

1. GENERAL

1.1 Intent

- .1 Provide complete, fully tested and operational mechanical systems to meet requirements described herein and in complete accord with applicable codes and ordinances.
- .2 Contract Documents and Drawings of this Division are diagrammatic and approximately to scale unless detailed otherwise. They establish scope, material and installation quality and are not detailed installation instructions.
- .3 Follow manufacturer's recommended installation details and procedures for equipment, supplemented by requirements of Contract Documents.
- .4 Install equipment generally in locations and routes shown, close to building structure with minimum interference with other services or free space. Remove and replace improperly installed equipment to satisfaction of the Contract Administrator at no extra cost.
- .5 Install equipment to provide access and ease of maintenance.
- .6 Connect to equipment specified in other Sections and to equipment supplied and installed by other Contractors or by the City. Uncrate equipment, move in place and install complete; start-up and test.

1.2 Materials

- .1 Materials and equipment installed shall be new, full weight and of quality specified.
- .2 Each major component of equipment shall bear manufacturer's name, address, catalog and serial number in a conspicuous place.

1.3 Availability of Equipment and Materials

- .1 Make known in writing to the Contract Administrator ten (10) days prior to the tender closing date any materials specified that are required to complete the work which are not currently available or will not be available for use as called for herein. Failing to do so, it will be assumed that the most expensive alternate has been included in the tender price.

1.4 Metric Conversion

- .1 All units in this division are expressed in SI units.
- .2 Submit all shop drawings and maintenance manuals in SI units.
- .3 On all submittals (shop drawings etc.) use the same SI units as stated in the specification.
- .4 Equivalent Nominal Diameters of Pipes - Metric and Imperial:

- .1 Where pipes are specified with metric dimensions and Imperial sized pipes are available, provide equivalent nominal Imperial sized pipe as indicated in the table, and provide at no extra cost adapters to ensure compatible connections to all metric sized fittings, equipment and piping.
- .2 When CSA approved SI Metric pipes are provided, the Contractor shall provide at no extra cost adapters to ensure compatible connections between the SI Metric pipes and all new and existing pipes, fittings, and equipment.

EQUIVALENT NOMINAL DIAMETER OF PIPES

mm	Inches	mm	Inches	mm	Inches
3	1/8	65	2-1/2	375	15
6	1/4	75	3	450	18
10	3/8	100	4	500	20
15	1/2	125	5	600	24
20	3/4	150	6	750	30
25	1	200	8	900	36
30	1-1/4	250	10	1050	42
40	1-1/2	300	12	1200	48
50	2				

1.5 Cutting and Patching

- .1 Provide holes and sleeves, cutting and fitting required for mechanical work. Relocate improperly located holes and sleeves.
- .2 Drill for expansion bolts, hanger rods, brackets, and supports.
- .3 Obtain written approval from the Contract Administrator before cutting or burning structural members.
- .4 Patch building where damaged from equipment installation, improperly located holes etc. Use matching materials as specified in the respective section.

1.6 Drawings and Specifications

- .1 Drawings and Specifications are complementary each to the other, and what is called for by one shall be binding as if called for by both.
- .2 Should any discrepancy appear between Drawings and Specifications which leaves the Contractor in doubt as to the true intent and meaning of the plans and Specifications, obtain a ruling from the Contract Administrator, before submitting a tender. If this is not done, it will be assumed that the most expensive alternate had been included.
- .3 Examine all Contract Documents, including all Drawings and Specifications, and work of other trades to ensure that work is satisfactorily carried out without changes to building.

1.7 Examination of Site

- .1 Before submitting tender, visit and examine the site and note all characteristics and features affecting the work. No allowances will be made for any difficulties encountered or any expenses incurred because of any conditions of the site or item existing thereon, which is visible or known to exist at the time of tender.

1.8 Coordination of Work

- .1 Cooperate and coordinate with other trades on the project.
- .2 Make reference to electrical, mechanical, process and structural drawings when setting out work. Consult with respective Divisions in setting out locations for equipment and piping, so that conflicts are avoided and symmetrical even spacing is maintained.
- .3 Where dimensional details are required, work with the applicable structural drawings.
- .4 Full size and detailed Drawings shall take precedence over scale measurements from Drawings.

