

Part 1 General

1.1 REFERENCES

- .1 National Fire Protection Association (NFPA).
- .2 Electrical Equipment Manufacturers' Advisory Council (EEMAC)
- .3 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME)
 - .1 ANSI/ASME B31.1, Power Piping, (SI Edition).
- .4 American Society for Testing and Materials (ASTM)
 - .1 ASTM A125, Specification for Steel Springs, Helical, Heat-Treated.
 - .2 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A563, Specification for Carbon and Alloy Steel Nuts.
- .5 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP58, Pipe Hangers and Supports - Materials, Design and Manufacture.
 - .2 MSS SP69, Pipe Hangers and Supports - Selection and Application.
 - .3 MSS SP89, Pipe Hangers and Supports - Fabrication and Installation Practices.
- .6 Underwriter's Laboratories of Canada (ULC)

1.2 REGULATORY REQUIREMENTS

- .1 Refer to other parts of the specifications.
- .2 Conform to the requirements and recommendations of all local municipal, provincial and federal codes, by-laws and ordinances.
- .3 Where work indicated exceeds minimum requirements of applicable codes and standards, provide work as specified.

1.3 APPLICABLE CODES AND STANDARDS

- .1 In general and as applicable, the physical and chemical properties, the characteristics and the performance of items in this Division shall be as noted in the following:
 - .1 Canadian Standards Association.
 - .2 American National Standards Institute.
 - .3 Civic Building By-Laws.
 - .4 Civic Water Works By-Laws and Sewer By-Laws.
 - .5 Worker's Compensation Board Requirements.
 - .6 American Society for Testing and Materials.
 - .7 Canadian Government Specifications Board.
 - .8 National Fire Protection Association.
 - .9 Canadian Council of Ministers of the Environment Codes.
 - .10 Underwriters' Laboratories of Canada.

1.4 LATEST EDITIONS

- .1 The latest edition of all codes and standards, of the date of tender submission, shall apply; except for specific editions referenced by overriding codes.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for specified equipment and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province where work is taking place.
 - .2 Drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .3 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.
 - .4 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

1.6 AUTHORITIES HAVING JURISDICTION

- .1 Comply with all requirements of Authorities Having Jurisdiction (AHJ), including authorized inspectors, without additional compensation.

1.7 PERMITS, FEES AND CERTIFICATES

- .1 Obtain all permits, approvals, and the like, required to complete the work ready for occupancy. Include the cost of same in the Tender Price.
- .2 Assist the Departmental Representative in obtaining both temporary and permanent occupancy permits.
- .3 In addition to the requirements in Division 01, obtain all required Certificates of Inspection for the work and deliver same to the Departmental Representative before request for substantial performance. These include but are not limited to:
 - .1 Equipment start-up reports.
 - .2 Fire protection certificate.

1.8 EQUIPMENT LIST

- .1 Compile a complete list of fire suppression equipment and materials to be used on this project and forming part of tender documents by adding manufacturer's name, model number and details of materials, and submit for approval.

- .2 Submit for approval within 10 days after award of contract.

1.9 SPECIFIED EQUIPMENT AVAILABILITY

- .1 If specified equipment is not available (due to delays in delivery due to reasons within the Contractor's control) at scheduled installation time an acceptable alternate shall be installed AT THE CONTRACTOR'S EXPENSE and replaced with the specified equipment when the specified equipment becomes available with no additional compensation.

1.10 REGISTRATION / CERTIFICATION OF FIRE PROTECTION CONTRACTOR

- .1 The contractor shall be registered and/or certified as a fire protection contractor, where required by the Authority Having Jurisdiction.
- .2 All individual workers must hold a valid Certificate of Qualification, or be a Registered Apprentice, as required by the AHJ.
- .3 Where required by the local professional engineering governing body, fire protection engineer shall carry authorization to practice as an engineering service company (such as a Certificate of Authorization, etc.).

