
Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 23 05 00 - Common Work Results for HVAC
- .2 Section 23 05 05 - Installation of Pipework
- .3 Section 23 05 13 - Installation of Pipework
- .4 Section 23 05 17 - Pipe Welding
- .5 Section 23 05 19 - Thermometers and Pressure Gauges – Piping Systems
- .6 Section 23 05 23 - Valves
- .7 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
- .8 Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment
- .9 Section 23 05 49.01 - Seismic Protection Systems
- .10 Section 23 05 53.01 - Mechanical Equipment and Network Identification
- .11 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC
- .12 Section 23 05 94 - Pressure Testing of Ducted Air Systems
- .13 Section 23 07 13 - Duct Insulation
- .14 Section 23 07 15 - Thermal Insulation for Piping
- .15 Section 23 08 01 - Performance Verification Mechanical Piping Systems
- .16 Section 23 08 02 - Performance Verification Mechanical Piping Systems
- .17 Section 23 11 13 - Facility Fuel-Oil Piping
- .18 Section 23 11 23 - Facility Natural Gas Piping
- .19 Section 23 21 13 - Hydronic Networks – Steel Piping, Valves and Connections
- .20 Section 23 21 14 - Hydronic Specialties
- .21 Section 23 21 23 - Hydronic Network Pumps
- .22 Section 23 25 00 - HVAC Water Treatment Systems
- .23 Section 23 31 13 - Metal Ductwork
- .24 Section 23 32 48 - Acoustical Air Plenums
- .25 Section 23 33 00 - Air Duct Accessories
- .26 Section 23 33 14 - Dampers - Balancing
- .27 Section 23 33 15 - Dampers - Control
- .28 Section 23 33 16 - Dampers – Fire and Smoke
- .29 Section 23 33 46 - Flexible Ductwork
- .30 Section 23 33 53 - Duct Liners

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- .31 Section 23 34 00 - HVAC Fans
 - .32 Section 23 36 00 - Air Terminal Units
 - .33 Section 23 37 13 - Diffusers, Registers and Grilles
 - .34 Section 23 37 20 - Louvres, Intakes and Vents
 - .35 Section 23 38 13 - Commercial Kitchen Hoods
 - .36 Section 23 44 00 - HVAC Air Filtration
 - .37 Section 23 51 00 - Breeching, Chimneys and Stacks
 - .38 Section 23 52 00 - Heating Boilers
 - .39 Section 23 57 00 - Heat Exchanger for HVAC
 - .40 Section 23 57 33 - Geothermal Heat Exchanger
 - .41 Section 23 64 19 - Reciprocating Water Chillers
 - .42 Section 23 64 26 - Rotary-Screw Water Chillers
 - .43 Section 23 65 10 - Condensers, Coolers and Cooling Towers
 - .44 Section 23 72 00 - Air-to-Air Energy Recovery Equipment
 - .45 Section 23 73 10 - Air Handling – Built-up
 - .46 Section 23 82 19 - Fan Coil Units
 - .47 Section 23 82 36 - Finned Tube Radiation Heaters
 - .48 Section 23 82 39 - Unit Heaters
 - .49 Section 23 84 13 - Humidifiers

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 The term « Shop Drawings » means drawings, diagrams, illustrations, tables, execution graphs, brochures and other data that the Contractor must provide to show details of portions of the work.
 - .2 Review all shop drawings before submission to the Departmental Representative. This review demonstrates that the Contractor has determined all measures and verified on-site design criteria, materials, catalog numbers and similar data or that he will, and that he controlled and coordinated each shop drawing according to project requirements and contract documents.
 - .3 Submit shop drawings to the Departmental Representative for review within a reasonable time frame and in a logical order so as not to delay the work.
 - .4 The Departmental Representative's review is limited to verifying the compliance of shop drawings against the contract documents for recommendation to the Client or Owner. The Departmental Representative is not responsible for dimensional accuracy, details or quantities.