1.9 Substantial and Total Performance

- .1 Prior to Substantial Performance Inspection, provide complete list of items, which are deficient at the time of the substantial performance inspection.
- .2 Perform the following items prior to Substantial Performance Inspection.
 - .1 Make systems capable of operation with alarm controls functional and automatic controls in operation generally, but not necessarily finally calibrated.
 - .2 Make necessary tests on equipment including those required by authorities. Obtain certificates of approval.
 - .3 Complete valve tagging and identify equipment. Paint equipment, piping and install escutcheons.
 - .4 Lubricate equipment as per manufacturer's data.
 - .5 Mail warranty forms to manufacturer. Provide copy of original warranty for equipment which has warranty period longer than one year.
 - .6 Submit Operating/Maintenance Manuals as per Section 01300.
- .3 Prior to Total Performance Inspection provide declaration in writing that deficiencies noted at time of substantial performance inspection have been corrected and the following items completed prior to the total performance inspection:
 - .1 Complete final calibration of controls.

- .4 The Contractor shall provide qualified personnel in appropriate numbers to operate the facility until substantial performance is declared.

1.10 Shop Drawings

- .1 Identify materials and equipment by manufacturer, trade name and model number. Include copies of applicable brochure or catalog material. Do not assume applicable catalogues are available in the Contract Administrator's office. Maintenance and operating manuals are not suitable submittal material.
- .2 Clearly mark submittal material using arrows, underlining or circling to show differences from specified, e.g. ratings, capacities and options being proposed. Cross out non-applicable material. Specifically note on the submittal specified features such as special materials or painting.
- .3 Include dimensional and technical data sufficient to check if equipment meets requirements. Include wiring, piping, and service connection data and motor sizes.
- .4 Installed materials and equipment shall meet specified requirements regardless of whether or not shop drawings are reviewed by the Contract Administrator.
- .5 Do not order equipment or material until the Contract Administrator has reviewed and returned shop drawing.
- .6 Prior to submission to the Contract Administrator, the Contractor shall review all shop drawings. By this review, the Contractor certifies that he has determined and verified all field measurements, field construction criteria, materials, catalogue numbers and similar data, and certifies that he has checked and coordinated each shop drawings with the requirements of the work of the Contract Documents. The Contractor's review of each shop drawing shall be indicated by stamp, date and signature of a responsible person.

1.11 Equipment Protection and Clean-Up

- .1 Protect equipment and materials in storage on site during and after installation until final acceptance. Leave factory covers in place. Take special precautions to prevent entry of foreign material into working parts of piping and duct systems.
- .2 Protect equipment with polyethylene covers and crates.
- .3 Thoroughly clean both existing and new piping, ducts and equipment of dirt, cuttings and other foreign substances.
- .4 Ensure that existing equipment is carefully dismantled and not damaged or lost. Do not reuse existing materials and equipment unless specifically indicated.

1.12 Temporary or Trial Usage

- .1 Temporary or trial usage by the City or Contract Administrator of mechanical equipment supplied under contract shall not represent acceptance.

- .2 Repair or replace permanent equipment used temporarily.
- .3 Repair or otherwise rectify damage caused by defective materials or workmanship during temporary or trial usage.

1.13 Ductwork Cleaning

- .1 Protect all existing supply, exhaust and return air openings with temporary filters (minimum 20% filters equal to Farr 20/20, 25 mm thick).
- .2 At completion of project, remove all temporary filters and replace all existing air handling unit filters. At the Contract Administrator's discretion, turn the air handling unit filters over to the City, rather than installing in the units.
- .3 If, in the Contract Administrator's opinion, the existing ductwork has been made dirty by completion of the project, vacuum duct systems as indicated by the Contract Administrator.