1.11 DESIGN AND ENGINEERING OF FIRE PROTECTION SYSTEMS

- .1 The fire protection contractor is responsible for the design and engineering of the systems in accordance with NFPA, other applicable standards, and the AHJ. This includes, but is not limited to layout, calculations, certification, and other work required by NFPA.
- .2 Perform a complete system design confirming the requirements specified herein and detailing all aspects of the required fire protection systems and document with shop drawings as specified herein. Refer to other sections for additional requirements.
- .3 Data used for designing fire protection systems shall be current, obtained within six (6) months of date indicated on the working drawings. Fire protection contractor shall verify that conditions have not changed in the vicinity of the project that would make the data questionable. Test as required for valid, current data.
- .4 Equipment and piping indicated on the contract drawings shall be located as shown. Advise the Departmental Representative if code or other reasons do not permit equipment and piping to be located as shown. Locate other equipment and piping as required to suit the design, subject to timely coordination with other trades and approval of the Departmental Representative.

1.12 USE OF ELECTRONIC DRAWINGS FROM ENGINEER

- .1 Refer to Division 01 for availability with respect to obtaining drawings in electronic format (i.e. AutoCAD ".dwg" or ".dxf") directly from the Engineer, for use in the production of fire protection design, shop drawings, and/or record drawings. Otherwise contact Departmental Representative.

1.13 PROTECTION OF OPENINGS

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

1.14 ELECTRICAL CHARACTERISTICS

- .1 Check with the electrical trade and provide all mechanical items with correct electrical characteristics to suit the electrical work.
- .2 If correct characteristics are not available from the specified equipment manufacturer, contact the Departmental Representative prior to the close of tenders.
- .3 At time of ordering mechanical equipment, confirm electrical characteristics with the Electrical Contractor including voltage, current, horsepower and other relevant data, and ensure that they have been confirmed by the power authority.
- .4 No additional compensation will be paid for problems arising from incorrect electrical characteristics.

1.15 CUTTING, PATCHING, REPAIRING, MAKING GOOD

- .1 Note that Lower Fort Garry is a historic site. All cutting patching shall be done in accordance with architectural specifications and in strict accordance with Parks Canada Requirements.
 - .1 Any cutting and removal of material shall be done only with approval from Parks Canada. Where this is required, the work shall be done in a manner such that it can be reversed.
 - .1 Photograph and document existing conditions prior to work commencing.
 - .2 Deconstruction assembly, and document all components. Hand over all components to Parks Canada.
 - .3 Patching must be performed in strict accordance with Parks Canada's instructions.
 - .1 Work will involve matching materials and construction methods with original.
 - .2 Splice new work with old work.
 - .3 Material shall be of equal grade or better. Wood species shall match.
 - .2 The contractor shall allow for specialized labour, with experience in historic restoration work.
 - .3 In addition to the requirements in Division 01, each trade requiring such work shall be responsible for necessary cutting. Patching shall be by appropriate trade. All work to be performed by experienced tradesmen.
 - .4 Neatly perform cutting and patching work to blend smoothly with surrounding surfaces.
 - .5 Patch and make good disturbed surfaces to match existing adjacent work. Leave finished, neat, to Departmental Representative's approval.
 - .6 Perform X-ray examination of wall and floors prior to making openings, where required to avoid damage to concealed elements such as structural reinforcements and electrical conduit.

1.16 TESTS

- .1 In addition to the requirements in Division 01, carry out all tests hereinafter noted, as required by the regulatory agencies and as requested by the Departmental Representative and furnish all labour and equipment required for such tests without extra compensation.

- .2 Before activating systems, review manufacturer's instructions, recheck equipment, check all connections, set all controls for proper start-up, obtain necessary clearances from the electrical division, etc.
- .3 Submit to the Departmental Representative, legible report for each test conducted, within one week of the test.
- .4 Notify the Departmental Representative at least 2 regular working days ahead of all tests, so that the tests can be witnessed.

