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## **1. GENERAL**

### **1.1 Site Administration**

#### **.1 Access**

- .1 The Contractor shall arrange for and pay all costs involved in connection with access to site, in consultation with the Contract Administrator. The Contractor shall take all necessary precautions to protect all existing roads, sidewalks, parking areas, utilities and tunnels. The Contractor shall be held responsible for any damage resulting from his operations and subsequent repair or replacement. The Contractor shall take all necessary precautions to ensure proper means of ingress and egress from the Site during construction as required by local authorities.

#### **.2 Lines and Levels**

- .1 The Contractor shall, immediately upon entering project Site for purpose of beginning work, locate all general reference points and take such action as is necessary to prevent their destruction. The Contractor shall lay out his work and be responsible for all lines, elevations, batterboards, monuments, measurements, and building grading, paving, utilities and other work executed by him under the Contract. The Contractor shall exercise proper precaution to verify figures shown on Drawings, before laying out work and shall be held responsible for any error resulting from this failure to exercise this precaution.

#### **.3 Subsurface Conditions**

- .1 The Contractor shall report to the Contract Administrator immediately, unsatisfactory or questionable soil and subsurface conditions revealed during excavation, and cease foundation and substructural work until the condition has been examined and approval to again proceed has been given.

#### **.4 Use of Premises**

- .1 The Contractor shall obtain required permission from all bodies responsible, for use and temporary occupancy of Site premises during the period of construction, and shall obey all requirements and curfews for such use.

#### **.5 Easements and Encroachments**

- .1 Any encroachment onto adjacent property, or with zoning or alignment requirements shall be corrected or relieved at the expense of the Contractor. The Contractor shall be responsible for the provision and registration of any easements required for the installation of services.

### **1.2 Site Personnel Co-Ordination**

#### **.1 Co-operation of Parties on Site**

- .1 The Contractor shall give full co-operation to all Subcontractors by providing assistance in the laying out of their work. The Contractor shall ensure that no Subcontractor's work interferes with work of any other Subcontractors in such a way as to prevent the completion of the work in a satisfactory and workmanlike manner.

#### **.2 Field Inspection and Measurement**

- .1 Each Subcontractor shall be responsible to examine the work of other trades where such work affects his own performance, and shall notify the Contractor and the Contract Administrator in writing of any defects therein, before starting his portion of the work. Failure to so examine shall be taken as full acceptance of previously performed work, and no additional claims shall be considered.

.3 Expediting Activities

- .1 The Contractor shall be responsible for the transportation of his own work force and materials to the project Site, and shall supply scaffolding, tools, templates, hoists, cranes, derricks, plant and other equipment necessary to carry out his work.
- .2 All Subcontractors shall be responsible for the transportation of their own men and materials to the project Site and shall supply scaffolding, tools, templates, hoists, cranes, derricks, plant and all other equipment to carry out their respective work.

.4 Superintendent

- .1 A competent superintendent appointed by the Contractor shall be in complete charge of the work from commencement to completion, and shall devote his time exclusively to the work of this contract. The superintendent shall ensure that sub-trade layouts are co-ordinated sufficiently in advance of the work to avoid unnecessary conflicts.

**1.3 Documents and Instruction**

.1 Documents Provided

- .1 The Contractor shall be provided with sufficient sets of Drawings and Specifications from the Contract Administrator for use and distribution to Subcontractors in order to fully carry out the work.

.2 Documents on the Site

- .1 The Contractor shall at all times at the site have a signed and approved set of Documents in a secure and safe location within the site office, as well as a set of Drawings and Specifications for use during construction by all trades and for indicating "as built" conditions. At least, one (1) copy of all Building and Safety Codes, Regulations, Standards and Shop Drawings referenced within the Documents shall be maintained on the Site for use by personnel.

.3 The Cityship of Documents and Models

- .1 All Documents and Models which may be provided by the Contract Administrator are and shall remain his property, shall not be used on other work, and are to be returned in good condition to the Contract Administrator upon completion of work.

.4 Additional Instructions

- .1 Any additional instructions pertaining to the work shall be provided to the Contractor by the Contract Administrator.

**1.4 Climatic Environment**

.1 Summer Conditions

- .1 The Contractor shall take all necessary precautions to protect against damage to construction or materials caused by storms, wind, rain, flooding, heat, etc. Any material or construction damaged due to summer climatic conditions shall be replaced and made good at no extra cost to The City. No extensions in time scheduling will be allowed, should it be shown that the Contractor did not provide proper protection to all construction.

.2 Winter Conditions

- .1 The Contractor shall take all necessary precautions to protect against damage to construction and materials caused by storms, freezing temperatures, cold, wind, snow and overloading, etc. Where required, provide sufficient hoarding with adequate heat in areas where work is in progress to ensure continuous performance. Any material or

construction damaged due to winter climatic conditions shall be replaced and made good at no extra cost to The City. No extension in time scheduling will be allowed, should it be shown that the Contractor did not provide proper protection to all construction.

- .3 Where it shall be necessary to provide clearance of snow to continue construction unimpeded, or to prevent damage to construction and materials, such removal shall be provided by the Contractor at no extra expense to The City, in such manner and in such location as approved by local authorities.

