

Part 1 General

1.01 GENERAL

- .1 This section covers items common to all sections of Divisions 21 & 23.

1.02 SCOPE OF WORK

- .1 The work of this section 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 complete, functioning in intended system operation, notwithstanding that every item necessarily required may not be specifically mentioned.

1.03 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 seven (7) days after award of contract.

1.04 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit Shop Drawings to Departmental Representative for approval.
- .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.
- .5 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use Mechanical Contractors Association of Canada "Shop Drawing Submittal Title Sheet". **Identify section and paragraph number.**
- .6 Closeout Submittals:
 - .1 Provide Operation and Maintenance Data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
 - .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 Operation instruction for systems and component.
- .4 Description of actions to be taken in event of equipment failure.
- .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.
- .6 Approvals:
 - .1 Submit two (2) hard copies and one (1) electronic PDF copy 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 Contractor shall obtain one (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 for approval and make corrections as directed.
 - .3 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

1.05 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.06 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.

1.07 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.

1.08 TRIAL USAGE

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

1.09 PROTECTION OF OPENINGS

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

1.10 ELECTRICAL

- .1 The Electrical Contractor is responsible for all power wiring over 120V and over required for operation of mechanical equipment and plant systems.
- .2 Division 25 EMCS is responsible for all wiring required for controls systems, including obtaining 120V sources from the electrical system.

1.11 PREPARATION FOR FIRESTOPPING

- .1 All fire stopping is to be performed by a qualified subcontractor.
- .2 Contractor to identify all locations where mechanical penetrations are required through fire rated separations including type and sizing.
- .3 Provide all required clearances between outside surface of pipe and inside surface of sleeve, core drilled hole or listed fire rated system.

1.12 EXISTING CONDITIONS

- .1 Connect into existing systems at times coordinated with Departmental Representative.
- .2 Request written approval ten (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.

1.13 TESTS

- .1 Give 48 hours written notice of date for all 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 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.

1.14 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 - 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.
 - .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.

1.15 DEMONSTRATION, OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 Where specified elsewhere in Divisions 21 and 23, 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, Departmental Representative may record these demonstrations on video tape for future reference.

1.16 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 Departmental Representative.
- .3 Where uncertainty exists in the passing of pipes and location of equipment, the Departmental Representative 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 Departmental Representative.
- .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 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.

1.17 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. Where interference exists, this Contractor shall notify the Departmental Representative before installing the work. Any changes in the work or alterations of the Contractor's schedule of procedure required for such co-operation will not be considered as a claim for extra compensation.
- .2 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.

1.18 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 shall refer the matter to the Departmental Representative for change or clarification and shall not proceed with that portion of the work until advised by the Departmental Representative to do so.

Part 2 Products

2.01 MATERIALS

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

2.02 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 primers.
- .2 This section applies to all commercial and industrial sales and applications of adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers, or any other primers, unless otherwise specifically exempted by this rule.
- .3 Requirements:
 - .1 Unless otherwise specified in paragraph .2 a person shall not apply any adhesives, adhesive bonding primers, adhesive primers, or any other primer, which have a VOC content in excess of 250 g/L less water and less exempt compounds.

2.03 ENUM RATED WIRES AND CABLES

- .1 Cables and electrical wires used for transmission of sound or data and that are not located in totally enclosed non-combustible raceway shall be FT6 rated.

Part 3 Execution

3.01 PAINTING REPAIRS AND RESTORATION

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged.

3.02 CLEANING

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

3.03 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.

3.04 PROTECTION

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

END OF SECTION

Part 1 General

1.01 DESCRIPTION OF WORK

- .1 Provide pumps for fire suppression.

1.02 REFERENCES

- .1 American National Standards Institute/National Fire Protection Association (ANSI/NFPA):
 - .1 ANSI/NFPA 20-Latest Edition, Standard for the Installation of Stationary Fire Protection.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS):
 - .1 Material Safety Data Sheets (MSDS).