1.17 FUNCTIONAL TESTING

- .1 Test all fire protection equipment and systems. Test as required by the AHJ and Departmental Representative, submitting comprehensive reports. Example forms are available from the Departmental Representative.
- .2 Ensure all tests demonstrate compliance with the specified and manufacturers' shop drawing and catalogued performance, as well as compliance with applicable standards.

1.18 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 In addition to the requirements in Division 01, 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.
- .2 Manufacturers or expert suppliers to provide demonstrations and instructions.
- .3 Use operation and maintenance manual, record drawings, audio visual aids, etc. as part of instruction materials.
- .4 Instruction duration time requirement are as specified in appropriate sections. Where time is not specified, training shall be of sufficient scope and duration as needed to convey required information to the trainee, as approved by the Departmental Representative.
- .5 Where deemed necessary, Departmental Representative may record these demonstrations on videotape for future reference.
- .6 Submit training schedule and scope description to the Departmental Representative for review and approval for each training topic. Training shall not commence until approval of training schedule and scope if given by the Departmental Representative.

1.19 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 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.
- .3 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.
- .4 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.
- .5 Approvals:
 - .1 Submit 2 copies 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.
- .6 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .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. 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.
- .8 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.
- .9 Submit copies of as-built drawings for inclusion in final TAB report.

1.20 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Furnish spare parts as follows:
 - .1 Spare sprinkler heads, 6 per type
- .3 Provide one set of special tools required to service equipment as recommended by manufacturers.
- .4 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.21 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 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 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.

1.22 SUBSTANTIAL COMPLETION

- .1 Provide minimum notice of ten (10) working days to the Departmental Representative prior to request to declare project Substantially Complete. Failure to do so may result in site review by Engineer being delayed. Show 2 weeks on construction schedule.
- .2 A minimum of three (3) working days before substantial completion is to be declared, submit the following:
 - .1 All certificates and documentation recommended by NFPA standards and required by these specifications and AHJ that are applicable to the project.
 - .2 Operation and Maintenance Manuals, complete with revisions as directed.
 - .3 Confirm all fire protection equipment is operational, under control, indicating exceptions and temporary controls/arrangements, including 'tenant' areas.
- .3 Confirm systems are ready for occupancy and use for intended purpose in every respect. Submit a letter signed by the manager or president of the prime contractor under Div 21 (i.e. the fire protection contractor) stating as such upon request of the Departmental Representative.
- .4 Before certification date submit detailed written confirmation of completion of deficient life safety work noted in the documentation listed in previous paragraphs, including date completed. Provide schedule for any outstanding or deferred non-life safety work that is to be completed.

1.23 QUALITY OF MATERIALS

- .1 Furnish new materials, apparatus or products required for the work, of first class quality, delivered, erected, connected up and finished in every detail.
- .2 The use of any or all materials is subject to the approval of the Departmental Representative.
- .3 Unless otherwise specified, all products shall be CSA approved.

- .4 All fire protection materials, apparatus or products shall be ULC approved.
- .5 If materials, apparatus or products are not CSA or ULC approved, obtain approval of the provincial regulatory authority. Pay all applicable charges levied and make all modifications required for approval.
- .6 Confirm colours with the Departmental Representative before ordering.

1.24 SAFETY FEATURES

- .1 Provide safety features on all equipment to ensure safe operation and maintenance including belt, coupling, and other guards, screened fan intakes and discharges where inadequate ductwork for protection, safety interlocks and labels.

Part 2 Products

2.1 GENERAL

- .1 Installations shall include all devices, attachments, equipment, components and piping necessary to form complete working systems to code requirements.

