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**Part 1            General**

**1.1                RELATED SECTIONS**

- .1      Section 22 10 10 - Plumbing - Pumps.
- .2      Section 22 11 16 - Domestic Water Piping.
- .3      Section 22 13 17 - Drainage Waste and Vent Piping - Cast Iron and Copper.
- .4      Section 22 30 05 - Domestic Water Heater.
- .5      Section 22 42 01 - Plumbing - Specialities and Accessories.
- .6      Section 22 42 03 - Plumbing - Washroom Fixtures.

**1.2                REFERENCES**

- .1      National Research Council Canada (NRCC).
  - .1      National Building Code (CNB-2010).
  - .2      National Plumbing Code (CNP-2010).
  - .3      National Fire Protection Code (CNPI-2010).

**1.3                GENERAL**

- .1      The present specifications cannot necessarily specify in detail the design and construction of all the diverse elements and components as well as their installation. If missing information, the Contractor must observe generally accepted techniques and the manufacturer's recommendations.

**1.4                SUBMITTALS**

- .1      Submit documents and samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Shop Drawings and Technical Sheets:
  - .1      Submit shop drawings and technical sheets in electronic (pdf) format.
  - .2      Submit shop drawings and technical sheets for all equipment and sanitary fixtures in the project.
  - .3      The expression "Shop drawings" refers to drawings, schematics, illustrations, tables, performance graphs, and other documentation that must be supplied by the Contractor to describe in detail the element of Work referred to.
  - .4      Shop drawings must include the following information:
    - .1      Preparation and revision dates;
    - .2      Project name and number;
    - .3      The relevant section of the specifications pertaining to the equipment in question;
    - .4      The name and address of:
      - .1      The Contractor;

- .2 The sub-contractor;
  - .3 The supplier;
  - .4 The manufacturer.
  - .5 The shop drawings and technical sheets must show the following:
    - .1 Materials and fabrication details;
    - .2 Disposition or configuration, with dimensions, including those taken in the field;
    - .3 Operating and maintenance clearances, such as necessary spaces for access doors;
    - .4 Details pertaining to the installation and adjustment;
    - .5 Characteristics, such as force, flow rate, or capacity;
    - .6 Details pertaining to mechanical connections;
    - .7 Tables and performance curves indicating operating points;
    - .8 Reference norms;
    - .9 Operating weight;
    - .10 Technical details to allow for the performance of the submitted equipment to be evaluated.
    - .11 Material Safety Data Sheets (MSDS).
  - .6 Submit the following documents with the shop drawings and technical sheets:
    - .1 Detailed drawings of bases, supports, and anchor bolts;
    - .2 Manufacturer to certify current model production;
    - .3 Certification of compliance to applicable Codes.
  - .7 Submit the data sheets as required by the Health Canada/Workplace Hazardous Materials Information System (WHMIS). The sheets must be in conformity with the aforementioned system.
  - .8 Keep a copy of the shop drawings and technical sheets at the work site to be used for reference.
  - .9 The Contractor, in planning his work, must allow for a minimum of ten working days for the verification of the shop drawings by the Departmental Representative.
- .3 Erection Drawings:
- .1 General:
    - .1 Erection drawings consist of drawings drawn to scale, showing the position of equipment, conduits, piping, faucets, and others, with sections and details required, including dimensions of equipment, conduits and pipes, locations of ducts, openings, anchorages and supports, relative positions with structural, architectural, and other mechanical and electrical works, position of access doors, and clearances required for operation and maintenance.

- .2 Prepare and submit erection drawings in order to coordinate the work of the various trades of construction. Erection drawings are required for at least the following works:
  - .1 Plumbing work located in mechanical and electrical rooms, tunnels, wells, parking lots, etc.;
  - .2 Plumbing work located in places where space is congested with equipment such as corridors false ceilings and in raised floors;
  - .3 Expected ducts, openings drillings in walls, floors, roofs, beams, and columns;
  - .4 Anchors;
  - .5 All supports located in technical shafts;
  - .6 In places as described in plumbing specification sections;
  - .7 This clause is not restrictive. Erection drawings may be required in areas deemed necessary by the Departmental Representative.
- .3 Erection drawings must show clearly and precisely all the work involved, those of the discipline and those made by others.
- .2 Preparation:
  - .1 Prepare drawings at an appropriate scale, but never smaller than 1:50.
  - .2 Prepare erection drawings and coordinate with other mechanical and electrical trades.
  - .3 All erection drawings are to be prepared using the most recent version of AutoCAD in .DWG format, on paper or sepia, as required. The layers on the AutoCAD drawings for each sub-contractor must respect AICQ Standards.
- .3 Distribution of erection drawings:
  - .1 Provide plumbing erection drawings to Division 23 for inclusion into the global erection drawings. Revise and re-submit the drawings as required in order to ensure a proper coordination and to avoid incompatibilities.

## **1.5 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Manuals:
  - .1 Submit all closeout documents and attach them to the "Operating and Maintenance Manual".
  - .2 Supply the operation, maintenance and performance sheets and incorporate them into the "Operating and Maintenance Manual".
  - .3 The operation, maintenance and performance sheets must be verified by the Departmental Representative before the final inspection. Final copies to be conserved by the Representative.
  - .4 Operation sheets are to include:
    - .1 Description of systems and their controls.
    - .2 Operation instruction for systems and component.

- .3 Description of actions to be taken in event of equipment failure.
- .4 Valves schedule and flow diagram.
- .5 Colour coding chart.
- .5 Maintenance sheets are 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.
- .6 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 in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .7 The "Operating and Maintenance Manual" must also include the following:
  - .1 Shop drawings that have already been commented and corrected;
  - .2 The installation and position of all equipment, as installed in the project;
  - .3 The description and exact functioning, by steps, of all installed systems;
  - .4 The description of the point by point procedure for the start-up and shutdown of the installed systems to ensure a safe and reliable operation;
  - .5 A list of components liable to require replacement on a regular basis and indicate the frequency of replacement;
  - .6 A list of replacement parts, including the names, addresses and telephone numbers of the suppliers for every piece of equipment, motor, and the supplied and installed accessories. Include a reference to the appropriate specification article.
- .8 Approvals:
  - .1 Submit for approval to the Departmental Representative a preliminary copy of the "Operating and Maintenance Manual". Unless otherwise directed by the Departmental Representative, do not submit sheets individually.
  - .2 Perform the necessary modifications to the "Operating and Maintenance Manual" and resubmit it as directed by the Departmental Representative.
  - .3 Supply three final copies of the "Operating and Maintenance Manual".
- .9 Additional data:
  - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .10 The "Operating and Maintenance Manual" must be presented in a three-ring binder and must respect the order of the articles in the specifications.

- .11 Site records:
  - .1 Provide sets of 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 to reproducibles, revising reproducibles to show Work as actually installed.
  - .3 Make available for reference purposes and inspection.
- .3 As-built Drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing, 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".
  - .6 Submit one copy of each as-built and incorporate them into the final report detailing the tests, balancing and adjustment of the systems and installations.

## **1.6 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Site Meetings:
  - .1 Hold site meetings in accordance with 01 32 16.07 – Construction Progress Schedule – Bar Chart.
  - .2 Field quality control by the manufacturer as described in article FIELD QUALITY CONTROL in PART 3 must include site visits at the following steps:
    - .1 Once all products have been delivered and stored on-site and all preparatory work has been completed but before starting the installation of equipment detailed in the present section;
    - .2 Twice during the advancement of the project, once at 25% completion and another time at 60% completion;
    - .3 Once when all work and cleaning operations have been finished.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

- .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 a dry location and in accordance with manufacturer's recommendations in a clean, dry, and well-ventilated area.
  - .2 Store and protect from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **1.8 IMPLEMENTATION**

- .1 Location of Equipment and Materials:
  - .1 The drawings and specifications indicate in a schematic and approximate manner the location of equipment, ducts and pipes, etc. Before starting Work, verify exact dimensions and locations on-site and not on the drawings with a ruler.
  - .2 Install equipment, materials, and pipework in a manner that limits encumbrance and conserves the most amount of useable surface possible and this in accordance with the manufacturer's recommendations concerning safety, access, and maintenance.
  - .3 Inform the Departmental Representative of any problem that might be caused by the location of any equipment or material and proceed with the installation according to the Representative's instructions.
  - .4 If access doors are required to permit the access to or maintenance of a piece of equipment or material, obtain the approval of the Departmental Representative before proceeding with the installation. The supply and installation of access doors shall be performed at no additional cost.
  - .5 The location of devices and equipment may be modified at the demand of the Departmental Representative without additional cost or credit, on the condition that the position change does not exceed 5 m and that it is requested before Work has started.
- .2 Protection of Work during Execution:
  - .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.
  - .2 Ensure that finished work or work in progress is sufficiently protected. Any work damaged or altered due to lack of protection must be replaced or repaired at no additional cost according to the requirements of the Departmental Representative.
  - .3 All open extremities of pipes and conduits installed by the Contractor must be hermetically sealed in a manner that restricts dust and waste from entering during the execution of Work. All machineries must be protected with a polyethylene cover against dust and adverse conditions.

