a whole.
- .2 Any change in the work or schedule caused by failure to coordinate trades shall not be considered as a claim for extra compensation.

## **1.6 CHANGES AND EXTRAS**

- .1 No change to the drawings and specifications will be accepted, if not authorized in writing by the Departmental Representative.
- .2 All work carried out which does not conform to the plans and specifications shall be corrected at the Contractor's expense.
- .3 The Owner reserves the right to change quantity, quality, or any kind of work or equipment described on the drawings or in the specifications without affecting the validity of the contract
- .4 Monetary adjustments required by such changes shall be accepted in writing by the Departmental Representative before alterations are proceeded with by the Contractor.

## **1.7 LAWS AND ORDINANCES**

- .1 All work performed under this division shall comply with the requirements of the authorities having jurisdiction, including, but not limited to, the following: Provincial Department of Labour, Provincial Department of Environment, Provincial Fire Marshall, Provincial Board of Insurance Underwriters, Provincial Department of Health, Plumbing Inspector, Building Inspector, National Building Code of Canada, Local and Municipal By-Laws and Canadian Standards Association.

## **1.8 GUARANTEE**

- .1 All mechanical work and equipment shall be guaranteed to work satisfactorily for a period of one year from the date of acceptance of substantial completion of the contract, provided any failure is not due to neglect or improper use by the Owner.
- .2 Any certificate given, payment made, partial or entire use of the equipment by the Owner, shall not be construed as acceptance of defective work or improper materials.
- .3 This general guarantee shall not act as a waiver of any specified guarantee for any greater length of time.

## **1.9 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 – Submittal procedures.
- .2 Shop drawings to show:
  - .1 Mounting arrangements.
  - .2 Operating and maintenance clearances.
- .3 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.
- .4 Closeout Submittals:
  - .1 Provide operation and maintenance data for incorporation into manual.
  - .2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
  - .3 Operation data to include:
    - .1 Control schematics for systems including environmental controls.
    - .2 Description of systems and their controls.
    - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
    - .4 Operation instruction for systems and component.
    - .5 Description of actions to be taken in event of equipment failure.

- .6 Valves schedule and flow diagram.
- .7 Colour coding chart.
- .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 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.
- .6 Approvals:
  - .1 Submit 3 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.
- .7 Additional data:
  - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .8 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.
- .9 As-built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing for plumbing, 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 plumbing using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.10 Submit copies of as-built drawings for inclusion in final TAB report.

#### **1.10 PERMITS AND TAXES**

- .1 This Contractor shall apply for and pay all necessary municipal permits. All Provincial and Municipal taxes shall be included in the tendered amount. He shall arrange for all inspections of work by these authorities.
- .2 All materials and labour required to conform to any or all of the regulations imposed by the authorities having jurisdiction over the contract shall be included by the Contractor in his tender. There shall be no additional charges to the Owner.

#### **1.11 STAGING**

- .1 This contractor shall supply all staging and equipment necessary for the installation of his work.

#### **1.12 LABOUR AND WORKMANSHIP**

- .1 All tradesmen employed by this Contractor for this work shall be properly licensed journeymen and apprentices qualified to do work in each particular trade. The Departmental Representative shall have the right to examine each man's credentials and order any unqualified personnel away from the project.
- .2 This Contractor shall be completely responsible for the proper execution of the work as outlined in the plans and specifications. This Contractor shall assume responsibility for workmanship and material defects whether or not they are discovered by the Departmental Representative.

#### **1.13 DEFFICIENCY LISTS**

- .1 The Departmental Representative will notify this Contractor at various intervals of defective workmanship or installation deficiencies, etc. This Contractor shall not request revised or updated lists without first submitting a current detailed, item by item report on the status of all deficiencies as reported to the Contractor on a previous listing.
- .2 When the Contractor notifies the Departmental Representative that the contract is ready for final inspection, a comprehensive deficiency listing will be prepared. If such list exceeds twenty (20) items, the contract shall not be considered ready for final inspection and the Architect/ Departmental Representative need to furnish the Contractor with such listing.