1.03 SECTION INCLUDES

- .1 Section Includes:
 - .1 Materials and installation for fire pumps for use when water pressure serving facility is inadequate.
 - .2 Division 1 - General Requirements.
 - .3 Section 21 05 01 - Common Work Results for Mechanical.

1.04 QUALITY ASSURANCE

- .1 All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the drawings.
- .2 Installer: company or person specializing in fire pump installations with documented experience and approved by manufacturer. The manufacturer shall assume "Unit Responsibility" for the complete fire pump. Unit responsibility shall be defined as responsibility for interface and successful operation of all system components supplied by the pumping system manufacturer.
- .3 Ensure pump pressure ratings are at least equal to system's maximum operating pressure at point where installed, but not less than specified.
- .4 Equipment provider shall be responsible for providing certified equipment start-up and, when noted, an in the field certified training session. This pump start-up shall be by the pump manufacturer or a certified factory-trained representative per NFPA 20.
- .5 This start-up shall include verification of proper installation, system initiation, adjustment and fine tuning. Start-up shall not be considered complete until the sequence of operation, including all alarms, has been sufficiently demonstrated to the Departmental Representative. This job site visit shall occur only after all hook-ups, tie-ins, and terminations have been completed and signed off on the manufacturer's start-up request form.

1.05 PRODUCT HANDLING

- .1 Protection: Use all means necessary to protect equipment before, during, and after installation in accordance with manufacturer's storage, installation and maintenance instructions.

1.06 SUBMITTAL

- .1 Submit each item in this article according to the Conditions of the Contract and Specifications Sections.
- .2 Submit manufacturer's installation instructions under provisions of General Conditions.
- .3 Product Data including certified performance curves and rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, and accessories. Indicate pump's operating point on curves.
- .4 Hanging and support requirements should follow the recommendations in the Manufacturer's installation instructions.

1.07 OPERATION AND MAINTENANCE DATA

- .1 All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the drawings.

1.08 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to the site in such a manner as to protect the materials from shipping and handling damage. Provide materials on factory provided shipping skids. Materials damaged by the elements should be packaged in such a manner that they could withstand short-term exposure to the elements during transportation.
- .2 Store materials in clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage.

Part 2 Products

2.01 FIRE PUMPS

- .1 Packaged, ULC listed and labeled horizontal shaft, diesel engine.
- .2 Driver: diesel engine, 2100 rpm, complete with: silencer, fuel connection, block heater, dual engine batteries.
- .3 Mounting: install pump and driver on common base.
- .4 Materials and construction: to ANSI/NFPA 20.

- .5 Capacity: as indicated to satisfy fire protection system requirements and NFPA:
 - .1 Flow rate: 1500 usgpm.
 - .2 Pressure: 758 kPa (110 psi.).
 - .3 Speed: 2100 rpm.
 - .4 Maximum suction pressure: 275 kPa (40 psi.).
 - .5 NPSHR @ rated flow: 40.7 kPa (5.92 psi.).
 - .6 NPSHR @ 150% rated flow: 52.8 kPa (7.66 psi.).
 - .7 Rated BHP: 125.95 hp (94 kW).
 - .8 Peak power BHP: 194.5 hp (145 kW).
 - .9 Inlet: NPS 8.
 - .10 Outlet: NPS 6.
 - .11 Impeller: 381 mm.
- .6 Anchor bolts and templates:
 - .1 Supply for installation by others.
 - .2 Size anchor bolts to withstand seismic zone acceleration and velocity forces.
- .7 Engine:
 - .1 Rated speed: 2100 rpm, 194 kW.
 - .2 Fuel type: Diesel.
 - .3 Cylinders: 6.
 - .4 Rated for use on fire pumps: UL, VLC, FM approved.
 - .5 Displacement: 6.8L.
 - .6 Combustion: Direct injection, common rail, electronic.
 - .7 Combustion air: 285 L/s.
 - .8 Fuel consumption: 48.4 L/hr.

2.02 ENGINE DRIVEN FIRE PUMP - CONTROLLER

- .1 Existing automatic engine-driven microprocessor based fire pump controller: shall be reconnected to new diesel fire pump and commissioned as a full operational system. Contractor shall verify all operational parameters including the following:
 - .1 Pressure-switch transducer start.
 - .2 Fire protection equipment start.
 - .3 Main AC power failure relay connected either to start engine or to actuate remote trouble alarm.
 - .4 Common local alarm bell and individual trouble lamps or annunciator to indicate:
 - .1 Low oil pressure.
 - .2 High cooling water temperature.
 - .3 Engine failure to start.
 - .4 Shut down from over speed.
 - .5 Shut down from pump operation.
 - .6 Shut down from trouble on controller or engine.
 - .7 Shut down from loss of ac power.
 - .8 Battery failure for each battery.

- .9 Battery charger failure.
- .10 Low suction
- .11 Low fuel level
- .12 Water reservoir low
- .13 Water reservoir empty
- .14 Low pump room temperature
- .15 High fuel level
- .16 Main switch in auto
- .17 Engine run
- .18 Failure when running
- .5 Provision for selectable automatic alternate use of two separate storage batteries. With alarm if battery fails and prevention of use of defective battery on start-up.
- .6 Intermittent cranking of engine with lock-out if engine fails to start on 6 crank periods of approximately 15 s duration separated by 5 rest periods of approximately 15 s duration.
- .7 Provision for lock-out alarm if a battery is disconnected or becomes inoperative.
- .8 Selector switch to bypass relay circuits and provide for manual starting.
- .9 Provision for 10 s delayed start.
- .10 Sequential timing device.
- .11 Circuits for various engine mounted devices such as automatic chokes, anti-dieseling solenoid valve, cooling water line solenoid valve.
- .12 Timing relay for automatic stop.
- .13 Weekly timer for automatic weekly test run.
- .14 Remote start switch relay.
- .15 Auto-manual, selector.
- .16 "Auto" position indicating lamp.
- .17 Manual, start-stop pushbuttons.
- .18 Recording pressure gauge with 7 day chart.
- .19 Two built-in automatic battery chargers.
- .20 Transformer to feed 115 V panel.
- .21 Control cabinet strip heater.
- .22 NEMA 3R enclosure.
- .23 Mark "DIESEL FIRE PUMP CONTROLLER".
- .24 Remote alarm contacts rated at 10 amp, 125 VAC for:
 - .1 Over speed.
 - .2 Fail to start.
 - .3 Low oil pressure.
 - .4 High coolant temperature.
 - .5 Failure when running.
- .25 Provision for deluge valve, start, remote.
- .26 Operator control panel and annunciator to incorporate
 - .1 Individual charger voltmeter and ammeter readout, charger mode indication.
 - .2 Individual cut-in, cut-out and system pressure.

- .3 Lamp test/silence, run test, print and paper feed test buttons.
- .4 Individual battery manual crank push button.
- .27 Controller to shut down engine for low oil pressure or high coolant temperature during exercise cycle but restart in case of water pressure drop.
- .28 Engine over speed shutdown without time delay and lockout until manually reset.
- .29 Include low fuel level float switch, high fuel level float switch, low pump room temperature thermostat, low suction pressure switch mounted inside controller.

Part 3 Execution

3.01 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.02 INSTALLATION

- .1 Install in accordance with ULC listing, ANSI/NFPA 20, manufacturer's instructions and approved reviewed shop drawings.
- .2 Align pump and motor shafts to within manufacturer's recommended clearances prior to start-up.
- .3 Wiring to perform in accordance with manufacturer's instructions and applicable codes.

3.03 FIELD QUALITY CONTROL

- .1 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.
 - .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.
 - .4 Supplier shall have a service technician that is certified to work on this product in the Province of New Brunswick.
- .2 Site Tests:
 - .1 Field test fire pump, driver and controllers in accordance with ANSI/NFPA 20. Testing shall include:
 - .1 Verification of proper installation, system initiation, adjustment and fine tuning.
 - .2 Verification of the sequence of operations and alarm systems.
 - .2 Testing to be witnessed by authority having jurisdiction.
 - .3 Develop, with Departmental Representative assistance, detailed instructions for O & M of this installation.

3.04 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION