

PART 1 General**1.1 GENERAL**

- .1 All drawings and all sections of the specifications shall apply to and form an integral part of this section.
- .2 Provide fully tested and operational mechanical systems in complete accordance with applicable codes and bylaws.
- .3 Contract documents of this section are diagrammatic and approximately to scale. Do not scale from the drawings, exact dimensions to be taken from architectural drawings or from the Site. The drawings and specifications establish scope for material and installation quality and are **not** detailed installation instructions. Follow Manufacturer's recommendations for installation supplemented by contract documents, unless otherwise specified by the Contract Administrator. Any discrepancies must be brought to the Contract Administrator's attention in writing prior to the close of Bid Opp.

1.2 SCOPE OF WORK

- .1 Work to include labour, material and equipment required for supplying, installing, testing, adjusting, balancing, commissioning mechanical systems and provision of As-built drawings, O & M manuals and personnel training as detailed in this and other Sections of Divisions 21, 22 & 23.
- .2 It is the responsibility of the Contractor to co-ordinate the Work among the various Subcontractor(s) to ensure complete functioning systems.

1.3 DEFINITIONS

- .1 Whenever "drawings" and "specifications" are referred to, it means "the Contract Documents".

1.4 WORK INCLUDED

- .1 Sections of these mechanical specifications are not intended to delegate functions or to delegate work and supply to any specific trade. The Work shall include all labour, materials, equipment, and tools required for a complete and working installation as described on the drawings and all Sections of Divisions 21, 22 & 23.

1.5 COMMISSIONING

- .1 Systems commissioning will be conducted prior to substantial completion. The purpose of the Commissioning is to ensure all systems are functioning as designed prior to substantial completion.
- .2 Commissioning will require the presence of knowledgeable representatives of the necessary Mechanical Trades. Manufacturer representatives are required to be on site for commissioning. The Mechanical Contractor shall include all necessary costs for systems commissioning. The Contract Administrator will participate to the extent deemed necessary.

- .3 All aspects of mechanical systems operations will be operated, checked and verified. If any portion of the Work fails to meet design requirements, the Commissioning procedure will be halted and only resumed when all necessary repairs are completed. All extra costs including costs for the Contract Administrator to revisit the Site resulting from this postponement will be borne by this Contractor.
- .4 **The Contractor shall submit, to the Contract Administrator, a commissioning report detailing the commissioning tests performed and the results of these tests. Format of report is to be one sheet for each piece of mechanical equipment and it shall include: Equipment tag, description, location and point form description of tests and results. Submit blank draft commissioning test forms for each equipment to Contract Administrator for review prior to testing.**
- .5 Contractor to provide seasonal commissioning as required. If heating or cooling systems can not be commissioned at the completion of the Work due to outside weather conditions, the contractor is to return for the heating or cooling season to ensure the system is fully operational and functioning properly.

1.6 COMPLETION

- .1 After completing tests and adjustments remove temporary covers, and strainers, and obstructions to flow. Drain, flush and refill piping systems as often as required until all piping is clear of dirt and debris.
- .2 Leave Mechanical work in specified working order.
- .3 Provide spare components as specified in other Sections of Divisions 21, 22 & 23.
- .4 Provide one set of all specialized tools required to service equipment as recommended by manufacturers.

1.7 CONTRACT DRAWINGS AND SPECIFICATIONS

- .1 Drawings and specifications are complementary each to the other, what is called for by one shall be binding as if called for by both. Many items, such as valves, vents, thermometers, pressure gauges, etc. are shown only on schematics and are not shown on plan and elevation views. Provide and install all items shown in any or all of the drawings (or schematics).
- .2 Should any discrepancy appear between the drawings and specifications, which leave the Contractor in doubt as to the true intent and meaning of the plans, and specifications, the Contractor shall obtain a ruling from the Contract Administrator in writing **before submitting a Bid Opp**. If this is not done it will be assumed that the most expensive alternative has been included in the Bid Opp price. For any ruling to become binding, the Contract Administrator must issue the new direction in a published addendum.
- .3 Examine all contract documents, including all drawings, specifications and work of other trades to ensure that Work is co-ordinated and satisfactorily carried out without changes to the building or contract value.
- .4 The drawings for mechanical work are performance drawings. They are generally diagrammatic and are not to scale unless detailed otherwise. They establish scope, material and installation quality and are not detailed installation instructions showing every offset, fitting, valve or every