#### **1.14 METRIC DESIGNATION OF NOMINAL PIPE SIZES**

- .1 For the purposes of this contract only, pipes and tubes shown in this specification and on accompanying drawing(s) have been given metric nominal sizes in accordance with the following table:

ins.	Mm	ins.	mm	ins.	mm	ins.	mm
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1/4	6	2-1/2	65	15	375	36	900
5/16	8	3	75	16	400	39	975
3/8	10	3-1/2	90	18	450	40	1000
1/2	12	4	100	20	500	44	1100
5/8	16	5	125	21	525	48	1200
3/4	20	6	150	22	550	52	1300
7/8	22	7	175	pl.	560	56	1400
1	25	8	200	24	600	60	1500
1-1/8	28	9	225	pl.	630	64	1600
1-1/4	32	10	250	26	650	72	1800
1 3/8	35	11	275	27	675	then by multiples of 200 mm to 4000 mm	
1-1/2	40	pl.	280	28	700		
1-5/8	41	12	300	pl.	710		
1-3/4	44	pl.	315	30	750		
1-7/8	47	14	350	32	800		
2	50	pl.	355	33	825		

PL. – listed in CGSB.41 – Plastic Series.

- .2 It should be understood by all concerned that there is no intended physical change in the sizes of pipes, tubes, fittings, valves and screw threads. They are simply given a metric nominal designation.
- .3 Pipe thread sizes will be designated as they have been in the past: e.g. 2" NPT means a two inch tapered pipe thread, to ANSI B2.1, pipe threads, specification.

## 1.15 METRIC SYMBOLS

- .1 All metric symbols used in this specification and on the accompanying drawings are those used in National Standard of Canada, CAN3-Z234.1-79, Canadian Metric Practice Guide.

## 1.16 METRIC DESIGNATION OF SHEET METAL GAUGES

- .1 For the purpose of this contract only, sheet metal gauges shown on this specification and on the accompanying drawing(s) are given in millimeter thicknesses in accordance with the following table of gauge equivalents:

Nominal Thickness in mm	Hot or Cold Rolled Steel	Stainless Steel	Galvanized Steel	Aluminium
0.4	28	28	30	26
0.5	26	26	28	24
0.6	24	24	26	22
0.8	22	22	22 to 24	20
1	20	20	20	18
1.2	18	18	18	16
1.5	16	16	16	14
2	14	14	14	12

2.5	12			10
3		12	12	
3.5	10	10		8
4	8			6
4.5		8		

Metric Sheet Metal Products:

The above noted table indicates the metric nomenclature which replaces the gauge numbers of those metal sheets commonly used in construction.

**1.17 MAINTENANCE**

- .1 Furnish spare parts as follows:
  - .1 One set of packing for each pump.
  - .2 One casing joint gasket for each size pump.
  - .3 One glass for each gauge glass.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers.
- .3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

**Part 2 Products**

**2.1 MATERIALS**

- .1 All materials used in this project must be purchased directly through jobbers, manufacturers' agent, wholesalers and suppliers having an established office in the Maritime Provinces and purchased through Maritime representatives. By submitting a tender, this contractor acknowledges this responsibility.

**2.2 STANDARD OF ACCEPTANCE**

- .1 Means that item named and specified by catalogue number forms part of specification regarding performance, quality of materials and workmanship.
- .2 Tender price shall be based upon materials as specified. Manufacturer's products that are not named in the specifications must receive approval from the Departmental Representative prior to the tender closing date.
- .3 All designs are based on units numbered in schedules on drawings or stated as being "basis of design" in the spec. If approved equal is chosen, contractor shall be responsible for any and all modifications required to make unit fit, including but not limited to mechanical, electrical, architectural and structural modifications.

**2.3 MOTORS**

- .1 Provide motors for mechanical equipment as specified.

- .2 If delivery of specified motor will delay delivery or installation of any equipment, install motor approved by Departmental Representative for temporary use. Final acceptance of equipment will not occur until specified motor is installed.
- .3 Motors under 1/2 HP: speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 115 V, unless otherwise specified or indicated.
- .4 Motors 1/2 HP and larger: EEMAC Class B, high efficiency squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40°C. Power supply voltage and phases as indicated on drawings.