## **1.9 COORDINATION OF WORK**

- .1 Each specialist contractor must examine all the construction drawings and all other documentation released after the awarding of the Contract, but before proceeding with the installation of equipment, to ensure that the equipment relevant to their discipline may be installed at the location indicated on the drawings without hindering the installation of equipment from other disciplines.
- .2 Particular attention should be paid to equipment that is to be surface mounted or hung from the ceiling, as well as pipe risers in shafts or pipes installed on the surface or inside walls. Equipment that must remain accessible must be installed in a manner that their access is not hindered by other equipment, ventilation ducts, or inaccessible ceilings. Verify the depth of recessed equipment in the walls or ceilings to properly coordinate their installation.
- .3 Particular attention should be paid to pipes and equipment located in areas considered patrimonial. The installation should be done in a manner that minimizes visual impact.

## **1.10 DEMOLITION**

- .1 Remove all existing plumbing and natural gas equipment as indicated and in accordance with Section 02 41 17 - Selective Construction Demolition. Equipment shall be removed at the appropriate time.
- .2 All existing equipment to remove:
  - .1 Shall be removed with all piping, equipment, and mounting accessories from its supply point to its point of use;
  - .2 Becomes the property of the Contractor who shall dispose it promptly.
  - .3 All existing paints are considered to contain lead. All interventions or contact with these paints must be done according to the specification section 02 83 12 - Removal of lead-containing paint coatings - Maximum Precautions
  - .4 All cement materials, cement coatings under plaster, cement debris, residual dust and particles are considered to contain asbestos. All interventions or contact with these materials must be done according to the specification section 02 82 00.03 – Asbestos Removal - Maximum Precautions.

## **1.11 STRUCTURAL SUPPORTS**

- .1 Horizontal and vertical reservoirs must be supported by a steel structure made of "I" or "H" beams or angle irons with reinforcements and cross bracing. Horizontal reservoirs must be placed on steel cradles.
- .2 All floor mounted supports must have a steel plaque bolted to the floor at their base.
- .3 Supply all steel structures required for the installation of equipment.
- .4 Supports that are to be supplied by the manufacturer of the equipment are indicated in the section that describes the relevant piece of equipment.
- .5 Supports that are not supplied by the manufacturer are to be made of galvanized steel.
- .6 Supports must be braced to resist seismic forces according to the National Building Code.

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## **1.12 CORROSION PROTECTION**

- .1 All non-protected metallic pieces, such as the pipe supports, anchors, machinery, etc., must be given a coat of anticorrosion paint on-site once the metal surfaces have been cleaned.
- .2 All plugs, screws, and other devices located on the building's exterior must be bronze or cadmium plated.
- .3 Prime and touch-up marred finished paintwork to match original.
- .4 Any surface too badly damaged for a coat of primer and touch-ups must be restored as new.
- .5 Any element made of galvanized steel that is cut or perforated must be protected by paint such as Galvicon or an approved equivalent.

## **1.13 TESTS AND CERTIFICATION**

- .1 At the termination of Work, start-up the equipment and mechanical systems, verify they are functioning properly, perform tests and adjustments, balance them, ensure they respond to all points indicated on drawings and in specifications, and submit the reports relevant to these activities.
- .2 Next, systematically demonstrate in the presence of the Departmental Representative that the equipment and systems function as indicated on drawings and in specifications. A second set of tests will be performed, as required, 2 weeks after the first set of tests. After these tests are completed, submit a report to the Departmental Representative.
- .3 Refer to the descriptions in each section to determine the exact tests required.

## **Part 2 Products**

### **2.1 NOT USED**

- .1 Not used.

## **Part 3 Execution**

### **3.1 INSPECTION**

- .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.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.
- .2 Unless otherwise directed, the Contractor must advise the Departmental Representative 48 hours before covering installed materials to permit the inspection of said materials.

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### **3.2 PAINTING REPAIRS AND RESTORATION**

- .1 Perform painting work in accordance with 09 91 23 – Interior Painting.
- .2 Prime and touch-up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

### **3.3 SYSTEM CLEANING**

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

### **3.4 FIELD QUALITY CONTROL**

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .2 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 as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Perform site visits in accordance with the PART 1 - QUALITY ASSURANCE article.

### **3.5 DEMONSTRATION**

- .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 part of instruction materials.
- .4 Instruction duration time requirements as specified in appropriate sections.

### **3.6 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

- .3 Waste Management: separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**3.7 PROTECTION**

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

**END OF SECTION**