1.14 Electrical Motors

- .1 Supply mechanical equipment complete with electrical motors.
- .2 Provide motors designed, manufactured, and tested in accordance with the latest edition of the following codes and standards: NEMA, EEMAC, CSA, CEC Part 1, IEEE and ANSI. All motors to be CSA labelled. All motors to be approved for use in the designated area classification by the Provincial Electrical Protection Branch.
- .3 Unless specified otherwise, provide motors designed for full voltage starting, EEMAC Design B. Motors driving high torque or high inertia loads may be EEMAC Design C or D.
- .4 Provide motors rated for continuous duty with 1.15 service factor unless specified otherwise in the driven equipment specifications. Provide all motors with thermal overload protection.
- .5 Provide motors with complete nameplate data.
- .6 Provide motors with grease or oil lubricated anti-friction type ball or roller bearings.
- .7 Provide motors designed with Class B insulation; Class F insulation for totally enclosed motors.
- .8 Refer to electrical specifications, Division 16, for voltage, frequency, and phase data. This shall take precedence over any reference in Division 15.
- .9 Where motor power is stated in watts or kilowatts, nominal motor horsepower multiplied by 746 or 0.746 respectively, has been used as the conversion factor.
- .10 Minimum certified motor efficiency shall be as outlined in Manitoba Hydro's latest high efficiency motor incentives program, or the following table, whichever indicates the higher minimum efficiency.

MINIMUM EFFICIENCY (%) *

HP	3600 RPM	1800 RPM	1200 RPM	900 RPM
1	75.5	82.5	80.0	74.0
1.5	82.5	84.0	85.5	77.0
2	84.0	84.0	86.5	82.5
3	85.5	87.5	87.5	84.0
5	87.5	87.5	87.5	85.5
7.5	88.5	89.5	89.5	85.5

(*) As defined in CSA C390 or IEEE 112B Nominal Standards

1.15 Painting and Identification

- .1 Coordinate colour coding of piping and equipment with that of the existing plant. All piping and equipment is to be painted.
- .2 Colour code mechanical equipment, piping and exposed ductwork. Refer to colour schedule at end of this section.
- .3 Legend and direction of flow arrows shall consist of adhesive backed labels, yellow colour, with minimum 20 mm high black lettering equal to Brady System B-500, vinyl cloth labels for non-insulated surfaces; and Brady B 946 for insulated surfaces.
- .4 Identify piping with labels, colour bands, and flow arrows. Provide identification at 15 m maximum intervals, before and after pipes pass through walls, at all sides of tees, behind access doors and in equipment rooms as required.
- .5 Apply colour bands at both ends of the label with primary colour bands used to secure both ends of individual labels. Refer to colour schedule at end of this section.
- .6 Provide 20 mm diameter brass, with metal photo black numbers, or white lamacoid with black engraved numbers, secured to valve stem with key chain.

Provide neat, typewritten directories, giving valve number, services and location. Frame one copy under glass for wall mounting as directed, second copy to be forwarded to the City. Include copies in O & M Manuals.

- .7 Tag automatic controls, instruments and relays and match/key to control shop drawing identification numbers. Tag all equipment and control panels.
- .8 Identify electric starting switches, thermostats controlling motors, remote push button stations, and controls equipment supplied under this division with lamacoid plates having 6 mm minimum letter size. Identification to state equipment controlled.

1.16 Colour Coding Schedule

- .1 Colour numbers are called for in Canadian Government Specification No. 5-GP-1a. Colours assigned from CGSB 1-GP-12c for colour code identification. Follow the color coding/identification system utilized in the existing plant, where no system exists use the following:

MECHANICAL PRIMARY COLOURS FOR PIPE LINES/EQUIPMENT

- | | | |
|-----|------------|---------|
| .1 | Yellow | 505-102 |
| .2 | Light Blue | 502-106 |
| .3 | Green | 503-107 |
| .4 | Orange | 508-102 |
| .5 | Brown | 504-103 |
| .6 | Red | 509-102 |
| .7 | White | 513-101 |
| .8 | Aluminum | 515-101 |
| .9 | Purple | 501-101 |
| .10 | Grey | 501-107 |

SECONDARY COLOURS FOR BANDS

- | | | |
|----|--------|---------|
| .1 | Red | 509-102 |
| .2 | Orange | 508-102 |
| .3 | Blue | 502-106 |

BANDING

- | | | | |
|----|--------|---|--|
| .1 | Red | - | to indicate extremely hazardous material |
| .2 | Orange | - | to indicate mildly hazardous material |
| .3 | Blue | - | to indicate non-hazardous material |

.2 Identification Symbols and Colour for Piping

Service	Pipe Colour	Stripe Colour	Symbol
Potable water process piping			
Validation process piping			
Instrument Air piping			
Drains	Aluminum	Red/Orange	Drain
Vent	Aluminum	Red/Orange	Vent

.3 Mechanical Control Systems

- .1 Conduit pull boxes, terminal boxes and junction boxes - GREY Covers - GREY with black 'C'.
- .2 Main and secondary control panels, factory finish acceptable - control Contractor to install company label to identify.