## **2.4 BELT DRIVES**

- .1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.
- .2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise specified.
- .3 For motors under 10 HP: standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.
- .4 For motors 10 HP and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.
- .5 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.
- .6 Motor slide rail adjustment plates to allow for centre line adjustment.

## **2.5 GUARDS**

- .1 Provide guards for unprotected drives.
- .2 Guards for belt drives:
  - .1 Expanded metal screen welded to steel frame.
  - .2 Minimum 1.2 mm thick sheet metal tops and bottoms.
  - .3 38 mm dia holes on both shaft centres for insertion of tachometer.
  - .4 Removable for servicing.
- .3 Provide means to permit lubrication and use of test instruments with guards in place.
- .4 Install belt guards to allow movement of motors for adjusting belt tension.
- .5 Guard for flexible coupling:
  - .1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
  - .2 Securely fasten in place.
  - .3 Removable for servicing.



- .6 Unprotected fan inlets or outlets:
  - .1 Wire or expanded metal screen, galvanized, 19 mm mesh.
  - .2 Net free area of guard: not less than 80% of fan openings.
  - .3 Securely fasten in place.
  - .4 Removable for servicing.

## **2.6 EQUIPMENT SUPPORTS**

- .1 Equipment supports supplied by equipment manufacturer: specified elsewhere in Division 22.
- .2 Mount base mounted equipment on chamfered edge housekeeping pads, minimum of 100 mm high and 50 mm larger than equipment dimensions all around.
- .3 Supply anchor bolts and templates for installation by other division.

## **2.7 SLEEVES**

- .1 Pipe sleeves: at points where pipes pass through masonry, concrete or fire rated assemblies and as indicated.
- .2 Schedule 40 steel pipe.
- .3 Sleeves with annular fin continuously welded at midpoint:
  - .1 Through foundation walls.
  - .2 Where sleeve extends above finished floor.
- .4 Sizes: minimum 6 mm clearance all around, between sleeve and uninsulated pipe or between sleeve and insulation.
- .5 Terminate sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25 mm above other floors.
- .6 Fill voids around pipes:
  - .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. Where pipes/ducts pass through fire rated walls, floors and partitions, maintain fire rating integrity.
  - .3 Ensure no contact between copper tube or pipe and ferrous sleeve.
  - .4 Fill future-use sleeves with lime plaster or other easily removable filler.
  - .5 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CGSB 1-GP-181M+Amdt-Mar-78.

## **2.8 FIRESTOPPING**

- .1 All penetrations through all fire separations (Wall and floor penetrations) are to be fire stopped.

- .2 All firestopping by general contractor with the exception of mechanical firestopping as specified elsewhere in Division 22.
- .3 Mechanical contractors to coordinate number, size and locations of openings with general contractor.

## **2.9 ESCUTCHEONS**

- .1 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.

## **2.10 SPECIAL TOOLS AND SPARE PARTS**

- .1 Provide one set of special tools required to service equipment as recommended by manufacturers.
- .2 Identify spare parts containers as to contents and replacement parts number.

## **2.11 ACCESS DOORS**

- .1 Supply access doors to concealed mechanical equipment for operating, inspecting, adjusting and servicing.
- .2 Flush mounted 600 x 600 mm for body entry and 300 x 300 mm for hand entry unless otherwise noted. Doors to open 180°, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.
- .3 Material:
  - .1 Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by Departmental Representative.
  - .2 Remaining areas: use prime coated steel.
- .4 Installation:
  - .1 Locate so that concealed items are accessible.
  - .2 Locate so that hand or body entry (as applicable) is achieved.
  - .3 Installation is specified in applicable sections.

## **2.12 DIELECTRIC COUPLINGS**

- .1 General:
  - .1 To be compatible with and to suit pressure rating of piping system.
  - .2 Where pipes of dissimilar metals are joined.
- .2 Pipes 50 mm and under: isolating unions.

- .3 Pipes 65 mm and over: isolating flanges.