- difficulty encountered during execution of Work and should not be used as an excuse for deficiencies or omissions.
- .5 Follow the recommended installation details and procedures for equipment as found in Supplier technical data, supplemented by contract document details.
 - .6 Install piping, ductwork, etc., generally in the locations and routes shown on the drawings, close to the building structure to minimize furring and interference with other services or free space. Remove piping, ductwork, etc. that is not properly installed and replace to the satisfaction of the City of Winnipeg/Contract Administrator at no additional cost.
 - .7 Be completely responsible for the acceptable condition and operation of systems and equipment components forming part of the installation or associated with it. Promptly replace defective materials, parts and equipment and repair related damage.
 - .8 The drawings are intended to convey the scope of Work and indicate general arrangement and approximate location of apparatus and fixtures, and indicate the general location and route to be followed by pipes and ducts. Where required installations are not shown on plans or are only shown diagrammatically, install in such a way as to conserve headroom and interfere as little as possible with free use of space through which they pass, while allowing adequate space for service, maintenance, repair, or replacement for all equipment.
 - .9 All serviceable items, such as valves, controls, bearings, filters and similar items, must be installed in such a manner as to be accessible for service, maintenance, repair and replacement without the removal of other material or equipment, and without the need for specialized equipment such as lifts, harnesses, or other safety items. Basically, work to be installed to allow easy equipment isolation and servicing functions while all surrounding systems continue to operate.
 - .10 All individual pieces of equipment shall be provided with appropriate means of isolation and bypass so that systems may continue to operate during maintenance of individual components. It is understood that this may not be possible in all situations, but this is a requirement where isolation is possible.
 - .11 Drawings and specifications to be considered as an integral part of contract documents and neither drawings nor specifications are to be used alone. Misinterpretation of requirements of plans or specifications shall not relieve Contractor of responsibility of properly completing Work to approval of Contract Administrator.
 - .12 Obtain information involving accurate dimensions from dimensions shown by site measurement. Visit and inspect the Site to verify location and elevation of existing services which may affect the Bid Opp and Work of this Division (water, electrical, sanitary, ductwork etc.) before submission of Bid Opp and proceeding with the Work. Make all necessary changes or additions to runs to accommodate structural conditions (pipes or ducts around beams, columns etc.) without additional expense to the City of Winnipeg. Locations of pipes, ducts and other equipment to be altered without charge to City of Winnipeg, provided change is made before installation and does not necessitate additional materials and that all such changes are acceptable to the Contract Administrator and are suitably recorded on Record Set of Drawings.
 - .13 Confirm on the Site the exact location and mounting elevation of outlets and fixtures as related to existing Mechanical & Electrical components.

- .14 As work progresses and before installing piping, ductwork, fixtures and equipment interfering with interior treatment and use of building, consult Contract Administrator for appropriate action before proceeding. This applies to all levels and proper grading of piping. If Contractor fails to perform above checking and fails to inform Contract Administrator of such interference, Contractor to bear all subsequent expense to make good the installation.
- .15 Refer to Structural drawings for roof construction details. These shall relate to roof supports, piping penetrating roofs, etc. as indicated on mechanical detail sheets.
- .16 Alter, at no additional cost, the locations of materials and/or equipment as directed that do not necessitate additional material.

1.8 CUTTING AND PATCHING

- .1 Cutting, core drilling, patching and repairs to existing surfaces required as a result of the removal and/or relocation of existing equipment and piping, and/or installation of new equipment and piping to be included by Divisions 21, 22 & 23 - Mechanical in Bid Opp price. Divisions 21, 22 & 23 to employ and pay appropriate Subcontractor whose work is involved, for carrying out Work described above.
- .2 The cutting of openings not requiring lintels or other structural support will be the responsibility of the trade requiring the opening, the opening size will be the minimum required, and that patching will be the responsibility of the trade making the opening to the original or specified conditions.
- .3 Where openings require lintels or other structural support, or roofing work, such openings will be specified under other divisions of this specification.

1.9 PAINTING

- .1 Apply at least one coat of corrosion resistant primer paint to ferrous supports and site fabricated work.
- .2 Prime and paint marred finished paintwork to match original.
- .3 Restore to new condition finishes which have been damaged too extensively to be merely primed and touched up.
- .4 Painting of all new exposed ductwork and unexposed un-insulated piping by Division 09 91 99 – Painting of Minor Works.