**END OF SECTION**

## **1. GENERAL**

### **1.1 General Procedures**

- .1 The term "Shop Drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by the Contractor to illustrate details of a portion of the Work.
- .2 The Contractor shall arrange for the preparation of clearly identified Shop Drawings as called for by the Contract Documents or as the Contract Administrator may reasonably request.
- .3 Prior to submission to the Contract Administrator, the Contractor shall review all Shop Drawings. By this review, the Contractor represents that he has determined and verified all field measurements, field construction criteria, materials, catalogue numbers and similar data or will do so and that he has checked and coordinated each Shop Drawing with the requirements of the Work and of the Contract Documents. The Contractor's review of each Shop Drawing shall be indicated by stamp, date and signature of a responsible person.
- .4 The Contractor shall submit Shop Drawings to the Contract Administrator for his review with reasonable promptness and in orderly sequence so as to cause no delay in The Work or in The Work of Other Contractors. If either the Contractor or the Contract Administrator so requests, they shall jointly prepare a schedule fixing the dates for submission and return of Shop Drawings. Shop Drawings shall be submitted in an electronic format such as PDF and AutoCAD (minimum version acceptable is AutoCAD 2010) and shall be sent to the attention of the Contract Administrator in an electronic format, and also may be required to be sent in a printed, hard-copy format, in a specified number of copies, to the office of the Contract Administrator, as the Contract Administrator may direct. At the time of submission, the Contractor shall notify the Contract Administrator in writing of any deviations in the Shop Drawings from the requirements of the Contract Documents.
- .5 The Contract Administrator will review and return Shop Drawings in accordance with any schedule agreed upon, or otherwise with reasonable promptness so as to cause no delay. The Contract Administrator's review shall be for conformity to the design concept and for general arrangement only and such review shall not relieve the Contractor of responsibility for errors or omissions in the Shop Drawings or of responsibility for meeting all requirements of the Contract Documents unless a deviation on the Shop Drawings has been approved in writing by the Contract Administrator.
- .6 The Contractor shall make any changes in Shop Drawings which the Contract Administrator may require, consistent with the Contract Documents, and resubmit unless otherwise directed by the Contract Administrator. When resubmitting, the Contractor shall notify the Contract Administrator in writing, of any revisions other than those requested by the Contract Administrator.
- .7 Issue copies of Shop Drawings to all those sub-trades whose work is affected by the respective Drawings, and shall co-ordinate this part of the work of the project.
- .8 The Contractor has the sole responsibility with respects to trade co-ordination stemming from trade Shop Drawings submittal and acceptable equals and actual trade information used in the shop to manufacture the goods to be supplied.
- .9 The Contract Administrator's or Contract Administrator's review of Shop Drawings or of the revised Drawings shall not relieve the Contractor from responsibility for errors made therein nor for changes made from The City's Drawings or Specifications.
- .10 The Contract Administrator's review does not alter the Contractor's contractual obligations and does not relieve the Contractor of responsibility for conforming with the Tender Documents, for accuracy of dimensions, and co-ordination. Reviewed Shop Drawing shall be

printed by the respective sub-trades and shall be distributed to all parties concerned by the Contractor.

- .11 Ascertain which Shop Drawings will be required for approval by the municipality or other authorities having jurisdiction, and be responsible for submitting reviewed final copies of each drawing for their acceptance, and pay all charges and fees in this regard.

## **1.2 Definition**

- .1 The stamp applied to reviewed Shop Drawings shall state or have implied the following:  
“This review by the Contract Administrator is for the sole purpose of ascertaining conformance with the general design concept. This review does not mean that the Contract Administrator approved the detail design inherent in the Shop Drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of his responsibility for meeting all requirements of the contract documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes, or to techniques of construction and installation and for co-ordination of the work of all sub-trades.”

## **1.3 Samples**

- .1 The Contractor shall submit for the Contract Administrator's acceptance, such standard Manufacturer's samples as the Contract Administrator may reasonably require. Samples shall be labeled as to origin and intended use in The Work and shall conform to the requirements of the Contract Documents.
- .2 The Contractor shall provide samples of special products, assemblies, or components, when so required.

**END OF SECTION**

**1. GENERAL**

**1.1 Quality Control**

- .1 Quality Control Requirements
  - .1 Inspection and testing, administrative and enforcement.
  - .2 Test and mix designs.
  - .3 Equipment and system adjustment and balancing.
- .2 Inspection
  - .1 Representatives of The City and Contract Administrators shall have access to the work. If parts of the work are in preparation at locations other than the place of work, access shall be given to such work whenever it is in progress.
  - .2 Give timely notice requesting inspection if work is designated for special tests, inspections or approvals by Contract Administrator's instructions, or the law of the Place of the Work.
  - .3 If the Contractor covers or permits to be covered, work that has been previously designated for special tests, inspections or approvals before such is made, uncover such work, have the inspections or tests satisfactorily completed and make good such work at no additional cost to The City.
  - .4 The City may order any part of the work to be examined if such work is suspected to be not in accordance with Contract Documents. If, upon examination, such work is found not in accordance with Contract Documents, correct such work and pay the cost of examination and correction. If such work is found in accordance with Contract Documents, The City shall pay the cost of examination and replacement.
- .3 Independent Inspection Agencies
  - .1 Independent inspection/testing agencies may be engaged by The City for the purpose of inspecting and/or testing portions of the work. Costs of such services will be borne by The City.
  - .2 Provide equipment required for executing inspection and testing by the appointed agencies.
  - .3 Employment of inspection/testing agencies does not relax the responsibility to perform work in accordance with the Contract Document.
  - .4 If defects are revealed during inspection and/or testing, the appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defects and irregularities as advised, at no cost to The City. Pay costs for re-testing and reinspection.
- .4 Access to Work
  - .1 Allow inspection/testing agencies access to the work and to off-site manufacturing and fabrication plants.
- .5 Procedures
  - .1 Notify the appropriate agency and the Contract Administrator in advance of the requirement for tests, in order that attendance arrangements can be made.
  - .2 Submit samples and/or materials required for testing as specifically requested in specifications.

- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.
- .6 Rejected Work
  - .1 Remove defective work, whether the result of poor workmanship, use of defective products or damage, and whether incorporated in the work or not, which has been rejected by The City as failing to conform to Contract Documents. Replace or re-execute in accordance with the Contract Documents.
  - .2 Promptly make good all work damaged by such removals or replacements promptly.
  - .3 If, in the opinion of the Contract Administrator, it is not expedient to correct defective work or work not performed in accordance with Contract Documents, The City may deduct from Contract Price the difference in value between work performed and that called for by Contract Documents, the amount of which shall be determined by the Contract Administrator.
- .7 Reports
  - .1 Promptly submit two (2) copies of inspection and test reports to the Contract Administrator.
  - .2 Submit one (1) copy to Subcontractor of work, or manufacturer of material being inspected or tested.
- .8 Tests and Mix Designs
  - .1 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by the Law of the Place of Work shall be appraised by the Contract Administrator and may be authorized as recoverable.

**END OF SECTION**



## **1. GENERAL**

### **1.1 Construction Facilities**

- .1 Requirements Included
  - .1 This Section includes administrative and site work, equipment and facilities not incorporated into the final or permanent work.
- .2 Installation/Removal
  - .1 Provide construction facilities and temporary controls in order to expeditiously execute the work, and remove from site all such work after use.
- .3 Barriers
  - .1 Erect hoarding as required and/or where indicated on Drawings to protect public, workers and private property from injury or damage.
  - .2 Provide lockable gates within hoarding for access to site by workers and vehicles.
  - .3 Provide secure, rigid guard railings, and barricade around deep excavations, open shafts, open stairwells, and open edges of floors and roofs.
  - .4 Provide covered walkways and barricades required by governing authorities for public right-of-ways and for public access to building.
- .4 Environmental Controls
  - .1 Provide weathertight closures to unfinished door and window openings, types of shafts and other openings in floors and roofs. Close off floor areas where walls are not finished; seal off other openings; enclose building interior work area for temporary heat.
  - .2 Provide dust-tight screens or partitions to localize dust generating activities, and for the protection of workers and the public in finished areas of work.
- .5 Construction Aids
  - .1 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms temporary stairs.
  - .2 Designated existing stairs may be used by construction personnel. Coordinate use with The City.
  - .3 Provide and maintain hoists/cranes required for moving of workers, materials, and equipment. Hoists/cranes shall be operated by qualified personnel.
  - .4 Designated elevators may be used by construction personnel and when transporting materials. Provide protective coverings for finish surfaces of cars and entrances. Coordinate with The City.
  - .5 Provide temporary drainage and pumping facilities to keep excavation and site free from standing water.
- .6 Use of the Work
  - .1 Confine the work and operations of employees to limits indicated by Contract Drawings. Do not unreasonably encumber the premises with products. Do not load or permit to be loaded any part of the work with a weight or force that will endanger the work.
- .7 Traffic Control
  - .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as required for access to the work.

- .2 Provide and maintain flagpersons, traffic signals, barricades and flares/lights/lanterns as required to perform the work and protect the public.
  - .3 Parking **Will Not** be permitted on site.
- .8 Utilities
- .1 Provide sufficient sanitary facilities for workers in accordance with local health authorities. Maintain in clean condition.
  - .2 The City **will** provide a continuous supply of potable water for construction use.
  - .3 Provide temporary heating required during construction period, including attendance, maintenance and fuel. Maintain temperatures of minimum 10°C in areas where construction is in progress, unless indicated otherwise. Ventilate heated areas and keep building free of exhaust or combustion gases.
  - .4 Permanent heating system may be used when available. Be responsible for damages thereto. On completion of work for which permanent heating system is used, replace filters and clean all motors, and visible surfaces. Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is so certified by Contractor Administrator.
  - .5 Pay costs for maintaining temporary heat, when using permanent heating system. The City will pay utility charges when temporary heat source is existing building equipment.
  - .6 Be responsible for damage to the work due to failure in providing adequate heat and protection during construction.
  - .7 Provide and pay for temporary power required during construction for lighting and operation of power tools. Provide and maintain temporary lighting throughout project. Level of illumination on all floors shall be not less than 15 foot candles/162 Lx.
  - .8 Provide and pay for temporary telephones necessary for own use and for use of the Contractor Administrator and Contractor Administrators.
- .9 Protection
- .1 Protect surrounding private and public property, from damage during performance of work. Be responsible for damage incurred.
  - .2 Provide and maintain temporary fire protection equipment during performance of work required by the Contractor Administrator, governing codes, regulations and by-laws.
  - .3 Provide protection for finished and partially finished building finishes and equipment during performance of work required by the Contractor Administrator and governing codes, regulations and bylaws. Open fires and burning of rubbish are not permitted on site.
- .10 Offices and Sheds
- .1 Where required provide and maintain in clean condition during progress of work, adequately lighted, heated and ventilated Contractor's office with space for filing and layout of contract documents. Provide adequate required first aid facilities.
  - .2 Subcontractors may provide their own offices as necessary. Direct the location of these offices.
  - .3 Provide and maintain, in a lean and orderly condition, lockable weatherproof storage of tools, equipment and materials. Locate materials not required to be stored in weatherproof sheds on site in manner to cause the least interference with work activities.

.11 Signage

- .1 Provide and erect, within three (3) weeks of signing Contract, a project sign in a location designated by the Contractor Administrator. Sign to be of wood frame, plywood construction, painted with exhibit lettering produced by a professional sign painter. Maintain sign in good condition for the duration of work. Clean periodically. No other signs or advertisements, other than warning signs, are permitted on site. See Section 01 45 00.

.12 Cleaning

- .1 Maintain the work in tidy condition, free from the accumulation of waste products and debris, other than that caused by The City or Other Contractors.
- .2 Remove waste material and debris from site and deposit in waste containers at end of each working day.
- .3 Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.

**END OF SECTION**

## **1. GENERAL**

### **1.1 Materials**

- .1 Where materials and equipment are being used installed or set in place, the work shall be executed in accordance with the Manufacturer's latest printed directions. Copies of such directions shall accompany any samples submitted for acceptance.
- .2 Materials shall be new and of good quality for incorporation within the work; otherwise they will be rejected and replaced as directed by the Contract Administrator at no extra cost to The City.
- .3 Early deliveries of the materials necessary to the execution of the work shall be arranged for, to ensure its being on hand well in advance of the time it is required. Properly co-ordinate delivery time of all items supplied by The City for incorporation within the work. Do not deliver materials unduly long before they are needed for the work, or in excessive amounts.
- .4 Storage of materials, plant and equipment shall be on site only, unless otherwise agreed to by the Contract Administrator. If materials are stored off site, they shall be stored in a bonded warehouse and protected by suitable insurance, satisfactory to the Contract Administrator. All materials shall be delivered in their original undamaged packages, with all seals intact.
- .5 Store materials under waterproof cover, off the ground and in a smooth, level surface to prevent damage. Follow instructions of Manufacturer as to the handling and storage of their material. Materials damaged in shipment or in storage shall be removed from the site, and not incorporated into the work.

### **1.2 Standards**

- .1 The project shall be constructed in accordance with the local Building Code, latest edition, or the requirements of the Municipality, whichever is the higher, and as outlined in these Specifications.
- .2 Materials and workmanship shall conform to the Canadian Standards Association (CSA.), Canadian General Standards Board (CGSB), National Standards of Canada, ASTM International. (ASTM) or other governmental or trade specifications or standard referred to within the specification. Where required the Contractor shall provide proof that the products conform to specification requirements.
- .3 Wherever possible, all materials and systems shall be as listed in Canada Mortgage and Housing Corporation's manual "Building Materials Evaluation Reports".
- .4 Where the word 'acceptable' is used in the specifications to designate an item of material, equipment or system, the item or system shall be one that is acceptable to the Contract Administrator for the purpose intended.

### **1.3 Co-ordination of Trades**

- .1 The Contractor shall co-ordinate the work of all trades to expedite completion of the entire project without delay.
- .2 When requested by the Contract Administrator, provide copies of orders placed for equipment or materials by himself or any of the sub-trades, with copies of acknowledgment of orders with firm delivery dates noted thereon. Delivery of all materials shall be properly scheduled so that work on all activities progresses continuously in harmony with the approved construction schedule for this project. Claims will not be allowed for delays or additional expense resulting from failure to place orders in time. Should the Contractor find that poor delivery of any specified item will delay his work, the Contractor shall immediately notify the Contract Administrator in writing.

- .3 Specification items that refer to particular requirements and responsibilities of various Subcontractors shall not relieve the Contractor of his responsibility to co-ordinate the work, or of his overall responsibility for the work.
- .4 Workmanship shall be of a uniformly high quality and in strict accordance with good standard practices. Mediocre or inferior workmanship shall be replaced by work of first class quality without cost to The City, when so directed by the Contract Administrator.
- .5 Mechanics whose work is unsatisfactory to the Contract Administrator or who are considered to be unskilled or otherwise objectionable for the work, shall be dismissed upon notice by the Contract Administrator to The Contractor.
- .6 The Contractor and all Subcontractors shall fully guarantee that they will repair or cause to be repaired at their own expense any damage to the building, both during construction and during the course of the specified guarantees after completion and acceptance of the building by The City, which occurs as a result of faulty workmanship or materials. Cost of such repairs will be borne by the Contractor responsible for such faulty workmanship or materials.

#### **1.4 Delivery, Storage and Handling**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.
  - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

**END OF SECTION**

**1. GENERAL**

**1.1 Substantial Performance Inspection**

- .1 Inspection for Substantial Performance shall be carried out at the written request of the Contractor and only under the following conditions:
  - .1 Roof, site and exterior cleaned free of all construction debris.
- .2 Confirm to the Contract Administrator that the project is ready for Substantial Performance inspection and will request a date for same to be made.
- .3 During the inspection, a list of items not in accordance with Drawings and Specifications will be compiled by the Contract Administrator for distribution and immediate action. A copy shall be forwarded to the Contractor.
- .4 Proceed to correct the deficiencies and complete the project in a satisfactory and timely manner.
- .5 Should it become necessary for the Contract Administrator to re-inspect the work for deficiencies which were not corrected satisfactorily, the Contractor shall be responsible and pay for the additional time and expense incurred by the Contract Administrator for further inspection.
- .6 Even though acceptance has been given on certain aspects of the project, should deficiencies or omissions arise after the acceptance, it will not relieve the Contractor of the responsibility of correcting these deficiencies or omissions. Furthermore, a sum, in the opinion of the Contract Administrator, sufficient to correct the deficiencies or omissions can be requested to be returned to The City.
- .7 When the Contractor is satisfied that all deficiencies have been corrected, a formal application for a final inspection will be submitted to the Contract Administrator. After the Contractor has submitted the application for final inspection, it is the Contractor's responsibility to complete the requirements in order to obtain release of holdback monies.
- .8 On confirmation that all requirements have been met, the Contract Administrator may issue a Certificate of Total Performance for the project with or without a reserve fund allowance.

**1.2 Performance Assurance**

- .1 The guarantee period will expire twelve (12) months from the date of the Certificate of Total Performance, or should The City occupy the premises, the Certificate of Substantial Performance, with the exception of items carrying longer guarantee or warrantee periods, and items with seasonal completion requirements. The City shall give prompt written notice to the Contractor of any defects noted during the guarantee period and request the Contractor to remedy such defects.
- .2 During the month prior to the end of the guarantee period, the Contract Administrator shall conduct an inspection of the project and notify the Contractor to remedy all defects due to faulty materials for workmanship.
- .3 Neither the final payment nor any part thereof shall become due until the Contractor delivers to The City a detailed completed progress estimate, an insurance and performance bond, and a statutory declaration with Progress Claim #2 and subsequent claims.

**END OF SECTION**

## **1. GENERAL**

### **1.1 During Construction**

- .1 Submittals to the Contract Administrator during progress of construction shall include:
  - .1 Schedule submissions.
  - .2 Reports on damage, or on conditions or problems arising out of receipt of The City's equipment on site.
  - .3 Complete list of proposed equipment by Divisions 21 and 26, through Contractor.
  - .4 Progress reports shall be kept by the Contractor for a permanent written record of the work and shall indicate dates of commencement and completion of all phases of work by all trades, daily weather conditions, the number of men (including sub-contractors) engaged on the work, and the division of the work upon which each group of men is engaged. Documentation shall be provided of inspections performed and tests carried out, and of all visitors to site. A general note shall be added relating the actual progress of work to the construction schedule. Reports shall be submitted to Contract Administrator on a regular basis, or as requested.
  - .5 Record Drawings shall be retained on the job site at all times during construction. The Contractor or relevant Subcontractor shall record all changes on Record Drawings as the work progresses. Each change shall show the date, authority and reason for the deviation from the original construction drawings. No changes shall be carried out without prior written approval from the Contract Administrator. Submit set of 'Record' Drawings at completion of project.
  - .6 'As-built' Drawings produced by a competent AutoCAD drafting technician, who has been engaged by the project Contract Administrator as identified by the Contract Administrator, and at the sub-contracted expense of the contractor, shall be produced in an electronic format using The City's drawing standards that are equal to the quality of the original issued contract documents, and in AutoCAD (minimum version acceptable is AutoCAD 2004), and are to be provided using sufficient CD-ROM discs as required to suit the scope and size of the project. Where projects are multi-floors, provide one (1) each CD-ROM of each floor of the facility. The Drawings shall provide all base plan details including any changes and departures from the Contract Drawings which have been transferred from the records of the project during construction. A package consisting of: a fittings and finishes info CD accompanied by one (1) hard copy record of a binder of specified interior fittings and finishes and applicable product maintenance sheets on the project, and a hard copy of the "As-built" Drawings, accompanied by the As-built Drawing CD-ROMs, to be provided as a record of the actual construction and installation. This package shall be verified and stated to be complete and accurate by submission of a signed cover letter which accompanies the package, from the Contractor to the Contract Administrator, within thirty (30) days of completion of the work.
  - .7 Three (3) copies of the Operation and Maintenance (O&M) manuals for the care, cleaning and maintenance of specified materials and equipment. Provide verbal instructions to The City or personnel from The City's staff on the operation of all systems and equipment, and document instruction time.
  - .8 Extra materials list, of products left on project for building maintenance, as specified within relevant Sections, by Contractor.

**END OF SECTION**

## **1. GENERAL**

### **1.1 Scope:**

- .1 New Fire Protection Water Supply consisting of:
  - .1 Potable rated piping materials.
  - .2 Double Check Valve Assembly for Fire Protection Service.
  - .3 Replacement of existing obstructed piping and reconnection to existing sprinkler zone piping.
  - .4 Valves and fittings suitable for Fire Protection Service.

### **1.2 Intent:**

- .1 Provide complete, fully tested and operational fire protection system to meet the requirements described herein and in complete accordance with the local building and fire codes, applicable bylaws, and the versions of standards as referenced therein.
- .2 Specifications and drawings of this Division are diagrammatic and approximately to scale unless otherwise noted. They establish scope, material and installation quality, and are not detailed installation instructions.
- .3 Follow Manufacturer's recommended installation details and procedures for equipment, supplemented by the requirements of the Contract Documents.
- .4 Install equipment generally in locations and routes shown. Run piping parallel or perpendicular to building lines and to minimize interference with other services and free space, unless specifically shown otherwise. Remove and replace improperly installed piping and equipment to the satisfaction Contract Administrator at no extra cost.
- .5 Install equipment to provide ease of access for operation and maintenance of serviceable components.
- .6 Connect to existing equipment and piping as found on site. Make preparations as required to ensure a leak-free joint can be made to existing surfaces.
- .7 'Provide' shall mean 'supply and install'.

### **1.3 Action and Informational Submittals**

- .1 Submit Shop Drawings in accordance with Section 01 33 00 - Submittals Procedures.
- .2 Clearly mark each Shop Drawing with the Specification Section number together with the clause number or schedule number and the item tag number (where applicable) to which it refers. Failure to indicate this information on Shop Drawings will result in the drawings being rejects.
- .3 Identify materials and equipment by manufacturer, trade name and model number, Include copies of applicable brochure or catalogue material. Do not assume the applicable catalogues are available in the Contract Administrator's office. Maintenance and operating manuals are not suitable submittal material.
- .4 Clearly mark submittal material using arrows, underlining, or circling to show differences from specified, e.g. Ratings, capacities and options being proposed. Cross out non-applicable material. Specifically note on the submittal specified features such as special coatings, construction materials, or electrical rating.



- .5 Include weights, dimensional, and technical data sufficient to check if equipment meets requirements. Include wiring diagrams, piping and service connection data, and motor sizes. Provide center of gravity diagrams. Prior to submission to the Contract Administrator, the Contractor shall review all shop drawings. By this review, the Contractor certifies that he has determined and verified all field measurements, field construction criteria, materials, catalogue numbers, and similar data, and certifies that he has checked and coordinated each Shop Drawing with the requirements of the Contract. Additionally, the Contractor certifies by this review the compliance of the submittal package with the requirements of items 1 through 4 above. The Contractor's review of each Shop Drawing shall be indicated by a stamp, date and signature of the Contractor's designated Contract Administrator.
- .6 Installed materials and equipment shall meet specified requirements regardless of whether or not Shop Drawings are reviewed by the Contract Administrator.
- .7 Retain one (1) copy of Shop Drawings on Site for review.
- .8 Shop Drawings to show:
  - .1 Mounting arrangements.
  - .2 Operating and maintenance clearances.
- .9 Shop Drawings and product data accompanied by:
  - .1 Detailed drawings of bases, supports, and anchor bolts.
  - .2 Manufacturer to certify current model production.
  - .3 Certification of compliance to applicable codes.
  - .4 Point(s) of operation on performance curves

**1.4 Closeout Submittals:**

- .1 Provide operation and maintenance data for incorporation into O&M manual specified in Section 01 78 00 – Closeout Submittals.
- .2 Operation and maintenance manual approved by, and final copies deposited with the Contract Administrator before final inspection.
- .3 Operation data to include:
  - .1 Testing and verification methods of determining proper operation
  - .2 Repair and adjustment instructions, part lists and source.
  - .3 Operation instruction for systems and components.
  - .4 Description of actions to be taken in event of equipment failure.
- .4 Maintenance data to include:
  - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
  - .2 Data to include schedules of tasks, frequency, tools required and task time.
  - .3 Provide service tags for record of inspection and service.
- .5 Performance data to include:
  - .1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.
  - .2 Equipment performance verification test results.

- .3 Special performance data as specified in the related specification sections.
- .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 The Contract Administrator will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur.
  - .2 Transfer information weekly to the 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 acceptance testing, 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 the Contract Administrator for approval and make corrections as directed.
  - .4 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

### **1.5 Coordination of Work**

- .1 Cooperate and coordinate with the other Contractors and Subcontractors on the project.
- .2 Make reference to Civil drawings when setting out work. Consult with respective Divisions in setting out locations for piping and equipment so that conflicts are avoided and symmetrical even spacing is maintained. Jointly work out all conflicts on the Work Site before fabricating or installing any materials or equipment.
- .3 Coordinate installation with underground works.
- .4 Where dimensional details are required, work with the applicable architectural and structural drawings.
- .5 Full size and detailed drawings shall take precedence over scale measurements from Drawings. Drawings shall take precedence over specifications.
- .6 Any areas indicated as space for future materials or equipment shall be left clear.

### **1.6 Permits**

- .1 Obtain all permits and pay all fees applicable to the Work.
- .2 Contractor shall arrange for inspections of the Work by the authorities having jurisdiction and shall provide certificates indicating Final Approval.

### **1.7 Quality Assurance**

- .1 Quality Assurance: in accordance with referenced standards and codes.

### **1.8 Maintenance**

- .1 Furnish spare parts to the Contract Administrator as follows:

- .1 One repair kit for the backflow preventer.
- .2 One spare flange gasket for each size.
- .3 One spare gasket for each grooved coupling size and type used.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers and deliver with transmittal to the Contract Administrator.

### **1.9 Delivery, Storage and Handling**

- .1 Materials delivered to site must be properly protected to prevent damage from handling, storage and the effects of weather.
- .2 Provide adequate storage on site for materials received which are not yet required for installation. Storage shall be secure, weather-resistant, and available for inspection by the Contract Administrator.
- .3 Seal all open-ended piping and equipment to prevent the ingress of dust and debris as installed or at the end of each work day.
- .4 At no cost to the Contract, the Contractor shall repair and/or replace any installed equipment or material which is deemed to be damaged at the sole discretion of the Contract Administrator. The final installation shall be to the Contract Administrator's satisfaction.
- .5 Thoroughly clean piping and equipment of dust, dirt, cuttings and other foreign substances to maintain potable conditions and to prevent future obstruction and potential damage to valves and equipment.
- .6 Where two or more products of the same type are required, products shall be of the same manufacturer.

## **2. PRODUCTS**

### **2.1 Materials - General**

- .1 Materials and products in accordance with NFPA 13-2013, Standard for Installation of Sprinkler Systems.
  - .1 All materials on the inlet side of the backflow preventer are to be potable rated.
- .2 All materials shall be new and standard products from the manufacturer.

### **2.2 Pipe**

- .1 All pipes shall be schedule 40 wall thickness steel pipe conforming to ASTM A53/A53M-12, "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless". Grade B, Type E, plain ends for field roll grooving.
  - .1 All potable rated steel pipe is to be fabricated to field verified dimensions, including grooving of ends, then dry-fitted to confirm fit, then spools sent out for hot-dip galvanizing.
  - .2 No cutting or modification of the pipe is permitted once galvanized.

### **2.3 Fittings**

- .1 All pipe fittings are to be cast ductile iron to ASTM A536-84(2009), "Standard Specification for Ductile Iron Castings" grade 65-45-12 with groove and/or shoulder design for use with grooved couplings.
  - .1 UL/ULC Listed and FM approved for fire protection systems.

- .2 Hot-dipped galvanized finish where potable rating is required, otherwise enamel painted finish.
- .3 Maximum working pressure: 1.2 MPa.

## **2.4 Joints**

- .1 All pipe joints other than where flanges are required are to be made with cast ductile iron rigid groove couplings to ASTM A536-84(2009), "Standard Specification for Ductile Iron Castings" grade 65-45-12, and CSA-B242-05 (2011), "Groove and Shoulder-Type Mechanical Pipe Couplings."
  - .1 UL/ULC Listed and FM approved for fire protection systems.
  - .2 Hot-dipped galvanized finish where potable rating is required, otherwise enamel painted finish.
  - .3 EPDM Gaskets
  - .4 Heat treated and plated carbon steel bolts meeting the physical requirements of ASTM-A183-03(2009), "Standard Specification for Carbon Steel Track Bolts and Nuts" and the chemical requirements of ASTM-A449-10, "Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use."
  - .5 Maximum working pressure: 1.2 MPa
- .2 All flanged pipe joints are to be made with cast ductile iron split flanges to ASTM A536-84(2009), "Standard Specification for Ductile Iron Castings" grade 65-45-12, Class 125/150 bolt pattern and flat face.
  - .1 UL/ULC Listed and FM approved for fire protection systems.
  - .2 Hot-dipped galvanized finish where potable rating is required, otherwise enamel painted finish.
  - .3 EPDM Gaskets
  - .4 Heat treated and plated carbon steel bolts meeting the physical requirements of ASTM-A183-03(2009), "Standard Specification for Carbon Steel Track Bolts and Nuts" and the chemical requirements of ASTM-A449-10, "Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use."
  - .5 Apply flanges to pipe only, not to fittings.
  - .6 Maximum working pressure: 1.2 MPa

## **2.5 Seals**

- .1 Elastomeric compression seals to be segmented construction with bolts and pressure plates to compress the seal into place around a pipe in a cored opening and seal the annular space liquid-tight.
  - .1 Segments molded of EPDM rubber compound, with a hardness of 50 measured according to the ASTM D-2240-05(2010), "Standard Test method for Rubber Property – Durometer Hardness", Shore A scale.
    - .1 Each segment shall be identified by the manufacturer's name and size code for the segment molded into the segment on a non-sealing face to allow identification in the field.
  - .2 Pressure plates of molded glass reinforced nylon on each end of compression bolts.

- .3 Carbon steel bolts with 2-part zinc-dichromate coating per ASTM B633-12, "Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel." Coating shall be tested in accordance with ASTM B117-11, "Standard practice for Operating Salt Spray (Fog) Apparatus." Fasteners to pass a 1500 hour salt-spray test without degradation of the coating.

## **2.6 Valves**

- .1 Quarter-turn butterfly valve with external right-angle drive manual handwheel actuator, groove and shoulder end connections, and coated ductile iron body and disc construction to ASTM A536-84(2009), "Standard Specification for Ductile Iron Castings" grade 65-45-12.
  - .1 Body coating to be polyphenylene sulfide blend.
  - .2 Disc to be coated with EPDM rubber
  - .3 Valve to be potable rated to NSF/ANSI 61-2013, "Drinking Water System Components – Health Effects."
  - .4 Stem bearing to be PTFE impregnated fiberglass with stainless steel backing.
  - .5 O-ring: EPDM
  - .6 Brackets and actuator housing: carbon steel
  - .7 Maximum working pressure: 1.2 MPa
  - .8 Temperature range: -34°C to 110°C.
  - .9 UL/ULC Listed and FM approved for fire protection systems.
  - .10 Actuator to include visual position indicator and tamper switches to indicate if the valve is moved from its normal position.

## **2.7 Backflow Preventer**

- .1 Potable rated backflow preventer with 100Ø inlet and discharge quarter turn butterfly valves, 90° elbows, and double check valve assembly for fire protection service.
  - .1 UL/ULC Listed and FM approved for fire protection systems.
  - .2 Valve to be potable rated to NSF/ANSI 61-2013, "Drinking Water System Components – Health Effects."
  - .3 Designed and constructed in accordance with CSA-B64.0-11,"Definitions, General Requirements, and Test Methods for Vacuum Breakers and Backflow Preventers" and CSA B64.5-11, "Double Check Valve Backflow preventers for Fire Protection Systems (DCVAF)."
  - .4 AISI Type 304 stainless steel housing and sleeve.
  - .5 Maximum working pressure: 1.2 MPa.
  - .6 Grooved end connections to meet CSA-B242-05 (2011), "Groove and Shoulder-Type Mechanical Pipe Couplings."
  - .7 Four integral test cocks.
  - .8 Replaceable check disc rubber.
  - .9 Maximum 55 kPa pressure loss at 30l/s flow.
  - .10 Acceptable Material: Watts Model 757NBFG or approved equal in accordance with B7.

### **3. EXECUTION**

#### **3.1 Installation**

- .1 Follow Manufacturer's recommended installation details and procedures for equipment supplemented by requirements of Contract Documents.
- .2 Install equipment generally in locations and routes shown and as required by codes and regulations. Run piping parallel to building lines so as to minimize interference with other services and free space. Remove and replace improperly installed piping and equipment to satisfaction of the Contract Administrator at no extra cost.
- .3 Install equipment to provide access and for ease of maintenance.
- .4 Co-ordinate the requirements for access on the exterior of the building for coring of the exterior wall with the underground services contractor. Arrange work to minimize the time the excavation must remain open.

#### **3.2 Demonstration**

- .1 The Contract Administrator may use equipment and systems for test or emergency purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
  - .1 Fire protection water supply system.
- .3 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.
- .4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .5 Instruction duration time requirements to be minimum 4 hours.
- .6 The Contract Administrator will record these demonstrations on video tape for future reference.

#### **3.3 Protection**

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

**END OF SECTION**

## **1. GENERAL**

### **1.1 References**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.1-2012, Canadian Electrical Code, Part 1 Safety Standard for Electrical Installations.
  - .2 CAN3-C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
  - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

### **1.2 Submittals**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
  - .1 Submit Shop Drawings for Fire Alarm monitoring modules.
- .3 Provide CSA certified equipment and material. All products used must be certified to CE Code Part II standards by a Standards Council of Canada (SCC) accredited Certification Organization (CO), and be marked with that Certification Organization's certification mark.

### **1.3 Quality Assurance**

- .1 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification.

### **1.4 Permits, Fees and Inspection**

- .1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay associated fees.
- .3 Contract Administrator will provide Drawings and Specifications required by Electrical Inspection Department and Supply Authority at no cost.
- .4 Notify Contract Administrator of changes required by Electrical Inspection Department prior to making changes.
- .5 Furnish Certificates of Acceptance from authorities having jurisdiction on completion of work to Contract Administrator.

## **2. PRODUCTS**

### **2.1 Materials and Equipment**

- .1 Provide material and equipment in accordance with Section 01 60 00 - Common Product Requirements.
- .2 Material and equipment shall be new and free from all defects.

### **2.2 Equipment and Controls**

- .1 Verify installation and co-ordination responsibilities related to equipment and controls, as indicated.

**2.3 Warning Signs**

- .1 Warning Signs: in accordance with requirements of authority having jurisdiction, inspection authorities, and Contract Administrator.
- .2 Lamacoid, red with white lettering, minimum size 175 x 250 mm.

**2.4 Wiring Terminations**

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

**2.5 Equipment Identification**

- .1 Identify electrical equipment with nameplates as follows:
  - .1 Nameplates: lamicaid 3 mm thick plastic engraving sheet, black face, white core, lettering accurately aligned and engraved into core mechanically attached with self-tapping screws.
  - .2 Sizes as follows:

<b>NAMEPLATE SIZES</b>			
Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Allow for minimum of twenty-five (25) letters per nameplate and label.

**2.6 Wiring Identification**

- .1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of wiring.

**2.7 Conduit and Cable Identification**

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.
- .4 Provide and install lamicaid label size 3 to both end of cables identifying circuit and equipment. Permanently attach to cables with UV resistant Ty-Rap cable tie.

<b>Service</b>	<b>Prime</b>	<b>Auxiliary</b>
Fire Alarm	Red	-



### **3. EXECUTION**

#### **3.1 Installation**

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

#### **3.2 Grounding**

- .1 All circuits shall be installed with dedicated ground wire.

#### **3.3 Nameplates and Labels**

- .1 Ensure Manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

#### **3.4 Coordination with Other Divisions**

- .1 Examine the Drawings and Specifications of all Divisions and become fully familiar with their work. Before commencing work, obtain a ruling from the Contract Administrator if any conflict exists. No additional compensation will be made for any necessary adjustments.
- .2 Lay out the work and equipment with due regard to architectural, structural and mechanical features. Architectural and structural drawings take precedence over electrical drawings regarding locations of walls, doors and equipment.
- .3 Do not cut structural members without approval of the Contract Administrator.
- .4 Coordinate with all Division installing equipment and services, and ensure that there are no conflicts.
- .5 Install anchors, bolts, pipe sleeves, hanger inserts, etc. in ample time to prevent delays.
- .6 Examine previously constructed work and notify the Contract Administrator of any conditions which prejudice the proper completion of this work. Commencement of this work without such notification shall constitute acceptance of other work.

#### **3.5 Location of Devices**

- .1 Electrical drawings are, unless otherwise indicated, drawn to scale and approximate distances and dimensions may be obtained by scaling. Figured dimensions shall govern over scaled dimensions. Where exact dimensions and details are required, refer to Architectural and Structural drawings.
- .2 Device and equipment locations shown on the Drawings are approximate. Locations may be revised up to 3 m to suit construction and equipment arrangements without additional cost to The City, provided that the Contractor is notified prior to the installation of the devices, or equipment.

#### **3.6 Separation of Services**

- .1 Maintain separation between electrical wiring system and building piping, ductwork, etc. so that wiring system is isolated (except at approved connections to such systems) to prevent galvanic corrosion.
- .2 In particular, contact between dissimilar metals, such as copper and aluminum, in damp or wet locations is not permitted.
- .3 Do not support wiring from pipes, ductwork, etc. Hangers for suspended ceilings may be used for the support of wiring only when approval is obtained from the Contract Administrator and the ceiling installer, and approved clips or hangers are used.

#### **3.7 Fire Stopping**

- .1 Provide fire stopping where electrical services penetrate fire rated assemblies.

**3.8 Closeout Submittals**

- .1 Provide verification report for modified fire alarm system.

**END OF SECTION**

## **1. GENERAL**

### **1.1 Related Sections**

- .1 Common Work Results for Electrical - Section 26 05 00.
- .2 Conduits, Conduit Fastenings and Conduit Fittings - Section 26 05 34.
- .3 Hangers and Supports for Electrical Systems - Section 26 05 29.

## **2. PRODUCTS**

### **2.1 Materials**

- .1 Conductors in Conduit:
  - .1 Type: RW90.
  - .2 Conductors:
    - .1 Solid Copper #10 AWG and smaller.
    - .2 Stranded Cooper #8 AWG and larger.
    - .3 Sized as indicated (Minimum #12 AWG).
  - .3 Insulation: cross link polyethylene (RW90), (RWU90), 90°C.
  - .4 Configuration: Single conductor.
  - .5 Voltage Rating: Minimum 600V.
  - .6 Certification: CSA C22.22 No. 38 or latest revision.
- .2 Fire Alarm Cable:
  - .1 Conductor: Solid Copper minimum #18 AWG.
  - .2 Insulation: 105°C flame retardant PVC.
  - .3 Configuration: Multi-conductor, (minimum 4 conductors per cable).
  - .4 Voltage Rating: 300V.
  - .5 Conductor Identification: Colour coded.
  - .6 Shielding: Aluminum mylar foil.
  - .7 Outer Jacket: 105°C red PVC jacket.
  - .8 Certification: CSA Class #5851-01 File #LR41741.
  - .9 Flame Rating: FT4.
  - .10 Refer to Fire Alarm Section for additional wiring requirements.
- .3 Low Voltage Control Cables:
  - .1 Type: LVT.
  - .2 Conductor: Solid Copper minimum #18 AWG.
  - .3 Insulation: Thermoplastic, colour coded.
  - .4 Configuration: single, two conductor – parallel, three or more conductors twisted.
  - .5 Voltage Rating: 30V.
  - .6 Outer Jacket: Thermoplastic.
  - .7 Certification: CSA C22.22 No. 35.

.8 Flame Rating: FT4.

### **3. EXECUTION**

#### **3.1 Installation of Raceways**

- .1 Install wiring as follows:
  - .1 In conduit systems.
  - .2 Ensure conduits are dry and free of debris before pulling cables.
  - .3 Colour coding and identification as per this section.
  - .4 Wires in outlets, junction and switch boxes, not having a connection within box shall not be spliced, but shall continue unbroken through the box.

#### **3.2 Installation in Equipment**

- .1 Group and lace-in neatly wire and cable installed in cabinets, wireways and other such enclosures.

#### **3.3 Terminations**

- .1 Terminate wires and cables with appropriate connectors in an approved manner.

#### **3.4 Identification**

- .1 Use colour coded wires in communication cables, matched throughout systems.
- .2 Identify control conductors in fire alarm panels, etc. with shrink wrap wire markers.

**END OF SECTION**

**1. GENERAL**

**1.1 Related Sections**

- .1 Common Work Results for Electrical - Section 26 05 00.
- .2 Conduits, Conduit Fastenings and Conduit Fittings - Section 26 05 34.
- .3 Wires and Cables - Section 26 05 21.

**2. PRODUCTS**

**2.1 Support Channels**

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended or set in poured concrete walls and ceilings or as required.
  - .1 Manufacturers: B-Line, Burndy, Electrovert, Unistrut, Pilgrim, Pursley.

**3. EXECUTION**

**3.1 Installation**

- .1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .3 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .4 Fasten exposed conduit or cables to building construction or support system using straps.
  - .1 One-hole malleable iron straps to secure surface conduits and cables 50 mm and smaller.
  - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
  - .3 Beam clamps to secure conduit to exposed steel work.
- .5 Suspended support systems.
  - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
  - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .6 For surface mounting of two or more conduits use channels at 1500 mm oc spacing.
- .7 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .8 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .9 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .10 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Contract Administrator.
- .11 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.
- .12 Threaded rod to be minimum 6 mm diam. galv. or nickel plated. Black steel rod is not acceptable.

**END OF SECTION**

**1. GENERAL**

**1.1 References**

- .1 CSA C22.1-2009, Canadian Electrical Code, Part 1.

**2. PRODUCTS**

**2.1 Receptacle and Conduit Boxes General**

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 347 V outlet boxes for 347 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

**2.2 Boxes for Rigid PVC Conduit**

- .1 Rigid PVC boxes and fittings: Unplasticized PVC.

**2.3 Boxes for Metallic Conduit**

- .1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.

**2.4 Fittings - General**

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

**3. EXECUTION**

**3.1 Installation**

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

**END OF SECTION**

## **1. GENERAL**

### **1.1 References**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
  - .2 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
  - .3 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.
  - .4 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.

## **2. PRODUCTS**

### **2.1 Conduits**

- .1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

### **2.2 Conduit Fastenings**

- .1 One hole galvanized steel straps to secure surface conduits 50 mm and smaller.
- .2 Two hole galvanized steel straps for conduits larger than 50 mm.
- .3 Beam clamps to secure conduits to exposed steel work.
- .4 Channel type supports for two or more conduits at 1 m on centre.
- .5 Threaded stainless steel rods, 9 mm diameter, to support suspended channels.

### **2.3 Conduit Fittings**

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

## **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 datasheets.

### **3.2 Installation**

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.
- .3 Use EMT conduit in general interior locations.
- .4 Minimum conduit size: 21 mm.
- .5 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .6 Mechanically bend steel conduit over 21 mm diameter.
- .7 Install fish cord in empty conduits.
- .8 Remove and replace blocked conduit sections.
  - .1 Do not use liquids to clean out conduits.

- .9 Dry conduits out before installing wire.

### **3.3 Surface Conduits**

- .1 Run parallel or perpendicular to building lines.
- .2 Run conduits in flanged portion of structural steel.
- .3 Group conduits wherever possible on suspended or surface mounted aluminum channels.
- .4 Do not pass conduits through structural members except as indicated. Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

**END OF SECTION**



## **1. GENERAL**

### **1.1 Related Sections**

- .1 Section 26 05 00 – Common Work Results for Electrical.

### **1.2 References**

- .1 Government of Canada
  - .1 NBC-2010, National Building Code of Canada.
- .2 Underwriter's Laboratories of Canada (ULC)
  - .1 CAN/ULC-S524-latest, Installation of Fire Alarm Systems.
  - .2 CAN/ULC-S536-latest, Inspection and Testing of Fire Alarm Systems.
  - .3 CAN/ULC-S537-latest, Verification of Fire Alarm Systems.

### **1.3 System Description**

- .1 Existing Chubb Edwards EST Quick Start Conventional (non-addressable) fire alarm system.

### **1.4 Requirements of Regulatory Agencies**

- .1 System:
  - .1 Subject to FC inspection for final acceptance.
- .2 System components: listed by ULC and comply with applicable provisions of National Building Code and Local/Provincial Building Code, and meet requirements of local authority having jurisdiction.

### **1.5 Shop Drawings**

- .1 Submit shop drawings in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Include:
  - .1 Sprinkler tamper supervisory device.
  - .2 End of line device.

### **1.6 As-Built Drawings**

- .1 As-built drawings are to show the following information as a minimum:
  - .1 Floor plans showing all devices installed under this Contract.

## **2. PRODUCTS**

### **2.1 Materials**

- .1 Equipment and devices: ULC listed and labelled and supplied by existing system manufacturer.

### **2.2 Wiring**

- .1 Control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.

### **2.3 Monitoring Devices**

- .1 Sprinkler tamper supervisory switch.

### **2.4 End-Of-Line Devices**

- .1 End-of-line devices to control supervisory current in signalling circuits, sized to ensure correct supervisory current for each circuit. Open or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

## **3. EXECUTION**

### **3.1 Installation**

- .1 Install new field devices systems in accordance with the latest edition of CAN/ULC-S524 "Standard for the Installation of Fire Alarm Devices".
- .2 Each sprinkler supervisory switch is to annunciate individually on the existing Fire Alarm System.
- .3 Provide one switch for each new valve.
- .4 Identify circuits and other related wiring at fire alarm control panel and field device.

### **3.2 Field Quality Control**

- .1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical and CAN/ULC-S537.
- .2 Fire alarm system:
  - .1 Simulate grounds and breaks on circuits to ensure proper operation of systems.

### **3.3 Verification**

- .1 The existing system shall be tested and verified for system modifications in accordance with the latest edition of CAN/ULC-S537, the Standard for Verification of Fire Alarm Systems.
- .2 The manufacturer shall conduct all testing and provide necessary technical personal. Proof of CFAA certification must be provided by the manufacturer for the technician(s) conducting the verification.
- .3 The Electrical Contractor shall provide necessary manpower to facilitate the verification and supply access to all devices.
- .4 Certificate of Verification confirming that the inspection has been completed, showing the conditions upon which such inspection and certification have been rendered, is to be submitted to the Contract Administrator for review.

**END OF SECTION**