2.2 MOTORS

- .1 Motors to be high efficiency, in accordance with local Hydro company standards.
- .2 Comply with all Canadian Electrical Code requirements, and in particular CSA C22.2 No. 100, c/w CSA label, unless otherwise specified.
- .3 Motors included in the scope of CAN/CSA-C747 shall have a nominal full-load efficiency not less than the minimum specified in that standard. Efficiency ratings of motors included in the scope of this standard shall be based on a statistically valid quality control procedure conforming to the standard. Nameplates shall list the nominal full-load motor efficiency.
- .4 Motors included in the scope of CAN/CSA-C390 shall have a nominal full-load efficiency not less than the minimum specified in that standard. Efficiency ratings of motors included in the scope of this standard shall be based on a statistically valid quality control procedure conforming to the standard. Nameplates shall list the nominal full-load motor efficiency.
- .5 In general, motors are EEMAC Class B (for standard torque applications), 1,800 RPM, continuous duty, open drip proof, ball bearing, 40°C temperature rise above 40°C ambient, 1.15 service factor. Motors are squirrel cage induction unless specifically noted otherwise. Special motors are specified with the equipment driven.
- .6 Single-phase motors shall be equipped with integral thermal overload protection.
- .7 Provide adequate capacity on each motor to operate the associated driven device under all conditions of load and service without overloading and be of at least the power specified.
- .8 Refer to Division 26 and provide motor characteristics within +5% of power source, or get written approval from the Departmental Representative.
- .9 Co-operate with Division 26 during start-up and provide all necessary assistance in commissioning.
- .10 Acceptable motor manufacturers may be listed under the Section 21 05 03 – Acceptable Fire Suppression Manufacturers/Contractors.

- .11 If delivery of specified motor will delay delivery or installation of equipment, install motor approved by Departmental Representative for temporary use. Final acceptance of equipment will not occur until specified motor is installed.

2.3 GUARDS

- .1 Provide guards for unprotected drives.
- .2 Guards for belt drives:
 - .1 Expanded metal screen welded to steel frame.
 - .2 Minimum 1.2 mm thick sheet metal tops and bottoms.
 - .3 38 mm diameter holes on both shaft centres for insertion of tachometer.
 - .4 Allow movement of motors for adjusting belt tension.
- .3 Guard for flexible couplings:
 - .1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
- .4 Guards are to be removable to permit servicing of equipment.
- .5 Provide means to permit lubrication and use of test instruments with guards in place.
- .6 Ensure that all guards are securely fastened in place, sufficiently sturdy to provide the required safety and are free of rattles

2.4 FIRE SEPARATION REPAIR

- .1 Cooperate fully with other trades to ensure maintenance of the rating of fire separations that are penetrated, in strict compliance with the manufacturer's recommendations and requirements of the AHJ.

2.5 ACCESSIBILITY

- .1 Be responsible for supplying and locating all access panels in the ceiling, wall, partitions, etc., where openings are necessary for the inspection, servicing and/or removal of equipment, valves and other items that require periodic access. Panel type to suit the construction of the ceilings, walls, partitions, etc., in which they are located. Determine the location subject to the approval of the Departmental Representative. Access panels to be installed by trade experienced in work with surface in which the panel is to be installed.
- .2 Mark mechanical access points in accessible ceilings with distinctive but inconspicuous tags properly attached to the ceiling grid. Obtain sample approval before purchase and installation. Indicate on record drawings.
- .3 Accessibility shall be defined as:
 - .1 Ability to place both hands on equipment or device, with no duct, pipe or other equipment in the way.
 - .2 Must be accessible while standing on maximum 8'-0" step ladder.
 - .3 Must be in plain view.

2.6 SLEEVES AND PENETRATIONS

- .1 Install sleeves for all piping passing through floors and walls.
- .2 Sleeves as specifically noted, or through structural walls shall be Schedule 40 steel. All other sleeves are 6 mm galvanized sheet steel.