## **2.13 DRAIN VALVES**

- .1 Locate at low points and at section isolating valves unless otherwise specified.
- .2 Minimum 20 mm unless otherwise specified: bronze, with hose end male thread and complete with cap and chain. Refer to specifications in relevant sections.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Unions or flanges: provide for ease of maintenance and disassembly.
- .2 Space for servicing, disassembly and removal of equipment and components: provide as recommended by manufacturer or as indicated.
- .3 Equipment drains: pipe to floor drains.
- .4 Install equipment, rectangular cleanouts and similar items parallel to or perpendicular to building lines.
- .5 Provide accessible means for lubricating equipment including permanent lubricated bearings.
- .6 A minimum clearance of 2.2 m shall be maintained unless otherwise stated or impossible to achieve. Where headroom will be less than 2.0 m from the finished floor, pipe or duct runs shall be approved by the Departmental Representative.

### **3.2 PROTECTION**

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.
- .2 protect all equipment, piping, fixtures, ductwork, etc. throughout the construction period and assume responsibility for the same.

### **3.3 CUTTING AND PATCHING**

- .1 Cutting and patching shall be the responsibility of the general contractor. Mechanical contractor to coordinate location of openings for mechanical equipment with general contractor.
- .2 If, however, cutting and patching is required to fix a defect and/or omission which is the responsibility of the Mechanical contractor, all cutting and patching costs required to fix this defect and/or omission shall be carried by the Mechanical contractor.

### **3.4 CONCEALMENT**

- .1 Unless otherwise shown or specified, all ducts and piping shall be run concealed in ceilings, walls, partitions, etc. Heating risers and water piping shall not be concealed in exterior walls without adequate thermal protection.

### **3.5 REMOVAL OF EQUIPMENT**

- .1 All equipment designated in later sections of this specification or on drawings as being turned over to Building Owners shall be placed in room as determined by Owners. This Contractor shall take every reasonable precaution to ensure that such equipment is kept in good condition.

### **3.6 ELECTRICAL**

- .1 Electrical work to conform to Division 26 including the following:
  - .1 Supplier and installer responsibility is indicated on electrical drawings and related mechanical responsibility is indicated on mechanical drawings.
  - .2 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 25. Refer to Division 26 for quality of materials and workmanship.

### **3.7 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 and ducts: ensure integrity of insulation and vapour barrier at fire separation.

### **3.8 TESTS**

- .1 Give 48 h 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 Departmental Representative.
- .4 Bear costs including retesting and making good.
- .5 Piping:
  - .1 General: maintain test pressure without loss for 4 h unless otherwise specified.
  - .2 Test drainage, waste and vent piping to National Building Code and authorities having jurisdiction.

- .3 Test domestic hot, cold and recirculation water piping at 1-1/2 times system operating pressure or minimum 860 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.

### **3.9 PAINTING**

- .1 Apply at least one coat of corrosion resistant primer paint to ferrous supports and site fabricated work.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched up.
- .4 Any piping, ductwork equipment, etc, which needs to be painted as part of the contract shall be painted by the general contractor. It is the Mechanical Contractor's responsibility to supply the list of equipment to be painted to the general contractor prior to tender closing.
- .5 Refer to section 09 91 00 – Painting.

### **3.10 CLEANING**

- .1 Clean interior and exterior of all systems including strainers.
- .2 In preparation for final acceptance, clean and refurbish all equipment and leave in operating condition including replacement of all filters in all air and piping systems.

### **3.11 EXISTING SYSTEMS**

- .1 Connections into existing systems to be made at time approved by Departmental Representative. Request written approval of time when connections can be made.
- .2 Be responsible for damage to existing plant by this work.

### **3.12 COMMISSIONING**

- .1 All contractors shall be available for commissioning process described in section 25 01 11 – EMCS: Start-up, Verification and Commissioning.
- .2 All bugs relating to mechanical equipment shall be fixed during commissioning process so that commissioning can be completed in a timely fashion. All deficiencies shall be fixed at no extra cost.
- .3 Contractor shall perform any and all test on their own equipment as required by manufacturer and as described in equipment's relevant section in order to ensure that their equipment is functioning properly prior to EMCS commissioning.

**3.13 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS**

- .1 Departmental Representative will 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 required as part of instruction materials.
- .4 Instruction duration time requirements as specified in appropriate sections.
- .5 Departmental Representative will record these demonstrations on video tape as required for future reference.
- .6 Where specified elsewhere in Division 22, manufacturers to provide demonstrations and instructions.

**END OF SECTION**