1.10 DOCUMENTATION AND SYSTEMS ACCEPTANCE

- .1 Provide the following on substantial performance of the Work:
 - .1 As-Built drawings. As-built information is to be recorded as detailed elsewhere in this Section. Submit As-Built drawings to Contract Administrator for review prior to total completion.
 - .2 Assemble the specified quantity of O&M manuals in D-ring binders with index tabs, each containing this Sub-Contractor's and suppliers names and telephone numbers, data sheets, valve charts, brochures, operating, maintenance, and lubricating instructions as well as number coded wiring diagrams and a complete set of reviewed

shop drawings for all equipment provided by this Division. Present all copies to the Contract Administrator for review.

- .3 Extended warranty certificates, where specified in other Sections of Divisions 21, 22 & 23.
- .4 Water balancing report. The Work of Divisions 21, 22 & 23 will not be considered totally performed until acceptance by the Contract Administrator of the Air and Water Balancing Report.

1.11 EQUIPMENT PROTECTION AND CLEANUP

- .1 Protect equipment and materials in storage on Site, during and after installation until final acceptance. Leave factory covers in place and take special precautions to prevent entry of foreign material into working parts of piping and duct systems.
- .2 Clean exposed surfaces of mechanical equipment, ductwork, piping, etc., and polish plated work.
- .3 Remove tools, surplus and waste material from the building Site upon completion. Clean grease, dirt and excess material from walls, floors, ceilings and fixtures for which this Contractor was responsible, and leave the premises suitable for immediate use.

1.12 EXAMINATION OF THE SITE AND DOCUMENTATION

- .1 Prior to submitting Bid Opp, carefully examine Site conditions, adjacent buildings and local conditions at the Site, which could affect the Work of this Division.
- .2 Examine all contract drawings to ensure Work can be performed without changes to the building, or Work, as shown on plans. No allowance will be made later for necessary changes, unless notification of interferences has been brought to The Contract Administrator's attention, in writing, prior to closing of Bid Opp.
- .3 Verify that materials and equipment can be delivered to the place of the Work and that sufficient space and access is available to permit installation thereof in locations shown on the drawings.

1.13 GUARANTEES AND WARRANTIES

- .1 Guarantee satisfactory operation of all Work and apparatus installed under this contract. Replace, at no expense to the City of Winnipeg, all items, which fail or prove defective within a period of time as define in Division 1, but in no circumstances shall the warranty period be less than one (1) year after final acceptance of complete contract by the City of Winnipeg. Make good all damage incurred as a result of failure or repair of mechanical work.
- .2 No certification given, payment made, partial or entire use of equipment by the City of Winnipeg, shall be construed as acceptance of defective work or acceptance of improper materials. Make good at once, without cost to the City of Winnipeg, all such defective work or materials and consequence resulting, within the period of time defined in Division 1, but not less than one (1) year from time of final acceptance date.
- .3 This general guarantee shall not act as a waiver for any specified guarantee and/or warranty of greater length of time noted elsewhere in these documents.

- .4 Comply with requirements of Division 1. Where warranties specified in Division 1 are longer, or more stringent than in Divisions 21, 22 & 23, Division 1 shall govern. Provide warranties on specified products, equipment and components as well as on the installation of these items. Include for all costs for cutting and patching, removals and restoration materials and work and repairs to other equipment affected in performance of warranty work.
- .5 Provide warranty certificates, wherever given or required, that are in excess of the normal warranty period showing the name of the firm giving the warranty, dated and acknowledged, on specific equipment and system.

1.14 INSTRUCTIONS TO THE OWNER

- .1 At the completion of the Work, the Contractor shall instruct and demonstrate to the City of Winnipeg's employee(s), or City of Winnipeg's representative, who will have charge of the equipment, the operation, maintenance care, and adjustment of all parts of the system to satisfaction of The Contract Administrator.
- .2 Demonstrate the specific starting, stopping, controlling and general maintenance requirements for each major piece of equipment and system.
- .3 Demonstrate all mechanical systems and provide a Contractor guided tour of the facility to point out all locations of equipment, dampers, control devices and the like.
- .4 Manufacturer's representative to provide training for operational staff, minimum of two separate 4hr training sessions.

1.15 LIABILITIES

- .1 Install concealed pipes and ducts neatly, close to building structure so furring is minimum size. Pipes, ducts and equipment installed improperly, to be removed and replaced without cost to City of Winnipeg.
- .2 Co-ordinate work with other sections to avoid conflict and to ensure proper installation of all equipment. Review all contract drawings.

1.16 MECHANICAL SUBCONTRACTORS

- .1 Submit, with the Bid Opp, the names of all Subcontractor(s) to be used on this project as well as the extent of work to be performed by each.
- .2 Contractor to have minimum five years experience in field of mechanical contracting and to have successfully performed work of similar nature and approximate size to that indicated in specifications and on drawings.