- .3 Fit sleeves flush on either side of the wall through which they pass, extend sleeves through floors and terminate 50 mm above finished floor. Adjust as necessary to accommodate the requirements of through-penetration fire-stopping systems.
- .4 Where passing through walls, make sleeves a minimum 6 mm clear of the piping, through floors make sleeves a minimum of 20 mm clear of the piping. Pack for full depth with fiberglass insulation & finish with a lagging compound. Penetrations through fire separations shall be repaired to maintain rating.
- .5 Provide escutcheon plates with set screws to completely cover openings for all exposed pipes passing through walls, subject to the approval of the Departmental Representative. Provide chrome plated plates in finished areas unless otherwise approved.
- .6 Be responsible for maintaining integrity of building envelope when making penetration to install equipment or devices. Enlist services of qualified trade to make openings in and/or repairs to building envelope.
- .7 Sleeving through steel beams shall be permitted only where approved by the Departmental Representative in writing or where expressly indicated on the Contract Documents. Sleeves are NOT permitted in concrete beams.
- .8 Seal all sleeves to make water tight.

2.7 PRESSURE GAUGES

- .1 To requirements of NFPA.

Part 3 Execution

3.1 GENERAL

- .1 All Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. Do not scale the Drawings. Consult the Architectural Drawings and details for exact locations of fixtures and equipment; obtain direction from the Departmental Representative where equipment locations are not clearly defined.
- .2 Follow Drawings as closely as possible in laying out work and check Drawings of all other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. When headroom or space conditions appear inadequate, notify the Departmental Representative before proceeding with the installation.
- .3 Make modifications to the work to accommodate conditions on site without additional compensation, as required to prevent conflicts with work of other trades and to ensure proper operation and installation of systems. Allow for vertical offsets and relocation of piping up to 3m in any direction to accommodate site conflicts.
- .4 Where variances occur between the Drawings and Specifications or within either document itself, include in the contract, the item or arrangement of better quality, greater quantity, and higher cost or clarify before tenders close. The final decision on the item and manner in which work is installed rests with the Departmental Representative.
- .5 The mechanical contractor, with all trades involved shall provide marked-up drawings, when requested, of mechanical spaces indicating all dimensions for all installations prior to the work being done. Report any discrepancies to the Departmental Representative. Any conflicts arising that may have been resolved by laying the work out in this manner will be resolved WITHOUT ADDITIONAL COMPENSATION.

- .6 Provide 48 hours minimum notice to Departmental Representative of all work before it is concealed. Expose concealed work for inspection, upon request, when proper notice was not provided and pay all costs therefore, including making good other trades' work.

3.2 SURVEYS AND MEASUREMENTS

- .1 Base all measurements, both horizontal and vertical from established bench marks. All work shall agree with these established lines and levels. Verify all measurements shown on the Drawings at the site, and check the correctness of same as related to the work.
- .2 Notify the Departmental Representative if any discrepancy is discovered between the actual measurements and those indicated which prevent following good practice or the intent of the Drawings & Specifications. Do not proceed with the work until receiving instructions from the Departmental Representative.

3.3 CO-ORDINATION

- .1 Give full co-operation to those doing work under other Divisions and furnish in writing with copies to the Departmental Representative any information necessary to permit the work of all Divisions to be installed satisfactorily and with least possible interference or delay. Work installed before full coordination is subject to removal and replacement without additional compensation.
- .2 Discuss work with other Divisions prior to installation. Confirm proposed locations for equipment installed by this Division will not interfere with work installed by others.
- .3 If work is installed before coordinating with other trades or so as to interfere with work of other trades, make necessary changes in the work to correct the conditions without extra compensation.
- .4 When requested, provide marked up drawings indicating required clearances for installation of fire protection equipment. Provide section drawings including location of other equipment not installed by Division 21, such as ducts, cable trays, other piping, etc. Report any discrepancies to the Departmental Representative.

3.4 ACCESSIBILITY

- .1 Locate all equipment which must be serviced, operated or maintained in fully accessible positions, with minimum interference and maximum usable space. Provide access doors as required to ensure sufficient access for service and inspection. Make minor modifications to routing and locations of equipment indicated on drawings as required to improve access to equipment. Obtain direction from the Departmental Representative where major modifications are necessary to provide sufficient access.

3.5 SCAFFOLDING, RIGGING, HOISTING

- .1 Unless otherwise specified, furnish all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of any equipment apparatus furnished. Remove same from the premises when no longer required.
- .2 Take precautions not to overload the structure in any manner nor provide inadequate scaffolding and rigging so as to endanger the safety of personnel on the site whether under this Division's employ or otherwise.

3.6 SUPPORTS

- .1 Provide all necessary and recommended supports for all equipment furnished under this Division. Co-ordinate and facilitate all necessary and recommended foundations, pads,

bases and piers provided under other Divisions for equipment furnished or installed under this Division.

3.7 PROTECTION

- .1 Protect the work and material of all other sections from damage and make good all damage thus caused, to the satisfaction of the Departmental Representative.

3.8 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.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.9 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.

3.10 SYSTEM CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.
- .2 Ductwork shall be turned over to owner in new condition.

3.11 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report.
- .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.
 - .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.

3.12 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.

- .5 Departmental Representative will record these demonstrations on video tape for future reference.

3.13 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 and recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.14 PROTECTION

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

3.15 EQUIPMENT START UP

- .1 Mechanical contractor shall ensure that all electrical/mechanical components match and that it is safe to start up mechanical equipment. See also Functional Testing.
- .2 All support such as electrical contractor, controls contractor, etc., shall be arranged by the mechanical and all trades directly involved in mechanical equipment being started shall be present for start-up.

3.16 MANUFACTURERS' RECOMMENDATIONS

- .1 Install, adjust, test, start-up, and maintain all equipment in strict accordance with the manufacturer's recommendations. If in conflict with the drawings and specifications, contact the Departmental Representative for clarification. Include edited data in O&M manuals.
- .2 Ensure that the manufacturer recommends the product for its intended use. If in doubt, contact the Departmental Representative.

3.17 PERSONNEL PROTECTION

- .1 In addition to the requirements in Division 01, provide visual warning signs and/or markers and mechanical protection devices for all mechanical items mounted below the minimum limits listed below and suspended more than 1500mm clear of the floor.
 - .1 Occupied spaces 2.3 m.
 - .2 Service spaces 2.1 m.
- .2 Visual warning devices to be yellow tape with black stripes adhered to the entire perimeter of the item infringing on the occupied space. This will include but not be limited to:
 - .1 Length of pipes or equipment below specified height.
- .3 Mechanical protection devices to be 7 mm wire mesh guard and/or 25 mm thick flexible foam type insulation. This will include but not be limited to:
 - .1 Pipe and equipment hangers.
 - .2 Valves.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 21 05 05.

1.2 REFERENCES

- .1 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).
 - .2 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA13-[2007], Standard for the Installation of Sprinkler Systems.
 - .2 NFPA 25-[2011], Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- .3 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN4 S543-[M1984], Standard for Internal Lug Quick Connect Coupling for Fire Hose.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section [01 33 00 - Submittal Procedures].
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for equipment and systems, applicable series designation or style and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province where work is taking place.
- .4 Samples:
 - .1 Submit samples of following:
 - .1 Each type of sprinkler head.
 - .2 Signs and valve tags.
- .5 Test reports:
 - .1 Submit certified test reports for packaged fire pumps from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
 - .2 Test each pump/driver package at factory to provide detailed performance data and to demonstrate compliance with NFPA and specification. Submit certified test curves for approval of Departmental Representative.