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- .5 If the Contractor installs equipment or material for which he has not submitted a shop drawing for verification, the Departmental Representative may, if the equipment or equipment installed does not comply with the drawings and specifications, require that the equipment or material be removed and replaced with compliant products at no additional cost to the Owner.
 - .6 Shop drawings for products, systems or installations with special design requirements, whether custom-made or of a similar nature, and that are not part of standard catalogued products or services will be considered as engineering documents, and therefore must be authenticated by their engineer. Authentication must be in compliance with the laws and regulations in force in the province of Quebec. For information, but not limited to, shop drawings of custom-made modular air handling units are in this category and as such are engineering documents that must have a compliant authentication.
 - .7 When shop drawings are resubmitted, inform the Departmental Representative in writing of all revisions other than the revisions made by the Departmental Representative.
 - .8 Following the contract award and within a reasonable time frame, submit to the Departmental Representative all shop drawings requested in this Division for final review. Shop drawings sent by fax will not be accepted. For shop drawings that do not exceed 11 "x 17", submit one (1) hard copy or a PDF (single file). For shop drawings that exceed 11 "x 17", submit three (3) hard copies.
 - .9 When accepted by the contractor, shop drawings may be submitted electronically. The following rules must be observed in full:
 - .1 The identification sheet mentioned below must be present;
 - .2 A single PDF file per shop drawing must be submitted. If multiple documents make-up the drawings they must be incorporated within a single file.
 - .3 Printing settings must be integrated within the file to ensure a commercial type printer will print the drawing to scale;
 - .4 The file must be of excellent graphic quality.
 - .5 The circulation of drawings must be done through project approved communication channels.
 - .6 A transmittal slip must be included with all shop drawings submitted.
 - .10 Shop drawings that do not meet these guidelines will be returned to the Contractor as rejected.
 - .11 Provide each drawing or drawing group with an identification sheet. Group drawings according to the relevant article number in the specifications using the second numbering level (eg. 2.3). As a minimum requirement, the following information must be included on the identification sheet:
 - .1 Name of the Owner;
 - .2 Name of the project;
 - .3 Name of the Departmental Representative;
 - .4 Name of the Contractor;
 - .5 Name of the issuer;
 - .6 Name of the Subcontractor;

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- .7 Name of the Supplier;
 - .8 Name of the Manufacturer;
 - .9 Specialty;
 - .10 Description;
 - .11 Specifications section number and article number;
 - .12 Revision number;
 - .13 Blank space to stamp verification seal.
 - .12 Provide Manufacturer certified drawings for construction in English and French.
 - .13 Items or materials that are not catalogued must have drawings made specifically for the project.
 - .14 Shop drawings must include the following:
 - .1 Construction details, dimensions, weights and equipment or material characteristics along with additional information such as bulletins, illustrations and exploded views of the constituent parts. Advertising leaflets or brochures are not accepted.
 - .2 Graphics, curves, capacities, performance and other technical data provided by Manufacturers or requested by the Departmental Representative in regards to equipment operation.
 - .3 Wiring diagrams, single line diagrams, schematic diagrams, control diagrams, control sequences and all interconnections with other systems, when requested.
 - .4 Circulation diagrams for air flow, water, oil, fuel, etc., where applicable.
 - .15 Drawing compliance will first be checked based on the nature of the drawing or document received:
 - .1 Engineering document;
 - .2 Other document;
 - .16 Identification of the nature of the drawing is used to determine whether the drawing received is an engineering document either as described previously or due to special requests in the mechanical and electrical specifications sections that require engineering documents.
 - .17 Drawings received that are not engineering documents will be identified as other documents. Other documents implicitly identify shop drawings as identified previously or any other document enabling an adequate evaluation of the equipment in regards to the requirements in the drawings and specifications.
 - .18 The drawings will be returned with one of the following mentions: «Verified», «Edit and Resubmit», «Modify as noted», «Rejected».
 - .19 Drawings labeled « Verified » will not be subject to any other reviews. The drawings comply with the contract documents.
 - .20 Drawings labeled « Rejected » must be redone and resubmitted for review. The drawings do not comply with the contract documents.
 - .21 The drawings labeled « Modify as noted » must not be resubmitted. Drawings' compliance with the contract documents is conditional to the modifications being done as noted.

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- .22 Drawings labeled «Edit and Resubmit» must be resubmitted for review in part or in full and according to indications. These drawings are not compliant with the contract documents.
 - .23 Drawings labeled « Modify as noted » and « Edit and resubmit» must be resubmitted for review in part or in full and according to indications. Drawings' compliance with the contract documents is conditional to the modifications being done as noted.
 - .24 Verification of shop drawings by the Departmental Representative does not release of the liability to provide equipment compliant with current standards and regulations as well as with the requirements of the specifications.
 - .25 If equipment is manufactured prior to verification of shop drawings by the Departmental Representative he can refuse the equipment. Such refusals are at no additional cost to the Owner.
 - .26 The Departmental Representative has 10 working days from receipt of shop drawings for their verification.
 - .27 Electronic copy of shop drawings.
 - .28 An electronic copy of the Departmental Representative's drawings is available to facilitate the preparation of shop drawings by the Contractor.
 - .29 To obtain a copy, the Contractor must submit a written request to Pageau Morel. In the request, specify the disciplines required as well as the desired transmission method. The request must also include the duly completed release of liability form at the end of this section.
 - .30 To avoid any confusion as to the nature and revision of drawings, the Contractor must comply with the following instructions:
 - .1 Do not alter or remove any elements in Pageau Morel's cartridges;
 - .2 Independently identify the Contractor's drawing by at least indicating:
 - .1 Name of the Company;
 - .2 Name of the drawing;
 - .3 Drawing number;
 - .4 Revision number and dates.
 - .31 The electronic name of the Contractor's drawing must be different from that of the Departmental Representative's drawing.
 - .32 On print, the identification of the Contractor's drawing must be visible.
- .3 Erection drawings:
- .1 General:
 - .1 Erection drawings consist of plans drawn to scale, which show the position of equipment, ducts, piping, faucets and others, with required sections and details, including dimensions of equipment, ducts 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 required clearances for operation and maintenance.

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- .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 HVAC work located in mechanical and electrical rooms, tunnels, wells, parking lots, etc.;
 - .2 HVAC work located in places where space is crowded with equipment such as in hallway false ceilings and raised floors;
 - .3 Anticipated shafts, openings and perforations in walls, floors, roofs, beams and columns;
 - .4 Anchorages;
 - .5 All supports located in technical shafts;
 - .6 In places as described in HVAC specifications sections;
 - .7 This clause is not restrictive. Erection drawings may be required in areas deemed necessary by the Departmental Representative.
 - .3 Erection drawings must clearly and precisely show all the work done, as well as the work from the disciplines involved and work done by others.
- .2 Preparation:
- .1 Prepare drawings at an appropriate scale but not smaller than 1:50.
 - .2 Prepare erection drawings and coordinate with other mechanical and electrical trades.
 - .3 All erection drawings must be prepared with the latest AutoCAD version and presented in the form of .DWG files, sepia, and paper, according to the quantities required. AutoCAD layers of each trade shall meet PWGSC CADD standards.
 - .4 Receive erection drawings from other mechanical and electrical divisions and incorporate them with the HVAC erection drawings to form the global erection drawings. Ensure full coordination of global erection drawings and submit to the Departmental Representative for verification. If necessary, review the drawings and resubmit to ensure proper coordination and avoid incompatibilities.
 - .1 At the request of the Departmental Representative, submit the overall erection drawings printed with different colors to distinguish the work of different trades.
 - .2 Verification of erection drawings by Departmental Representative is limited to ensure that the technical requirements are met (VCF, grills, insulation, etc.). Departmental Representative does not check the quality of the coordination prepared by the Contractor.
 - .3 The Contractor must allocate in his work plan a minimum of ten working days for verification of erection drawings by Departmental Representative.

1.3 CLOSEOUT SUBMITTALS

- .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.
 - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .2 Operation data to include:
 - .1 Control diagrams 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 instructions for systems and components.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Colour coding chart.
 - .3 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
 - .4 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as determined 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.
 - .5 Approvals:
 - .1 Submit two (2) copies of Operation and Maintenance Manual draft to Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant.
 - .2 Make changes as required and re-submit as directed by Consultant.
 - .6 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data if, after training sessions mentioned previously, it becomes apparent that such data sheets are necessary.
 - .7 Site records:
 - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of prints as required for each phase of work. Mark changes as work progresses and as changes occur.
 - .2 Transfer information weekly to reproducibles, reviewing reproducibles to show work as actually installed.

- .3 Use different a coloured waterproof pen for each network.
- .4 Make available for reference purposes and inspection.
- .8 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 the lower right hand corner with 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 Consultant 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.
- .9 Submit copies of as-built drawings for inclusion in final TAB report.

1.4 REPLACEMENT/ MAINTENANCE MATERIALS TO PROVIDE

- .1 Where materials or products are specified by their trademark, consult the Instructions to Bidders document for the procedures to follow regarding the request for approval for replacement or maintenance materials.
- .2 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .3 Provide the following spare parts:
 - .1 One set of packing for each pump.
 - .2 One casing joint gasket for each pump size..
 - .3 One head gasket set for each heat exchanger.
 - .4 One glass for each gauge glass.
 - .5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.
- .4 Provide one set of special tools required to service equipment as recommended by manufacturers.
- .5 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance 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 Replace defective or damaged materials with new.

Part 2 Products

2.1 N/A

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 Consultant.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon their discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 PAINTING REPAIRS AND RESTORATION

- .1 Do painting in accordance with Section 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 and filters. Vacuum interior of ductwork and air handling units.

3.4 FIELD QUALITY CONTROL

- .1 Site Tests: conduct the 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 respect to 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.

3.5 DEMONSTRATION

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

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- .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 Instruction material must include, among others, operation and maintenance manual, as-built drawings, and audio visual aids.
 - .4 Instruction duration time requirements as specified in appropriate sections.
 - .5 Departmental Representative will record these demonstrations on video tape for future reference.

3.6 CLEANING

- .1 As the work progresses, the Contractor must remove demolition materials, empty containers, waste materials, etc. at his expense, and dispose of them offsite. At the end of the work, the Contractor must remove all that remains as well as the clutter, including excess waste; he must leave the premises clean and spotless.
- .2 Final Cleaning: upon completion remove surplus materials, waste, tools and equipment.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

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

END OF SECTION