1.17 OPERATING AND MAINTENANCE MANUALS

- .1 Provide O & M Manuals to the Contract Administrator for review 2 weeks prior to final inspection. Incorporate Contract Administrator's review comments into final copies.
- .2 Provide three (3) sets of manuals in separate 3 "D" ring, loose leaf binders with spine and face pockets, with the project name clearly indicated on the spine and face. The final accepted copies shall be provided to the City of Winnipeg.

- .3 General catalogue data for the Operations and Maintenance Manual is unacceptable. If manufacturer's specification sheets are generalized in any way, they shall be clearly marked to show exactly which item has been supplied, and the project designation for that item (e.g., PRV-1) is to be noted on Manufacturer's specification sheet which includes all details for this unit, including complete model number, serial number, and construction & performance data.
- .4 The outline for the Operating & Maintenance Manual shall be as follows:
- Contractor and Subcontractor Contact Information
 - Purpose
 - General Description
 - Operating Instructions
 - Seasonal Operations
 - Normal Valve Positions and Control
 - Recommended Inspection and Preventative Maintenance
 - Maintenance Schedule
 - Description of Maintenance Procedures
 - Recommended Major Equipment Spare Parts List
 - Appendices
 - Equipment Shop Drawings
 - Equipment Supplier Schedule
 - Manufacturer Recommended O & M Information
 - Exploded Views and Parts Lists
 - As-Built Drawings (reduced)
 - Control Narrative
 - Control Drawings
- .5 Include the following information in the manuals, incorporated into the outline format above, as applicable:
- .1 Mechanical Systems
1. Maintenance Tasks - including daily, weekly, monthly, semi-annual and annual checks.
 2. Lubrication Information.
 3. List of Subcontractor(s) and Equipment Suppliers including contact information
 4. Parts and Troubleshooting Information.
- .2 Certification and Identification
1. Inspection Certificates
 2. Balance Reports
- .3 Component Information
- .1 Section for each type of equipment to include shop drawings, installation and maintenance information.
- .4 Safety Information
- .5 Also provide the following information:

- .1 Include control diagrams, (including Building Automation System diagrams), sequence of operations, and service instructions (calibration, trouble shooting, etc.).
- .2 Provide Manufacturer's preventive maintenance procedures (recommended lubrication materials and procedures, frequency, etc.).
- .3 System and equipment troubleshooting guides.
- .4 A copy of the final balancing reports.

1.18 PERFORMANCE OF WORK

- .1 Protect and maintain work until work has been completed and accepted. Protect work against damage during installation. Cover with tarpaulins if necessary. Repair all damage to floor and wall surfaces resulting from carrying out of work, without expense to the City of Winnipeg.

1.19 PERMITS, FEES AND INSPECTIONS

- .1 Apply for, obtain, and pay for all permits, licences, inspections, examinations and fees required for Work of Divisions 21, 22 & 23.
- .2 Review drawings with authorities having jurisdiction to ensure compliance with all applicable codes and by-laws.
- .3 In case of conflict, codes and regulations take precedence over the contract documents. In no instance reduce the standard or scope of Work or intent established by the drawings and specifications by applying any of the codes referred to herein. Any discrepancies must be brought to the Contract Administrator's attention in writing.
- .4 Before starting any Work submit the required number of copies of drawings and specifications to the Authorities for their approval and comments. Comply with any changes requested as part of the contract, but notify the Contract Administrator immediately of such changes. Prepare and submit any additional drawings, details or information as may be required.

1.20 RECORD DRAWINGS

- .1 Obtain one set of drawings and specifications and, as the job progresses, mark these prints clearly in red pencil to accurately indicate installed work, as well as alterations to ductwork, piping, equipment and associated work changes and deviations from work shown on Contract Drawings, including all Addenda and Work Order Changes.
- .2 As-Built drawings to be maintained on a continuous basis to ensure they are up-to-date and accurate, and have current prints available for inspection at the Site at all times.
- .3 Submit this set of record drawings to the Contract Administrator for review on completion of the Work. Should the record drawings be lacking information or details of changes made, they will be returned to the contractor. The contractor is to, without additional cost to the City of Winnipeg or Contract Administrator, make the required site inspections, etc. and update the record drawings to the satisfaction of the Contract Administrator.