1.17 Alternate Materials and Equipment

- .1 The price submitted for this Contract shall be based on the use of materials and equipment as specified or as contained within the acceptable manufacturers list.

- .2 Requests for approval for tendering purposes of equivalent materials or equipment shall be submitted in duplicate, to the Contract Administrator no later than seven (7) working days prior to the closing date of tender for mechanical trade, complete with all applicable technical data, including performance curves and physical details. Approval of requests shall only be given by addendum.
- .3 The Contractor shall, in his quotation, indicate the degree of approval obtained from the Contract Administrator. In the event that the product has been approved as "Alternate Only", this shall be stated in the quotation.
- .4 Approved equivalents and/or alternatives to specified products shall be equal to the specified product in every respect, operate as intended, meet the space, capacity, and noise requirements outlined.
- .5 The Contractor shall be fully responsible for any additional work or materials required by the trades or other Contractors to accommodate use of other than specified materials or equipment. Extras will not be approved to cover such work.

1.18 Acceptable Manufacturers/Suppliers

- .1 The following listed manufacturers and suppliers are acceptable for their ability to meet the general design intent, quality and performance characteristics of the specified product. The list does not endorse the acceptability of all products available from the listed manufacturers/suppliers.
- .2 It remains the responsibility of the Contractor to ensure the products supplied are equal to the specified products in every respect, operate as intended, and meet the performance specifications and physical dimensions of the specified product.
- .3 The Contractor shall be fully responsible for any additional work or materials, to accommodate the use of equipment from the acceptable manufacturers and suppliers list.
- .4 Submit within 14 days of Contract award a copy of the list underlining the name of the manufacturer whose price was carried in the tender. If no manufacturers names are submitted, it will be assumed that the price carried in the tender was that of the specified manufacturer or where the specified product is generic, the first acceptable manufacturer listed for each item and equipment.
- .5 List of acceptable Manufacturers/Suppliers:
 - .1 Flexible Connectors - Piping Flexonics, Tube Turn, Atlantic, Hyspan, Hydroflex, Metraflex, United Flexible, Mason
 - .2 Piping Hangers and Saddles Grinnell, Myatt
 - .3 Gate, Globe, Swing Check, Ball Valves Jenkins, Toyo, Crane, Kitz
 - .4 Plug Cocks DeZurik, Newman-Milliken

.5	Eccentric Plug Valves	DeZurik, Homestead
.6	Butterfly Valves	Jenkins, Keystone, DeZurik, Centreline, Monotight, Dresser, Lunkenheimer, Crane, Bray, Toyo, Grinnell
.7	Drain Valves	Jenkins, Dahl, Crane, Toyo, Kitz
.8	Grooved Mechanical Pipe Joints (only where permitted)	Victaulic, Mech Line
.9	Air Vents	Hoffman, Maid-O-Mist, Taco
.10	Diaphragm Type Shock Absorber Tank	Amtrol, Hamlet and Garneau Inc.,
.11	Piping and Duct Insulation	Fibreglass Canada, Manson, Knauf Fibreglass, Plasti-Fab, Manville
.12	Water Pressure Reducing Valves	Watts, Clayton, Singer, BCA, Cash Acme, Brankman
.13	Roof and Wall Mounted Fans	Greenheck, Ammerman, Powerline, ACME, Loren Cook, Penn, Jenn Fan, ILG, Carnes, Twin City
.14	Filters	Cambridge, AAF, Pacific, FARR
.15	Pressure Gauges	Trerice, Marsh, Ashcroft, Weiss
.16	Thermometers	Trerice, Marsh, Ashcroft, Winters
.17	Control Dampers	T.A. Morrison, Ruskin
.18	Backflow Preventers	Febco, Watts, Hersey, Singer
.19	Controls	Johnson Controls, Honeywell, Mikkelsen Coward

1.19 Tender Price Breakdown

- .1 Submit a tender price breakdown within thirty (30) days of tender closing and before first progress claim, in a format required by the Contract Administrator.

END OF SECTION