- .3 Test hydrostatically to meet requirements of fire protection system to which it will be connected.
- .6 Certificates:
 - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .7 Manufacturers' Instructions:
 - .1 Instructions: provide manufacturer's installation instructions.
- .8 Field Quality Control Submittals:
 - .1 Manufacturer's Field Reports: submit manufacturer's field reports specified.
- .9 Sustainable Design Submittals:
 - .1 LEED Canada-[NC Version 1.0] [CI Version 1.0] Submittals: in accordance with Section 01 35 21 - LEED Requirements.
- 1.4 CLOSEOUT SUBMITTALS**
 - .1 Provide maintenance data for incorporation into manual specified in Section [01 78 00 - Closeout Submittals].
 - .2 Provide detailed hydraulic calculations including: summary sheet, Contractor's Material and Test Certificate for aboveground and underground piping, as well as other deliverables for incorporation into manual specified in Section 01 78 00 - Closeout Submittals, in accordance with NFPA 13.
- 1.5 QUALITY ASSURANCE**
 - .1 Qualifications:
 - .1 Installer: company or person specializing in dry sprinkler systems with documented experience.
 - .2 Supply grooved joint couplings, fittings, valves, grooving tools and specialties from a single manufacturer. Use date stamped castings for coupling housings, fittings, valve bodies, for quality assurance and traceability.
- 1.6 MAINTENANCE MATERIAL SUBMITTALS**
 - .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Provide spare sprinklers and tools in accordance with NFPA 13.
- 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:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
 - .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 ENGINEERING DESIGN CRITERIA

- .1 Design system in accordance with NFPA 13, using following parameters:
 - .1 Hazard:
 - .1 To suit occupancy as indicated.
 - .2 Pipe size and layout:
 - .1 Hydraulic design.
 - .2 Sprinkler head layout: to NFPA 13.
 - .3 Water supply:
 - .1 Conduct flow and pressure test of water supply in vicinity of project to obtain criteria for bases of design in accordance with NFPA 13.
 - .4 Zoning:
 - .1 System zoning as indicated.

2.2 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.
- .2 Grooved couplings and fittings made from minimum 90% recycled metal.

2.3 PIPE, FITTINGS AND VALVES

- .1 Pipe:
 - .1 Ferrous: to NFPA 13.
 - .2 Copper tube: to NFPA 13.
- .2 Fittings and joints to NFPA 13:
 - .1 Ferrous: screwed, welded, flanged.
 - .1 Grooved joints designed with two ductile iron housing segments, flush seal gasket for dry service, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
 - .2 Copper tube: soldered, brazed.
 - .3 Piping exposed in viewing areas shall have screwed fittings, black. Coloured fittings will not be accepted.
 - .4 Provide sample mock up of piping, fittings and supports to Departmental Representative for approval.
- .3 Auxiliary valves:
 - .1 ULC listed for fire protection service.
 - .2 Up to NPS 2: bronze, screwed ends, grooved, OS
 - .3 Swing or spring-actuated check valves.
 - .4 Ball drip.
 - .5 Tamper devices wired back to fire alarm panel.
- .4 Pipe hangers:
 - .1 ULC listed for fire protection services.

2.4 SPRINKLER HEADS

- .1 General: to NFPA 13 and ULC listed for fire services.

2.5 SPRINKLER HEAD TYPE A

- .1 Upright bronze.

2.6 SPRINKLER HEAD TYPE B

- .1 Pendent chrome link and lever type.

2.7 SPRINKLER HEAD TYPE C

- .1 Pendent chrome glass bulb type.

2.8 SPRINKLER HEAD TYPE D

- .1 Recessed polished chrome glass bulb type with ring and cup.

2.9 SPRINKLER HEAD TYPE E

- .1 Flush polished chrome link and lever type.

2.10 SPRINKLER HEAD TYPE F

- .1 Side wall polished chrome link and lever type.

2.11 AUXILIARY SUPERVISORY SWITCHES

- .1 General: to NFPA 13 and ULC listed for fire service.
- .2 Valves:
 - .1 Mechanically attached to valve body, with normally open and normally closed contacts and supervisory capability.
- .3 Flow switch type:
 - .1 With normally open and normally closed contacts and supervisory capability.
- .4 Pressure alarm switch:
 - .1 With normally open and normally closed contacts and supervisory capability.

