

Part 1 General

1.1 GENERAL

- .1 This section covers items common to All Mechanical Sections.

1.2 SCOPE OF WORK

- .1 The work of the Mechanical Sections includes all labour, materials, and equipment necessary for the installation complete of the mechanical systems shown on the drawings and described in these specifications.
- .2 It is the requirement of this work to provide all systems completely functioning in intended system operation, notwithstanding that every item necessarily required may not be specifically mentioned.
- .3 Refer to Division 01 – General Requirements.
- .4 All solvents, sealants, adhesives and other products used on the site shall comply with limits and materials specified in Division 01 – General Requirements. The requirements of Division 01 – General Requirements shall override all other specified material properties in the specification.

1.3 EQUIPMENT LIST

- .1 Complete list of equipment and materials to be used on this project and forming part of tender documents including manufacturer's name, model number and details of materials, and submit for approval.
- .2 Submit for approval within 7 days after award of contract.

1.4 SUBMITTALS

- .1 Submittals: in accordance with Division 01 – General Requirements.
- .2 Submit shop drawings to be approved by Engineer.
- .3 Shop drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances. eg. access door swing spaces
- .4 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.
 - .6 In addition to transmittal letter, identify section and paragraph number.

- .5 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual as specified in Division 01 –General Requirements.
 - .2 Operation and maintenance manual approved by, and final copies deposited with Engineer 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 in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
 - .6 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative and Engineer for approval. Submission of individual data will not be accepted.
 - .2 Make changes as required and re-submit as directed by Departmental Representative and Engineer.
 - .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 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).
 - .2 Submit to Departmental Representative and Engineer for approval and make corrections as directed.
 - .3 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .10 Submit copies of as-built drawings for inclusion in final TAB report in accordance with Division 01 – General Requirement.

1.5 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Division 01 – General Requirements.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Division 01 – General Requirements.

1.6 EQUIPMENT INSTALLATION

- .1 In accordance with Manufacturer's instructions unless otherwise indicated.
- .2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

1.7 CLEARANCES

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.
- .2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment and components.

1.8 TRIAL USAGE

- .1 Engineer and/or Owner may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Use of systems during construction
 - .1 Use of mechanical systems during construction.
 - .2 Use of new and existing permanent heating and ventilating systems for supplying temporary heat or ventilation is permitted only under following conditions:
 - .1 Entire system is complete, commissioned, pressure tested, cleaned and flushed out.

- .2 Specified water treatment system has been commissioned, water treatment is being continuously monitored.
 - .3 Building has been closed in, areas to be heated/ventilated are clean and will not thereafter be subjected to dust-producing processes.
 - .4 There is no possibility of damage.
 - .5 Supply ventilation systems are protected by 60% filters, inspected daily, changed every 2 weeks or more frequently as required.
 - .6 Return systems have approved filters over openings, inlets and outlets.
 - .7 Systems will be:
 - .1 Operated as per Manufacturer's recommendations and instructions.
 - .2 Operated by Contractor.
 - .3 Monitored continuously by Contractor.
 - .8 Warranties and Guarantees are not relaxed.
 - .9 Regular preventive and other Manufacturer's recommended maintenance routines are performed by Contractor at own expense and under supervision of Departmental Representative and Engineer.
 - .10 Refurbish entire system before static completion; clean internally and externally, restore to "as-new" condition and replace filters in air systems.
- .3 Filters specified in this Section are over and above those specified in other Sections of this project.

1.9 PROTECTION OF OPENINGS

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

1.10 PREPARATION FOR FIRESTOPPING

- .1 Firestopping and Smoke Seals shall be done by each individual contractor. Refer to Section 07 84 00 – Firestopping.
- .2 All Contractors shall use ULC rated system approved for use with the assembly being generated. Contractor to submit detailed shop drawings for each assembly and install as per Manufacturer's installation instructions.

1.11 EXISTING CONDITIONS

- .1 Connect into existing systems at times coordinated with Owner.
- .2 Request written approval 10 days minimum, prior to commencement of work.
- .3 Be responsible for damage to existing plant by this work.
- .4 Ensure daily clean-up of existing areas.

- .5 Relocate and modify existing system as shown on drawings and as required to incorporate existing systems to be re-used into new work as a complete working package at end of Contract. Not all detail may be indicated on drawings. Contractor shall verify existing conditions on-site prior to start of work. Any discrepancies between drawings and existing conditions shall be reported to Engineer for clarification.

1.12 TESTS

- .1 Give 48 h written notice of date for all tests.
- .2 Insulate or conceal work only after testing and approval by Engineer and Commissioning Agent.
- .3 Conduct tests in presence of Engineer and/or Owner's Representative and local authority having jurisdiction where applicable.
- .4 Bear costs including retesting and making good.
- .5 Equipment: test as specified in relevant sections.
- .6 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures or test medium.

1.13 ACCESS DOORS

- .1 Access doors shall be supplied and installed by the Mechanical Contractor. Refer to drawings and specification Sections 09 21 16 – Gypsum Board Assemblies and 20 00 20 – Access Doors for Mechanical Systems
- .2 Access doors shall be installed where operating, inspecting, adjusting and servicing to mechanical equipment is required. Coordination between all trades is required on site for determining all the location and sizes required and group components as much as possible to minimize the amount of access doors required.
- .3 Access door shall be 600 x 600 mm minimum for body entry and 300 x 300 mm minimum for hand entry unless otherwise noted.
- .4 Installation:
 - .1 Locate so that concealed items are accessible.
 - .2 Locate so that hand or body entry (as applicable) is achieved.

1.14 SLEEVES

- .1 General: Install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.
- .2 Material: Schedule 40 black steel pipe.
- .3 Construction: Foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at mid-point.

- .4 Sizes: 6 mm minimum clearance between sleeve and un-insulated pipe or between sleeve and insulation.
- .5 Installation:
 - .1 Concrete, masonry walls, concrete floors on grade: Terminate flush with finished surface.
 - .2 Other floors: Terminate 25 mm above finished floor.
 - .3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.
- .6 Sealing:
 - .1 Foundation walls and below grade floors: Fire retardant, waterproof non-hardening mastic.
 - .2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.
 - .3 Sleeves installed for future use: Fill with lime plaster or other easily removable filler.
 - .4 Ensure no contact between copper pipe or tube and sleeve.
- .7 Pipe 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 un-insulated 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 fire stopping. 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.

1.15 MAINTENANCE

- .1 Furnish spare parts in accordance with Division 01 –General Requirements as follows:
 - .1 Boiler Spare Parts (For each boiler):
 - .1 Ignitor, Spark w/ Gasket.
 - .2 Gasket, Flame Sensor.

- .3 Gasket set, Burner, Heat Exchanger, Sight Glass – Lower.
 - .4 Gasket, Fan.
 - .5 Condensate Neutralization Kit.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Division 01 –General Requirements.

1.16 DEMONSTRATION, OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 Where specified elsewhere in Division 21, 22, 23 and 25, Manufacturers to provide demonstrations and instructions.
- .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. Provide minimum 4 hour instruction.
- .5 When deemed necessary, Engineer and/or Departmental Representative will record these demonstrations on video tape for future reference.

1.17 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Construction Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Division 01 –General Requirements.
 - .2 Store and handle materials in accordance with Construction Plan and Manufacturer’s written instructions

1.18 INTERPRETATION OF PLANS AND SPECIFICATIONS

- .1 These specifications are to be considered as an integral part of the plans which accompany them and neither the plans nor the specifications shall be used alone. Any item which is omitted in one but which is reasonably implied in the other shall be considered properly and sufficiently specified and must, therefore, be provided by this Contractor.
- .2 Misinterpretation of the plans or specifications shall not relieve this Contractor of responsibility; final interpretation of details and clauses remains with the Engineer.
- .3 Where uncertainty exists in the passing of pipes and location of equipment, the general contractor and or project manager shall be consulted before work is started. Where such materials and equipment have been installed so as to cause interference with the inside treatment of the building, they shall be removed and relocated without additional cost to the Owner.

- .4 The plans do not necessarily show all valves, duct offsets, access panels, connections, balancing fittings, bases, isolators, flexible connections, drains, etc., and this Contractor shall not avail himself of these obvious omissions, but shall install the work complete in essential details so that it will function properly, can be easily balanced and so that repairs and removal of equipment can easily be made.
- .5 Building dimensions shall not be scaled from the Mechanical plans but shall be obtained from on-site dimensions of the building. Any discrepancy between the drawings and the building shall be questioned before proceeding with any installation.

1.19 CO-OPERATION OF CONTRACTORS

- .1 This Contractor shall become familiar with the work of other Contractors and in laying out and installing the work shall co-operate with the other Contractors, so as to facilitate the progress of the work as a whole and avoid interference or delays.
- .2 Where interference exists, this Contractor shall notify the general contractor and/or project manager and the Engineer before installing the work. Any changes in the work or alterations of the Mechanical Contractor's schedule of procedure required for such co-operation will not be considered as a claim for extra compensation.
- .3 Due to the complexities of many sub-trades, and the restrictive space available in this project, it is required that all trades co-operate closely so as to install all systems in their allotted locations as indicated on the drawings, or coordination on site.

1.20 ERRORS AND OMISSIONS

- .1 The drawings are not intended to show every item of accessory equipment, but the Contractor shall tender on and install all essential details to provide for efficiency of operation and ease of maintenance.
- .2 Should this Contractor discover errors or discrepancies in the plans or specification, he/she shall refer the matter to the Engineer for change or clarification and shall not proceed with that portion of the work until advised by the Engineer to do so.

Part 2 Products

2.1 MATERIALS

- .1 Materials and products in accordance with Division 01 – General Requirements
- .2 Do verification requirements in accordance with Division 01 – General Requirements

2.2 VOC LIMITS

- .1 The purpose of this section is to reduce emissions of volatile organic compounds (VOCs) and to eliminate emissions of chloroform, ethylene dichloride, methylene chloride, perchloroethylene, and trichloroethylene from the application of adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers, or any other primer.

Part 3 Execution

3.1 PAINTING AND PRIMER

- .1 All paint and/or primer requirements shall be done in accordance with Section 09 91 00 - Painting.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Minimum two coats primer over all mechanical supplied frames, brackets, supports and miscellaneous steel.
- .4 Restore to new condition, finishes which have been damaged.

3.2 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Division 01 – General Requirements and submit report as described in PART 1 - 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 – SUBMITTALS AND AS SPECIFIED RESPECTIVE SECTIONS
 - .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 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE

3.3 CLEANING

- .1 Cleaning of mechanical equipment and services shall be done by this contractor.
- .2 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling/roof top unit.

3.4 PROTECTION

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

END OF SECTION