1.21 REGULATORY REQUIREMENTS

- .1 Comply with the most stringent requirements of all Municipal, Provincial and Federal Bylaws and Ordinances, the requirements of Utilities such as Manitoba Hydro, and all sections of this specification.
- .2 Provide necessary notices, obtain permits and pay all fees, in order that Work specified may be carried out.
- .3 Furnish certificates confirming Work installed conforms to requirements of authorities having jurisdiction.

1.22 SHOP DRAWINGS

- .1 Submit to the Contract Administrator for review a maximum of four (4) sets of detailed shop drawings. Electronic .pdf format shop drawings are acceptable.
- .2 Check shop drawings for conformity to plans and specifications prior to submission.
- .3 Submit shop drawings for all items specified in the sections of Divisions 21, 22 & 23. For equipment, provide performance, physical and operating data as described in the Specifications and listed in equipment schedules. Provide performance curves for all pumps and fans.
- .4 Shop drawings shall include copies of applicable brochure or catalogue material clearly indicating manufacturer and model. Ambiguous shop drawings will not be reviewed.
- .5 Clearly mark submittal to indicate all differences from the specified material. The Contract Administrator will require all options and material indicated on the shop drawing to be provided and installed. Specifically note on the submittal specified features such as tank linings, pump seal materials, painting finish, etc.
- .6 Include dimensional and technical data sufficient to determine if equipment meets requirements, including weights, loading points, electrical data and motor sizes.
- .7 Identify the equipment by system name and number, e.g. "S1, Second Floor, Air Supply Fan", "P1, Chilled Water Pump", etc.
- .8 Installed materials and equipment shall meet specified requirements regardless of whether or not the shop drawings were reviewed by the Contract Administrator.
- .9 Each drawing to include name of project, equipment supplier and clause number equipment is specified under.
- .10 Clearly show division of responsibility. No item, equipment or description of Work shall be indicated to be supplied or Work to be done "By Others" or "By Purchaser". Any item, equipment or description of Work shown on shop drawings shall form part of contract, unless specifically noted to contrary.
- .11 Take full responsibility for securing and verifying field dimensions. In cases where fabrication must proceed prior to field dimensions being available, check all shop drawings and approve for dimensions only. In this case guarantee that dimensions will be worked to

and ensure that other Subcontractor(s) are aware of these dimensions and shall comply with them.

- .12 Review by the Contract Administrator shall be mutually understood to refer to general design only. If errors in detailed dimensions or interference with work are noticed, attention of Contractor will be called to such errors of interferences, but The Contract Administrator's review of drawings will not in any way relieve Contractor from responsibility for said errors or interferences, or from necessity of furnishing such work, and materials as may be required for completion of work as called for in contract documents.
- .13 This review by the Contract Administrator is for the sole purpose of ascertaining conformance with the design concept.
- .14 Do not order equipment until the Contract Administrator has reviewed and returned the reviewed shop drawings.
- .15 Keep one set of shop drawings on the Site.
- .16 Bind one complete set of checked shop drawings in each operating and maintenance instruction manual.

1.23 SITE REVIEW

- .1 The Contractor's work will be reviewed periodically by the City of Winnipeg, Contract Administrator or their representatives, solely for the purpose of determining general quality of Work. Guidance will be offered to Contractor in interpretation of plans and specifications as assistance to carry out Work.
- .2 Reviews and directives given to Contractor, his agents, servants and employees does not relieve the Contractor, his agents, servants or employees of their responsibility to provide the Work in all its parts in a safe and workmanlike manner, and in accordance with plans and specifications, nor impose on City of Winnipeg, and/or Contract Administrator or their representatives, any responsibility to supervise or oversee erection or installation of any Work.

1.24 SPECIAL TOOLS AND SPARE PARTS

- .1 Furnish the City of Winnipeg with spare parts as follows:
 - .1 Spare parts as detailed in individual Sections of Divisions 21, 22 & 23.

1.25 STANDARDS

- .1 Conform to the best modern practices of workmanship and installation methods and employ only skilled tradesmen working under the direction of fully qualified personnel.

1.26 STANDARD OF MATERIAL

- .1 All materials and equipment installed under this contract shall be new unless otherwise noted.
- .2 Materials and equipment specified and acceptable manufacturers are named in this specification for the purpose of establishing the standard of materials and workmanship to which Contractor shall adhere. Bid Opp price shall be based on the use of materials and equipment as specified.

- .3 Provide new material and equipment of first class quality, delivered, erected, connected and finished in every detail, and supplied with the acceptance of the Contract Administrator. Assume responsibility of ensuring that provided equipment performs as specified.
- .4 Requests for approval of equals must be done in accordance with B7.

1.27 SUBSTANTIAL COMPLETION

- .1 Prior to requesting any substantial completion inspection, complete all of the following items.
 - .1 All systems shall be operational with alarms, interlocks and control functions.
 - .2 Obtain all certificates of approval from the authorities having jurisdiction.
 - .3 All manufacturer start-ups shall be complete.
 - .4 Complete valve tagging and identification of all new mechanical systems and components.
 - .5 Lubricate all equipment as per manufacturers' instructions.
 - .6 Submit O & M Manuals and perform operator training.
 - .7 Provide all Manufacturers' reports required by specifications.
 - .8 Complete System Commissioning
 - .9 Complete all previously identified deficiencies.
 - .10 Clean equipment both inside and out.
 - .11 Complete final air and water balancing and submit reports.
 - .12 Complete final calibration.
 - .13 Provide As-Built record drawings in accordance with the Bid Opp documents.

1.28 SUPERINTENDENCE

- .1 Maintain qualified job site personnel consisting of licensed tradesmen and registered apprentices with proven experience in erecting, supervising, testing and adjusting projects of comparable nature and complexity.

1.29 TEMPORARY USE OF EQUIPMENT

- .1 Permanent systems and/or equipment not to be used during construction period, without the City of Winnipeg's permission.
- .2 Temporary use of equipment shall in no way relieve Contractor of providing warranties, as described elsewhere in this Section and in Division 1, on all equipment and systems so used.
- .3 Operate systems under conditions that ensure no temporary or permanent damage. Operate systems with proper treatment. Operate fans at proper resistance with filters installed. Change filters at regular intervals and prior to final acceptance. Operate with proper safety devices and controls installed and fully operational.
- .4 Under no circumstances shall air handling units, heat recovery ventilators or other air systems be used to provide temporary heating, cooling or ventilation during construction. Air systems (air handling units and heat recovery ventilators) shall only be operated after all drywall sanding and carpet installation (or any other operation that creates considerable dust or fibres) is complete.

1.30 WELDING REGULATIONS

- .1 Welding shall be performed by welder holding current welder's certificate from Provincial Department of Labour.
- .2 Suitable fire extinguishers are to be present during welding operations and during fire watch period.
- .3 During welding or soldering ensure structure is protected against fire, shield with fire-rated sheets and galvanized iron sheets.
- .4 Maintain a fire watch for a minimum of 1 hour after welding operations are complete.

1.31 WORKMANSHIP

- .1 Only first class workmanship will be accepted, not only as regards to safety, efficiency, and durability but also as regards to neatness of detail. Pipework must be installed parallel to, or at right angles to building planes. The entire Work shall present a neat and clean appearance on completion.

PART 2 Products

- .1 NOT USED.

PART 3 Execution**3.1 PAINTING REPAIRS AND RESTORATION**

- .1 Do painting in accordance with Section 09 90 00 – Painting.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

3.2 CLEANING

- .1 Clean interior and exterior of all systems including strainers.

3.3 DEMONSTRATION

- .1 Contract Administrator 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 Contractor shall record these demonstrations on video tape for future reference.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 22 42 01 – Plumbing Specialties & Accessories.

1.2 REFERENCES

- .1 Canada Green Building Council (CaGBC)
 - .1 LEED Canada 2009 for Design and Construction, LEED Canada 2009 for Design and Construction Leadership in Energy and Environmental Design Green Building Rating System Reference Guide.
- .2 National Fire Prevention Association (NFPA)
 - .1 NFPA 13, Standard for the Installation of Sprinkler Systems.

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, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by a professional engineer registered in the province of Manitoba.
 - .2 Indicate:
 - .1 Materials.
 - .2 Finishes.
 - .3 Method of anchorage
 - .4 Number of anchors.
 - .5 Supports.
 - .6 Reinforcement.
 - .7 Assembly details.
 - .8 Accessories.
- .4 Test reports:
 - .1 Submit certified test reports for wet pipe fire protection sprinkler systems.
- .5 Manufacturers' Instructions:
 - .1 Provide manufacturer's installation instructions.
- .6 Field Quality Control Submittals:
 - .1 Manufacturer's Field Reports: manufacturer's field reports specified.
- .7 Sustainable Design Submittals:
 - .1 Submittals: in accordance with Section 01 47 15 - LEED Sustainable Requirements.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide operation, maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals in accordance with NFPA 20.
- .2 Manufacturer's Catalog Data, including specific model, type, and size for:
 - .1 Pipe and fittings.
 - .2 Valves, including gate, check, and zone.
 - .3 Water motor alarms.
 - .4 Sprinkler heads.
 - .5 Pipe hangers and supports.
 - .6 Pressure or flow switch.
 - .7 Fire department connections.
 - .8 Mechanical couplings.
- .3 Drawings:
 - .1 Sprinkler heads and piping system layout.
 - .1 Prepare detailed working drawings of system layout in accordance with NFPA 13.
 - .2 Show data essential for proper installation of each system.
 - .3 Show details, plan view, elevations, and sections of systems supply and piping.
 - .4 Show piping schematic of systems supply, devices, valves, pipe, and fittings. Show point to point electrical wiring diagrams.
 - .2 Electrical wiring diagrams.
- .4 Design Data:
 - .1 Hydraulic calculations of sprinkler system design.
 - .2 Indicate type and design of each system and certify that each system has performed satisfactorily in the manner intended for not less than 18 months.
- .5 Records:
 - .1 As-built drawings of each system.
 - .1 After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes.
- .6 Operation and Maintenance Manuals:
 - .1 Provide detailed hydraulic calculations including summary sheet, and Contractor Material and Test Certificate for aboveground piping and other documentation for incorporation into manual in accordance with NFPA 13.

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in wet 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 60 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 Storage and Protection:
 - .1 Store materials in dry location.
 - .2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
- .4 Packaging Waste Management: In accordance with 01 74 21 Construction Waste Management.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Design automatic wet pipe fire suppression sprinkler systems in accordance with required and advisory provisions of NFPA 13, by hydraulic calculations for uniform distribution of water over design area.
- .2 Include with each system materials, accessories, and equipment inside and outside building to provide each system complete and ready for use.
- .3 Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed shop drawings.
- .4 Locate sprinkler heads in consistent pattern with ceiling grid, lights, and air supply diffusers.

- .5 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.
- .6 Location of Sprinkler Heads:
 - .1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13.
 - .2 Uniformly space sprinklers on branch.
- .7 Water Distribution:
 - .1 Make distribution uniform throughout the area in which sprinkler heads will open.
 - .2 Discharge from individual heads in hydraulically most remote area to be 100% of specified density.
- .8 Density of Application of Water:
 - .1 Size pipe to provide specified density when system is discharging specified total maximum required flow.
- .9 Sprinkler Discharge Area:
 - .1 Area: hydraulically most remote area as defined in NFPA 13.
- .10 Outside Hose Allowances:
 - .1 Include allowance in hydraulic calculations.
- .11 Friction Losses:
 - .1 Calculate in accordance with NFPA 13 procedures.
- .12 Water Supply:
 - .1 Base hydraulic calculations on water flow hydrant test.
 - .2 **Contractor shall perform water flow test at nearest hydrant under this project.**
- .13 System Safety Factor:
 - .1 **Sprinkler system shall be designed such that the maximum pressure required for the sprinkler system is 5 psi less than the residual pressure obtained from the hydrant flow test.**

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 ABOVE GROUND PIPING SYSTEMS

- .1 Provide fittings for changes in direction of piping and for connections.
 - .1 Make changes in piping sizes through tapered reducing pipe fittings, bushings will not be permitted.

- .2 Conceal piping in areas with suspended ceiling. Concealed piping in occupied spaces shall be painted to match adjacent surfaces. Confirm colours with Contract Administrator.

2.4 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 or roll grooved.
 - .1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, 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: screwed, soldered, brazed, grooved.
 - .3 Provide welded, threaded, or grooved-end type fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
 - .4 Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into pipe when pressure is applied will not be permitted.
 - .5 Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 32 mm and larger.
 - .6 Fittings: ULC approved for use in wet pipe sprinkler systems.
 - .7 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
 - .8 Side outlet tees using rubber gasketed fittings are permitted.
 - .9 Sprinkler pipe and fittings: metal.
- .3 Valves:
 - .1 ULC listed and FM approved for fire protection service.
- .4 Pipe hangers:
 - .1 ULC listed and FM approved for fire protection services in accordance with NFPA.

2.5 SPRINKLER HEADS

- .1 General: to NFPA 13 and ULC listed for fire services. All sprinkler heads shall be provided with a wax or polyester coating for corrosion resistance in accordance with NFPA 13 requirements.

2.6 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.

2.7 PRESSURE GAUGES

- .1 ULC listed and FM approved to NFPA 13
- .2 Maximum limit of not less than twice normal working pressure at point where installed.

2.8 PIPE SLEEVES

- .1 Provide pipe sleeves where piping passes through walls and floors.
- .2 Secure sleeves in position and location during construction.
- .3 Provide sleeves of sufficient length to pass through entire thickness of walls and floors.
- .4 Provide 2.5 cm minimum clearance between exterior of piping and interior of sleeve or core-drilled hole.
 - .1 Firmly pack space with mineral wool insulation.
 - .2 Seal space at both ends of sleeve or core-drilled hole.
 - .3 In fire walls and fire floors, seal both ends of pipe sleeves or core-drilled holes with ULC listed fill, void, or cavity material.
- .5 Sleeves in Masonry and Concrete Walls, Floors, and Roofs:
 - .1 Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in core-drilled hole are completely grouted smooth.
- .6 Sleeves in Other Than Masonry and Concrete Walls, Floors, and Roofs:
 - .1 Provide 0.61 mm thick galvanized steel sheet.

2.9 ESCUTCHEON PLATES

- .1 Provide metal plates for piping passing through walls, floors, and ceilings in exposed spaces.
- .2 Provide polished stainless steel plates in finished spaces.
- .3 Provide paint finish on metal plates in unfinished spaces.

2.10 INSPECTOR'S TEST CONNECTION

- .1 Locate inspector's test connection at hydraulically most remote part of each system, provide test connections in ceiling space for each sprinkler system or portion of each sprinkler system equipped with alarm device.
- .2 Provide test connection piping to location where discharge will be readily visible and where water may be discharged without property damage.
- .3 Provide discharge orifice of same size as corresponding sprinkler orifice.

2.11 SIGNS

- .1 Attach properly lettered and approved metal signs to each valve and alarm device to NFPA 13.
- .2 Permanently fix hydraulic design data nameplates to riser of each system.

2.12 SPARE PARTS CABINET

- .1 Provide metal cabinet with extra sprinkler heads and sprinkler head wrench adjacent to each alarm valve. Number and types of extra sprinkler heads as specified in NFPA 13.

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.

3.3 PIPE INSTALLATION

- .1 Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings.
- .2 Keep interior and ends of new piping and existing piping thoroughly cleaned of water and foreign matter.
- .3 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.
- .4 Inspect piping before placing into position.

3.4 ELECTRICAL CONNECTIONS

- .1 Provide electrical work associated with this section under Division 26.
- .2 Provide fire alarm system under Division 26.
- .3 Provide control wiring under Division 26.
- .4 Provide wiring in rigid metal conduit or intermediate metal conduit. Refer to Division 26.

3.5 DISINFECTION

- .1 Disinfect new piping in accordance with NFPA 13.

3.6 FIELD PAINTING

- .1 Clean, pretreat, prime, and paint new systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories.
- .2 Apply coatings to clean, dry surfaces, using clean brushes.
- .3 Clean surfaces to remove dust, dirt, rust, and loose mill scale.
- .4 Shield sprinkler heads with protective covering while painting is in progress.
- .5 Upon completion of painting, remove protective covering from sprinkler heads.

- .6 Remove sprinkler heads which have been painted and replace with new sprinkler heads.
- .7 Provide primed surfaces with following:
 - .1 Piping in Finished Areas:
 - .1 Provide primed surfaces with 2 coats of paint to match adjacent surfaces.
 - .2 Provide valves and operating accessories with 1 coat of red alkyd gloss enamel applied to minimum dry film thickness of 1.0 mil.
 - .3 Provide piping with 50 mm wide red painted enamel bands spaced at maximum of 6 m intervals throughout piping systems.
 - .2 Piping in Unfinished Areas:
 - .1 Priming / painting not required.

3.7 FIELD QUALITY CONTROL

- .1 Site Test, Inspection:
 - .1 Perform test to determine compliance with specified requirements.
 - .2 Test, inspect, and approve piping before covering or concealing.
 - .3 Preliminary Tests:
 - .1 Hydrostatically test each system in accordance with NFPA 13.
 - .2 Flush piping with potable water in accordance with NFPA 13.
 - .3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.
 - .4 Test alarms and other devices.
 - .5 Test water flow alarms by flowing water through inspector's test connection. When tests have been completed and corrections made, submit signed and dated certificate in accordance with NFPA 13.
 - .4 Formal Tests and Inspections:
 - .1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.
 - .2 Repeat required tests as directed.
 - .3 Correct defects and make additional tests until systems comply with contract requirements.
- .2 Site Tests:
 - .1 Verification requirements in accordance with Section 01 47 15 - Sustainable Requirements, 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 Cleaning:
 - .1 Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .4 Waste Management: In accordance with 01 74 21 Construction Waste Management.

END OF SECTION