2.12 FIRE DEPARTMENT CONNECTION

- .1 To NFPA 13 and ULC listed, Storz type, location as indicated. Thread specifications to be compatible with local fire department.
- .2 Polished chrome plated exposed with identifying sign cast on plate. Threaded metal caps and chains.
- .3 Install a 90-degree elbow with drain connection at low-point near each fire department connection to allow for system drainage to prevent freezing.

2.13 DRY PIPE VALVE

- .1 ULC listed.
- .2 Cast or ductile iron, flanged or grooved end type, sized to suit water main.
- .3 Components:

- .1 Accelerator.
 - .2 Air maintenance device with low pressure alarm.
 - .3 Alarm pressure switch with supervisory capability.
 - .4 Pressure gauges.
 - .5 Drain valve.
 - .6 Test valve with associated piping.
 - .7 Shut off valve - OS
- .4 Provide valve complete with internal components that are replaceable without removing valve from installed position.
- .5 COMPRESSED AIR SUPPLY
- .1 Oil Less Automatic Air Compressor.
 - .2 ULC listed.
 - .3 Capacity:
 - .1 To restore normal air pressure in system within 30 minutes.
 - .2 To provide air pressure in accordance with instruction sheet furnished with dry pipe valve.
 - .4 Piping: ferrous, NPS 3/4 screwed joints and fittings, to NFPA 13.
- .6 NITROGEN
- .1 General:
 - .1 Introduce Nitrogen to system through pressure regulator set to maintain system pressure.
 - .2 Features:
 - .1 Complete skid mounted unit – easy plug and play installation
 - .2 Integrated 1 HP oil-less air compressor needed for NFPA 13 required 30 minutes fill for 500 gallon system at 40 PSI
 - .3 Handles up to 1200 gallons of total sprinkler system capacity (based on NFPA 13 allowable leak rates for a new sprinkler system)
 - .4 Premium nitrogen membrane
 - .5 Requires only one power connection
 - .6 Built-in Programmable Logic Controller for leak detection and air bypass alarm systems
 - .7 Form C dry contacts for Building Management System (BMS) notification
 - .8 Air tank and nitrogen tank
 - .9 Fits through standard 32” door
 - .10 Includes all filters, relief valves, automatic drains and gauges
 - .2 Storage containers:
 - .1 Floor mounted anchored to wall.
 - .2 Location as indicated.
 - .3 One bank for initial use and one bank to be connected in reserve.
 - .4 Piping: ferrous NPS 3/4 screwed, welded fittings to NFPA 13.
 - .5 Provide:

- .1 Visual indication of status of nitrogen supply.
- .2 Pressure switch for indication of discharge of container to show at main fire alarm panel.
- .3 Common header.
- .4 Directional flow valves.
- .7 **PRESSURE GAUGES**
 - .1 ULC listed and to Section 23 05 19.01 - Thermometers and Pressure Gauges - Piping Systems.
 - .2 Maximum limit of not less than twice normal working pressure at point where installed.
- .8 **RELIEF VALVE**
 - .1 ULC listed.
- .9 **SPARE PARTS CABINET**
 - .1 For storage of maintenance materials, spare sprinkler heads and special tools.
 - .2 Construct to sprinkler head manufacturers standard.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install, inspect and test to acceptance in accordance with NFPA 13 and NFPA 25.
- .2 Testing to be witnessed by authority having jurisdiction.
- .3 Install fire department connections as indicated.
- .4 Install spare parts cabinet as indicated.
- .5 Pressure gauges:
 - .1 Location:
 - .1 On water side and nitrogen side of dry pipe valve.
 - .2 At air receiver.
 - .3 In each independent pipe from air supply to dry pipe valve.
 - .4 At exhausters and accelerators.
 - .2 Install to permit removal.
 - .3 Locate so as not subjected to freezing.
- .6 Valve identification:
 - .1 Identify drain valve, by-pass valves and main shut-off valve and all auxiliary valves.

3.3 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 - 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 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.
- .2 Verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification, include:
- .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Low-emitting materials.

3.4 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION