Part 1 General

1.1 ADMINISTRATIVE

.1 Submit to Contract Administrator submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.1 Allow 10 Working Days for review of submittals by the Contract Administrator.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are acceptable.

.5 Review submittals prior to submission to Contract Administrator. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

.6 Notify Contract Administrator, in writing at time of submission for review, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are co-ordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Contract Administrator’s review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator review.

.10 The Contractor shall make any corrections required by the Contract Administrator and shall resubmit the required number of corrected copies of Shop Drawings. The Contractor shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections requested by the Contract Administrator on previous submission.

.11 After Contract Administrator’s review and return of copies, distribute copies to sub-trades as appropriate.

.12 Keep one reviewed copy of each submission on site.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 The Contractor shall arrange for the preparation of clearly identified Shop Drawings as specified or as the Contract Administrator may reasonably request. Shop Drawings are to clearly indicate materials, weights, dimensions, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of the Work. Where articles or equipment attach or connect to other articles or equipment, clearly indicate that all such attachments and connections have been properly coordinated, regardless of the trade under which the adjacent articles or equipment will be supplied and installed. Shop Drawings are to indicate their relationship to design Drawings and Specifications. Notify the Contract Administrator in writing of any deviations in Shop Drawings from the requirements of the Contract Documents.

.3 Have Shop Drawings stamped, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba where required in the Specifications or by the Contract Administrator.

.4 The Contractor shall examine all Shop Drawings prior to submission to the Contract Administrator to ensure that all necessary requirements have been determined and verified and that each Shop Drawing has been checked and coordinated with the requirements of the Work and the Contract Documents. Examination of each Shop Drawing shall be indicated by stamp, date and signature of a responsible person of the sub-contractor for supplied items and of the General Contractor for fabricated items. Shop Drawings not stamped, signed and dated will be returned without being reviewed and stamped "Re-submit". Ensure that the following are verified:

.1 Field measurements.

.2 Field construction criteria.

.3 Catalogue numbers and similar data.

.5 Submittals shall be in one of the following formats:

.1 Submit three (3) copies of white prints and three (3) copies of all fixture cuts and brochures.

.2 Submit one electronic PDF copy.

.6 Shop Drawing reviews by the Contract Administrator is solely to ascertain conformance with the general design concept. Responsibility for approval of detail design inherent in Shop Drawings rests with the Contractor and review by the Contract Administrator shall not imply such approval.

.7 Shop Drawings will be returned to the Contractor with one of the following notations:

.1 When stamped "REVIEWED" or "NO EXCEPTIONS TAKEN", distribute additional copies as required for execution of the Work.

.2 When stamped "REVIEWED AS MODIFIED" or "MAKE NOTED CORRECTIONS", ensure that all copies for use are modified and distributed, same as specified for "REVIEWED".

.3 When stamped "REVISE AND RESUBMIT", make the necessary revisions, as indicated, consistent with the Contract Documents and submit again for review.

.4 When stamped "NOT REVIEWED" or "REJECTED", submit other Drawings, brochures, etc., for review consistent with the Contract Documents.

.5 Only Shop Drawings bearing "REVIEWED", "NO EXCEPTIONS TAKEN", "MAKE NOTED CORRECTIONS", or "REVIEWED AS MODIFIED" shall be used on the Work unless otherwise authorized by the Contract Administrator.

.8 After submittals are stamped "REVIEWED", "NO EXCEPTIONS TAKEN", "MAKE NOTED CORRECTIONS" or "REVIEWED AS MODIFIED", no further revisions are permitted unless re-submitted to the Contract Administrator for further review.

.9 Any adjustments made on Shop Drawings by the Contract Administrator are not intended to change the Contract Price. If it is deemed that such adjustments affect the Contract Price, clearly state as such in writing prior to proceeding with fabrication and installation of Work.

.10 Make changes in Shop Drawings, which the Contract Administrator may require, consistent with Contract Documents. When re-submitting, notify the Contract Administrator in writing of any revisions other than those requested by the Contract Administrator.

.11 Only two (2) reviews of Shop Drawings will be made by the Contract Administrator at no cost. Each additional review will be charged to the Contractor at the Contract Administrator’s scheduled rates. The Contract Administrator’s charges for the additional Work will be deducted from the Contractor’s Progress Certificates.

.12 Accompany submissions with transmittal letter, containing:

.1 Date.

.2 Project title and number.

.3 Contractor's name and address.

.4 Identification and quantity of each shop drawing, product data and sample.

.5 Specification Section, Title, Number, and Clause

.6 Other pertinent data.

.7 Date and revision dates.

.8 Project title and Bid Opportunity number.

.9 Name of:

.1 Contractor

.2 Subcontractor

.3 Supplier

.4 Manufacturer

.5 Separate detailer when pertinent

.10 Identification of product of material.

.11 Relation to adjacent structure or materials.

.12 Field dimensions, clearly identified as such.

.13 Specification section name, number and clause number or drawing number and detail/section number.

.14 Applicable standards, such as CSA or CGSB numbers.

.15 Contractor's stamp, initialled or signed, certifying review of submission, verification of field measurements and compliance with Contract Documents.

1.3 PROCEDURES

.1 The Contractor shall, if required by the Contract Administrator, submit for the review of the Contract Administrator method statements which describe in detail, supplement with Drawings where necessary, the methods to be adopted for executing any portion of Work.

.2 These statements shall also include details of constructional plant and labour to be employed. Acceptance by the Contract Administrator shall not relieve the Contractor of any of his responsibilities, nor shall reasonable refusal to approve entitle the Contractor to extra payment or an extension of time.

.3 Other Considerations

.1 Fabrication, erection, installation or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent shop drawings and resubmit.

.2 Material and equipment delivered to the site of the works will not be paid for at least until pertinent shop drawings have been submitted and reviewed.

.3 Incomplete shop drawing information will be considered as stipulated deductions for the purposes of progress payment certificates.

.4 No delay or cost claims will be allowed that arise because of delays in submissions, re-submissions and review of shop drawings.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 INSPECTION

.1 Allow Contract Administrator access to Work. If part of Work is in preparation at locations other than Place of Work, allow access 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 instructions, or law of Place of Work.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 The Contract Administrator will order part of Work to be examined if 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 cost of examination and correction. If such Work is found in accordance with Contract Documents, the City shall pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies may be engaged by the City for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by the City. Costs of additional tests required due to defective Work shall be paid by the Contractor.

.2 All equipment required for executing inspection and testing will be provided by the respective agencies.

.3 Employment of inspection/testing agencies does not relieve or relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by the Contract Administrator at no cost to the City. Pay costs for retesting and re-inspection.

1.3 ACCESS TO WORK

.1 The City, the Contract Administrator, and other authorities having jurisdiction shall have access to the work.

1.4 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by the Contract Administrator as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 Make good other Contractor's work damaged by such removals or replacements promptly.

.3 If in opinion of the Contract Administrator it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, the City will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Contract Administrator.

1.5 REPORTS

.1 Submit draft inspection and test reports to Contract Administrator, prior to inclusion with the O&M manuals, in accordance with Section 01 33 00 - Submittal Procedures.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.3 DEWATERING

.1 Provide temporary drainage and pumping facilities as required to keep excavations and site free from standing water.

1.4 WATER SUPPLY

.1 Provide potable water as required for construction use.

1.5 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating as required during construction period, including attendance, maintenance and fuel.

.2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.

.3 Provide temporary heat and ventilation in enclosed areas as required to:

.1 Facilitate progress of Work.

.2 Protect Work and products against dampness and cold.

.3 Prevent moisture condensation on surfaces.

.4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.

.5 Provide adequate ventilation to meet health regulations for safe working environment. A minimum of 6 ACH of continuous ventilation is required in below grade drywell areas.

.4 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.

.5 Ventilating:

.1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.

.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.

.4 Ventilate storage spaces containing hazardous or volatile materials.

.5 Ventilate temporary sanitary facilities.

.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.6 Maintain strict supervision of operation of temporary heating and ventilating equipment to:

.1 Conform with applicable codes and standards.

.2 Enforce safe practices.

.3 Prevent abuse of services.

.4 Prevent damage to finishes.

.5 Vent direct-fired combustion units to outside.

.7 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.6 TEMPORARY POWER AND LIGHT

.1 Provide temporary power and light as required for temporary pumping, construction power, lighting, and other requirements during shutdowns.

.2 The existing power supply may be utilized for power, provided that there are no operational impacts associated with the use of the power. Maintain sufficient power for pump operation at all times.

.1 Connect to existing power supply in accordance with Canadian Electrical Code.

.2 Electrical power and lighting systems installed under this Contract may be used for construction requirements provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract..

1.7 TEMPORARY COMMUNICATION FACILITIES

.1 Provide and pay for temporary telephone, fax, data hook up, line and equipment necessary for own use.

1.8 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.

.2 Burning rubbish and construction waste materials is not permitted on site.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used

END OF SECTION

Part 1 General

1.1 INSTALLATION AND REMOVAL

.1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.

.2 Indicate use of supplemental or other staging area.

.3 Provide construction facilities in order to execute work expeditiously.

.4 Remove from site all such work after use.

1.2 SCAFFOLDING

.1 Scaffolding in accordance with CAN/CSA-S269.2.

.2 Provide and maintain scaffolding and ladders as required.

1.3 HOISTING

.1 Provide, operate and maintain any hoists required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.

.2 Hoists to be operated by qualified operator.

1.4 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not disrupt performance of Work or access by the City.

1.5 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials as required.

.2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

1.6 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.7 LAYDOWN AND STORAGE

.1 All construction materials shall be stored at designated storage areas. Stored combustible materials shall be separated by clear space to prevent fire spread and allow access for manual fire fighting equipment, including fire hoses, extinguishers, hydrants, etc.

.2 Pressurized dry chemical fire extinguishers of suitable capacity or equally effective extinguishers as per NFPA 10 shall be provided where:

.1 Flammable liquids are stored or handled.

.2 Welding or flame cutting is performed.

1.8 DISPOSAL OF WASTE MATERIALS

.1 Spoiled and waste materials shall not be dumped, under any circumstances, in any locations other than those approved by the local authorities. Any cost for permits and fees for disposing of waste materials shall be at the Contractor's expense.

.2 Disposal of all excavated and waste materials shall be in accordance with the requirements of the appropriate provincial regulatory agencies.

.3 When working anywhere within the Works the Contractor shall at the end of each working day remove the rubbish and leave the Site in a clean and tidy state, to the satisfaction of the Contract Administrator. If this is not done, the City will clean the Site and charge the Contractor.

1.9 FACILITY ELECTRICAL SUPPLY AND DISTRIBUTION

.1 If service interruptions are necessary, such interruptions shall be made only at times approved by the Contract Administrator.

1.10 WARNINGS AND TRAFFIC SIGNS

.1 When Work is performed within public areas, provide and erect adequate warning signs as necessary to give proper warning. Place signs sufficiently in advance to enable public to respond to directions.

.2 Provide and maintain signs and other devices required to indicate construction activities or other temporary or unusual conditions resulting from the Work.

Part 2 Products

.1 Not Used.

Part 3 Execution

.1 Not Used.

END OF SECTION

Part 1 General

1.1 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

1.2 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs, and any other fall hazards.

.2 Provide as required by governing authorities.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Conform to reference standards, in whole or in part as specifically requested in specifications.

.2 If there is question as to whether products or systems are in conformance with applicable standards, the Contract Administrator reserves the right to have such products or systems tested to prove or disprove conformance.

.3 Cost for such testing will be borne by the City in event of conformance with Contract Documents or by the Contractor in event of non-conformance.

1.2 QUALITY

.1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection. Should disputes arise as to quality or fitness of products, decision rests strictly with the Contract Administrator based upon requirements of Contract Documents.

.3 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

1.3 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify the Contract Administrator of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.2 In event of failure to notify the Contract Administrator at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Contract Administrator reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 METRIC PROJECT

.1 Unless otherwise noted, this project has been designed and is to be constructed in the International System (SI) of Units metric system of measurements.

.2 During construction, when specified metric elements are unattainable at the time they are required to meet the construction schedule, the Contractor shall notify the Contract Administrator in writing and suggest alternative substitutions. Costs due to these substitutions shall be borne by the Contractor.

1.5 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials, lumber and similar products on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of the Contract Administrator.

.9 Touch-up damaged factory finished surfaces to Contract Administrator’s satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.6 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of Work.

1.7 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify the Contract Administrator in writing, of conflicts between specifications and manufacturer's instructions, so that the Contract Administrator will establish the course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes the Contract Administrator to require removal and re-installation at no increase in Contract Price or Contract Time.

1.8 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.9 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.10 PROTECTION OF WORK IN PROGRESS

.1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of the Contract Administrator.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 WORKMANSHIP

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify the Contract Administrator if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. The Contract Administrator reserves the right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with the Contract Administrator, whose decision is final.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit written request in advance of cutting or alteration which affects:

- .1 Structural integrity of elements of project.
- .2 Integrity of weather-exposed or moisture-resistant elements.
- .3 Efficiency, maintenance, or safety of operational elements.
- .4 Visual qualities of sight-exposed elements.
- .5 Work of the City or separate contractor.

.3 Include in request:

- .1 Identification of project.
- .2 Location and description of affected Work.
- .3 Statement on necessity for cutting or alteration.
- .4 Description of proposed Work, and products to be used.
- .5 Alternatives to cutting and patching.
- .6 Effect on Work of the City or separate contractor.
- .7 Written permission of affected separate contractor.
- .8 Date and time work will be executed.

1.2 MATERIALS

.1 Required for original installation.

.2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

1.3 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of Work.

.3 Beginning of cutting or patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

.5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

1.4 EXECUTION

.1 Remove and replace defective and non-conforming Work.

.2 Provide openings in non-structural elements of Work for penetrations of electrical Work.

.3 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

.4 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.

.5 Restore work with new products in accordance with requirements of Contract Documents.

.6 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.7 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with approved fire stopping material, full thickness of the construction element.

.8 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by the City or other Contractors.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by the Contract Administrator. Do not burn waste materials on site.

.3 If required, clear snow and ice from access to building, bank/pile snow in designated areas only.

.4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.5 Provide on-site containers for collection of waste materials and debris.

.6 Dispose of waste materials and debris off site.

.7 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.

.8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

.10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Copy will be returned after final inspection, with Contract Administrator's comments.

.3 Revise content of documents as required prior to final submittal.

.4 Furnish evidence, if requested, for type, source and quality of products provided.

.5 Pay costs of transportation.

1.2 OPERATING AND MAINTENANCE MANUALS

.1 Prepare using personnel experienced in maintenance and operation of described products.

.2 Operation and maintenance instructions and technical data to be sufficiently detailed with respect to design elements, construction features, component function, correct installation procedure and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation. Technical data to be in form of approved shop drawings, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists.

.3 One (1) advance copy of the manual shall be submitted prior to Total Performance of the Work for review and comments. After review, five (5) hard copies and one electronic (PDF) copy of the final manuals shall be submitted.

.4 For the guidance of the City's operating and maintenance personnel, the Contractor shall prepare O&M Manuals for the Work, describing in detail the construction of each part of the Work and the recommended procedure for operation, servicing and maintenance.

.5 All instructions in these manuals shall be in simple language to guide the City in the proper operating and maintenance of this installation.

.6 In addition to information called for in the Specifications, include the following:

- .1 Overall Title sheet, labelled "Operation and Maintenance Instructions", and containing project name and date, facility's covered in the manual, City's Contract number, the name and address of the Contractor, and the issue date.
- .2 Overall list of contents, indicating the facilities upgraded by the project.
- .3 Title sheet for each section, labelled "Operation and Maintenance Instructions", the applicable facility, and containing project name and date.
- .4 List of contents for each section.
- .5 Include:
  - .1 Brochures/catalogue excerpts of all components of the Work.
  - .2 Documentation of all test results.
  - .3 Complete set of equipment and assembly drawings

.4 Installation, start-up, O&M Manuals

.5 Any specific requirements from the Specifications

.6 Reviewed Shop Drawings of all equipment.

.7 Include sections for the record drawings of all installations. Drafted record drawings of size 432x279mm (11 x 17") will be inserted by the Contract Administrator, based on the drawings marked up by the Contractor and site inspections.

.8 Names, addresses, and telephone numbers of all major sub-contractors and suppliers.

.7 Modify and supplement the manual as required by the Contract Administrator.

.8 Format to be as follows:

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.

.4 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.3 AS-BUILT DRAWINGS

.1 After award of Contract, the Contract Administrator will provide a complete set of Drawings for the purpose of maintaining Project As-Built Drawings. Accurately record deviations from Contract Documents caused by Site conditions and changes ordered by the Contract Administrator. Update daily.

.2 Identify Drawings as "Project Record Copy". Maintain in good condition and make available for inspection on-site by Contract Administrator at all times.

.3 Provide accurate UTM coordinates for any new underground structures, underground valves, or underground piping to allow for the Contract Administrator to produce record drawings in accordance with the City of Winnipeg CAD-GIS standard - http://winnipeg.ca/waterandwaste/dept/cad_gis.stm. The coordinates shall be oriented using the same datum as WWD GIS: NAD 83 – June 1990. Coordinates are required for the following:

.1 Conduit locations to establish depth and direction and points of direction change in relation to property lines or pin

.2 Handhole locations in relation to property lines or pin

.3 The maximum distance between survey points (for depth and direction) is 100 m.

.4 Submit As-Built Drawings to Contract Administrator for review.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 This Section covers items common to Sections of Division 26. This section supplements requirements of Division 1.

1.2 CODES AND STANDARDS

.1 Do complete installation in accordance with the latest version of CSA C22.1 except where specified otherwise.

.2 Comply with all laws, ordinances, rules, regulations, codes, and orders of all authorities having jurisdiction relating to this Work.

1.3 DRAWINGS AND SPECIFICATIONS

.1 The intent of the Drawings and Specifications is to include all labour, products, and services necessary for complete Work, tested and ready for operation.

.2 The Specifications shall be considered as an integral part of the accompanying Drawings. Any item or subject omitted from either the Specifications or the Drawings but which is mentioned or reasonably specified in and by the others, shall be considered as properly and sufficiently specified and shall be provided.

.3 Provide all minor items and Work not shown or specified but which are reasonably necessary to complete the Work.

.4 If discrepancies or omissions in the Drawings or Specifications are found, or if the intent or meaning is not clear, advise the Contract Administrator for clarification before submitting Bid, in accordance with B4.

1.4 CARE, OPERATION AND START-UP

.1 Instruct City maintenance and operating personnel in the operation, care and maintenance of systems, system equipment and components.

.2 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.5 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 Notify Contract Administrator of changes required by Electrical Inspection Department prior to making changes.

.4 Furnish a Certificate of Final Inspection and approvals from inspection authority to the Contract Administrator.

1.6 MATERIALS AND EQUIPMENT

.1 Provide materials and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.

.3 Minimum enclosure type to be used is NEMA 12 unless otherwise specified.

1.7 ELECTRICAL EQUIPMENT MODIFICATION

.1 Where electrical equipment is field modified, arrange for special inspection and pay all associated fees.

1.8 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1.9 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.2 Nameplates:

.1 Lamicoid 3 mm thick plastic lamicoid nameplates, white face, black lettering, mechanically attached with self tapping screws.

NAMEPLATE SIZES

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
Size 8	35 x 100 mm	3 lines	5 mm high letters

.3 Wording on nameplates to be approved by Contract Administrator prior to manufacture.

.4 Allow for average of twenty-five (25) letters per nameplate.

.5 Identification to be English.

1.10 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings on both ends of phase conductors of feeders and branch circuit wiring.

.1 Wire tags to be heat shrink type with black letters on white background.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour code: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

1.11 MANUFACTURERS AND CSA LABELS

.1 Visible and legible, after equipment is installed.

1.12 WARNING SIGNS

.1 As specified and to meet requirements of Electrical Inspection Department and the Contract Administrator.

.2 Lamicoid 3 mm thick plastic engraving sheet, red face, white core, mechanically attached with self tapping screws, 20mm text.

1.13 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to top of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.

.1 Patch Panels: 1500mm to top

1.14 CONDUIT AND CABLE INSTALLATION

.1 Sleeves through concrete: schedule 40 galvanized steel pipe, sized for free passage of conduit.

.2 For wall, partitions, and ceilings the sleeve ends shall be flush with the finish on both sides but for floors they shall extend 100 mm above finished floor level.

.3 Fire stop opening with ULC approved assembly for the installation conditions.

1.15 FIELD QUALITY CONTROL

.1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform

specific tasks - the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.

.2 The work of this division to be carried out by a contractor who holds a valid Master Electrical contractor license as issued by the Province of Manitoba.

1.16 TESTING

.1 All test instruments are to have been calibrated within one year of the date utilized.

1.17 SUBMITTALS

.1 Prior to delivery of any Products to job Site and sufficiently in advance of requirements to allow ample time for checking, submit Shop Drawings for review as specified in Division 01 33 00.

.2 Submit Shop Drawings (including Product Data) for all equipment as required in each Section of this Specification.

.3 Prior to submitting the Shop Drawings to the Contract Administrator, the Contractor shall review the Shop Drawings to determine that the equipment complies with the requirements of the Specifications and Drawings.

.4 The term “Shop Drawing” means drawings, diagrams, illustrations, schedules, performance characteristics, brochures and other data, which are to be provided by the Contractor to illustrate details of a portion of the Work. Indicate materials, methods of construction and attachment of support wiring, diagrams, connections, recommended installation details, explanatory notes and other information necessary for completion of Work. Where equipment is connected to other equipment, indicate that such items have been coordinated, regardless of the section under which the adjacent items will be supplied and installed. Indicate cross-references to Design Drawings and Specifications. Adjustments made on Shop Drawings by the Contract Administrator are not intended to change the contract price. If adjustments affect the value of the Work state such in writing to the Contract Administrator prior to proceeding with the Work.

.5 Manufacture of Products shall conform to revised Shop Drawings.

.6 Provide As-Built drawings as defined in 01 78 00 Closeout Submittals.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA C22.2 No. 18.1, Metallic Outlet Boxes

.2 CSA C22.2 No. 45, Rigid Metal Conduit.

.3 CSA C22.2 No. 211.2, Rigid PVC (Un-plasticized) Conduit.

.4 CSA C22.2 No. 237 HDPE Conduit, conductors-in-conduit, and fittings

1.2 GENERAL CONDUIT REQUIREMENTS

.1 The drawings do not show every specific conduit run. Supply and install conduit, and support systems as required for a complete installation.

.2 All conduits shall be surface mounted unless otherwise indicated in the specifications and/or shown on the drawings.

1.3 SUBMITTALS

.1 Submit product data and testing results in accordance with Section 01 33 00 - Submittal Procedures.

Part 2 Products

2.1 GENERAL

.1 Material Requirements:

.1 Outdoor and Buried: PVC or HDPE

.2 Indoor: Rigid Metal

.3 Conduits that transition into areas requiring metal conduit must be Rigid Metal conduit in their entirety.

2.2 RIGID METAL CONDUIT

.1 Meets CSA C22.2 No. 45, aluminum threaded.

.2 Minimum conduit size: 19 mm, unless specifically indicated on the drawings or approved by the Contract Administrator.

2.3 RIGID PVC CONDUIT

.1 Meets CSA C22.2 No. 211.2.

.2 Minimum pipe stiffness: Schedule 80

.3 Minimum conduit size: 63 mm, unless specifically indicated on the drawings or approved by the Contract Administrator.

2.4 RIGID HDPE CONDUIT

.1 Meets CSA C22.2 No. 327.

.2 Minimum pipe stiffness: Schedule 80

.3 Minimum conduit size: 63 mm, unless specifically indicated on the drawings or approved by the Contract Administrator.

2.5 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.

.2 Strap material to match conduit material.

.3 Beam clamps to secure conduits to exposed steel work.

.4 Channel type supports for two or more conduits or as shown in the drawings.

.5 Threaded rods, 6 mm dia., to support suspended channels.

2.6 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 All fittings to be liquid and dust tight.

.3 Enclosure Connections

- .1 Connections in dry locations (bottom or side)
  - .1 Locknuts inside and outside enclosures.
  - .2 Insulated bushings Thomas & Betts Series 222 or approved equal in accordance with B7.
- .2 Connections in wet locations and tops of enclosures in dry locations
  - .1 Liquid-tight threaded hubs
  - .2 Insulated bushings Thomas & Betts Series 222 or approved equal in accordance with B7.
- .3 Utilize insulated grounding bushings at all non-metallic enclosure entries for metallic conduit, or as required for bonding in accordance with Code and good practice.

.4 Elbows:

- .1 Utilize factory elbows for 27mm and larger conduits.

.5 Threaded Hubs for Metal Conduit

- .1 Liquid and dust tight with insulated throat
- .2 Approved products
  - .1 Thomas & Betts "Bullet Hub" 370AL Series.
  - .2 Or approved equal in accordance with B7

.6 Fittings for Metal Conduit

.1 Cast metal
.2 Gasketted covers.
.3 Approved products
  .1 Crouse-Hinds Canada Ltd. "Condulet" series.
  .2 Or approved equal in accordance with B7

2.7 CONDUIT SPACERS

.1 PVC coated malleable iron spacers, CSA approved for the purpose.

.2 Aluminum channel may be utilized where conduits are grouped, however a non-metallic spacer must be provided between the aluminum channel and concrete.

2.8 FISH CORD

.1 Polypropylene

2.9 HANDHOLES

.1 Handholes are expected to be installed only in non-deliberate vehicular traffic locations. If required otherwise, contact the Contract Administrator.

.2 Requirements:

.1	Type:	Flared Wall Style FRP, Open Bottom
.2	Design/Test Load:	8,000/12,000 lb
.3	Size:	As needed for installation requirements.
.4	Minimum Size: (24” x 36” x 30”)	(Width x Length x Depth): 610mm x 914mm x 762mm
.5	Cover:	Bolted
.6	Logo:	Fiber Optics
.7	Standard of Acceptance: Hubbell Quazite FRP	

2.10 TRACER WIRE

.1 Suitable for direct burial

.2 Conductor: Copper, Solid, 12 AWG

.3 Insulation: HMWPE, 30V, Orange

2.11 SIMPLEX ENTRY SEALS

.1 For sealing of fibre cable entering conduit.

.2 Water tight and air tight

.3 Standard of Acceptance: Tyco Electronics JM-SIM Series

2.12 MARKER FOR BURIED SERVICES

.1 Type: Flexible utility marker

.2 Material: High impact fiberglass reinforced resins

.3 Length: 1676 mm (66”)

.4 Standard of Acceptance: Pro-mark PM-301

Part 3 Execution

3.1 GENERAL – BURIED CONDUIT

.1 Prevent the ingress of water, dirt, sand, and other foreign materials into the conduit prior to, during and after construction.

.2 Install the conduit system so the fiber optic cable maintains a minimum bend radius of 20 times the cable diameter.

.3 Install the conduit as shown in the plans. Provide all fittings and incidental materials necessary to construct a complete installation. Use approved methods for connecting inner duct or conduit within or between plowed portions, trenched portions, and bored portions.

.4 Expansion Plugs: Seal conduits to stop ingress of water and grit with fabricated expansion plugs.

.5 Entry Seals: Provide entry seals for all pullbox and handhole conduit entry.

.6 Tracer Wire:

.1 Install tracer wire along entire length of buried conduit. Do not install tracer wire in conduit with fiber optic cable.

.2 Locate tracer wire along the centerline of the top outer surface of the conduit at no more than 75 mm above the top of the conduit.

.3 Drill a hole in handholes for tracer wire entry. Fill any gaps between the tracer wire and the hole it passes through with nonshrink grout or a similar sealant suitable for the application.

.4 Provide a termination at each pullbox and handhole for connection to testing equipment.

.5 Do not run locate wires into field cabinets. Terminate locate wires at the first and last pull boxes in the conduit run.

.6 Perform continuity tests and insulation resistance tests on all tracer wires.

.7 Advise the Contract Administrator five days prior to the start of testing.

.8 Remove and replace tracer wire that fails either test and repeat the test until the section passes.

.9 Document and submit testing results to the Contract Administrator for review prior to installing cable.

.7 Clearances:

.1 Maintain the following minimum clearances for underground conduit runs:

.1 Power, fibre or unknown conduit: 500 mm

.2 Gas, oil, water, sewage: 150 mm when crossing, 305 mm when parallel

.3 Buildings or structures: 500 mm

.2 Advise the Contract Administrator if these clearances cannot be met.

.8 The conduit shall gradually and smoothly slope up to the elevation of the pullbox entrance to allow for drainage of the conduit system. Slope conduits away from building entry.

.9 Following conduit installation, all conduits shall be cleared of loose material by brush and compressed air.

.10 Conduit Testing:

.1 Conduit shall be tested for leakage by air testing at 5 psi, maintaining the pressure for one hour without showing any leakage

.2 Following the leakage test, a test mandrel sized to be a minimum of 90% of the inside diameter shall be passed through all conduits to detect alignment and deformation problems. Mandrel shall be passed in both directions.

.3 The cleaning and testing operation shall be conducted for each conduit section between adjacent handholes, a section at a time, for the entire route.

.4 Advise the Contract Administrator five days prior to the start of testing.

.5 Remove and replace conduit that fails either test and repeat the test until the section passes.

.6 Document and submit testing results to the Contract Administrator for review prior to installing cable.

3.2 HANDHOLES

.1 Install pullboxes so that the top of the cover is between 25 mm to 75 mm (one to three inches) above the final grade level of the restored surface to prevent accumulation of dirt, silt and debris on top of the handhole cover.

.2 Provide a 305mm bed of pea gravel or crushed stone for drainage underneath the handhole.

.3 Provide a marker for buried services at each handhole location.

3.3 GENERAL –CONDUIT WITHIN BUILDINGS

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.3 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.4 Do not include more than the equivalent of four (4) quarter bends between pull boxes. Provide pull boxes as required.

.5 Ensure electrical continuity in all metallic conduit systems.

.6 All conduit shown exposed in finished areas is to be free of unnecessary labels and trademarks.

.7 Seal conduits with duct seal where conduits are run between heated and unheated areas. Where conduits, cables, or cable trays pierce fire separations, seal openings with Dow Corning 3-6548 sealant. Seal all conduits entering or leaving hazardous classified areas with approved seals.

.8 Where conduits pass through walls, group and install through openings. After all conduits shown on the Drawings are installed, close wall openings with material compatible with the wall construction.

.9 Install fish cord in empty conduits.

.10 Dry conduits out before installing cable.

.11 Surface Conduits

.1 Run parallel or perpendicular to building lines.

.2 Group conduits wherever possible on suspended or surface channels.

.3 Provide a minimum space of 12 mm between conduits.

.4 Do not pass conduits through structural members except as indicated.

.5 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

.6 Install spacers as required to provide a space between the conduits and the supporting surface, with a minimum space as follows:

.1 Above grade spaces not classified as CEC Category 1 or 2:

.1 Drywall / Wood surfaces: no space required

.2 Masonry / concrete surfaces: 6 mm

.2 Below grade spaces: 12 mm

3.4 ROUTING

.1 Locate conduits containing communication and low voltage conductors away from conduits containing power wiring.

.2 Route conduits on existing or new pipe rack or suspended channels where possible.

.3 Avoid routes that would interfere with any potential maintenance activities.

.4 Where not specifically shown in detail on the drawings, review proposed conduit routing with Contract Administrator prior to installation. Comply with all routing changes requested by the Contract Administrator.

3.5 METAL CONDUIT

.1 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.2 Mechanically bend conduits over 19 mm in diameter.

.3 Concrete Penetrations:

.1 Sleeves for Aluminum Conduit

.1 Install schedule 40 galvanized steel pipe, sized for free passage of conduit.

.2 Seal and firestop penetration around conduit with ULC approved assembly for the installation conditions.

.3 For wall, partitions, and ceilings the sleeve ends shall be flush with the finish on both sides but for floors they shall extend 50 mm above finished floor level or housekeeping pad level.

.4 Maximum spacing between supports for rigid metallic conduit:

.1	16mm conduit:	1.0 m
.2	21mm conduit:	1.5 m
.3	27mm conduit	1.5 m
.4	35mm conduit	2.0 m
.5	41mm conduit and larger	2.5 m

3.6 INSTALLATIONS IN CATEGORY 1 LOCATIONS

.1 Arrange to provide drainage at frequent intervals to suitable locations.

.2 Equip with approved fittings to permit the moisture to drain out of the system.

.3 Install the conduit with a minimum of 12 mm space from the supporting surface.

.4 Install every joint to be water-tight.

.5 Where conduit leaves a warm room and enters a cooler atmosphere, seal the conduit and arrange the conduit in a manner to avoid condensation accumulation at the seal.

3.7 INSTALLATIONS IN CATEGORY 2 LOCATIONS

.1 Comply with requirements as described in Section 3.6 Installations in Category 1 locations.

3.8 INSTALLATIONS IN CATEGORY 2 WET LOCATIONS

.1 Comply with requirements as described in Section 3.6 Installations in Category 1 locations.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 The following is a list of standards that may be applicable in this section:

- .1 Institute of Electrical & Electronic Engineers, Inc.IEEE-383/IEEE-1202 flame test suitable for direct burial.
- .2 Telecommunications Industry Association (TIA); Electronics Industry Association (EIA):
  - .1 455, Standard Test Procedures for Fiber Optic Fibers, Transducers, Connecting and Terminating Devices
  - .2 568, Commercial Building Telecommunications Cabling Standard.
  - .3 569-D, Telecommunications Pathways and Spaces.
  - .4 607-C, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.
- .3 Canadian Standard Association (CSA):
  - .1 CSA C22.2 No.2556, Wire and cable test methods
  - .2 CSA C22.2 No. 230, Tray cables
  - .3 CSA C22.2 No. 232, Optical fiber cables
  - .4 CSA C22.2 No 262, Optical Fiber Cable and Communication Cable Raceway Systems
- .4 American National Standard (ANSI/NETA)
  - .1 ANSI/NETA ATS, Standard For Acceptance Testing Specification for Electrical Power Equipment and Systems.

1.2 ABBREVIATIONS

.1	dB	decibel
.2	EIA	Electronic Industries Association
.3	m	meter
.4	MHz	megahertz
.5	μ, micro	x 10^{-6}
.6	n, nano	x 10^{-9}

1.3 SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings and Product Data:

- .1 Subsystem detail design documents:

.1 Bill of Materials for Fibre Optic Network Components: Component number, manufacturer, model number, component description, and quantity.

.2 Cable schedule showing:

.1 Cable identification.

.2 Fibre counts for each cable and identification of used fibre pairs.

.3 Cable length and attenuation and planned number of splices. Splices, if any, shall be minimized. Splices require Contract Administrator approval.

.3 Component Data:

.1 Manufacturer and model number.

.2 General data and description.

.3 Engineering specifications and data sheet.

.4 Scaled drawings and mounting arrangements.

.5 Power and grounding requirements.

.6 Electrical and optic interfaces.

.3 Informational Submittals:

.1 Manufacturer's Certificate of Compliance.

.2 Manufacturer's suggested installation practices.

.3 Manufacturer's statement that installer is certified to perform installation Work.

.4 Qualifications:

.1 Fibre Optic Network Contractor or Subcontractor: Minimum of 5 years' experience providing, integrating, installing, and commissioning of similar systems.

.2 Fibre Optic Network Contractor's or Subcontractor's Site Representative: Minimum of 5 years' experience installing similar systems.

.3 Acceptance of Fibre Optic Network Contractor or Subcontractor does not exempt Contractor or Subcontractor from meeting Contract requirements nor does it give prior acceptance of subsystems, equipment, materials, or services.

.5 Copy of fibre optic cable installer's factory certified installation certificate. Certificate shall have the name of the person who completed training course and that person shall supervise all cable installations and terminations for compliance with manufacturer recommendations.

.6 Factory test reports

.7 Proposed Route

.1 Make a physical survey of the project site for the purpose of establishing the exact cable routing and cutting lengths.

.2 Submit the proposed conduit route, location of handholes, and location of underground services within one metre of the proposed route for review by the Contract Administrator at least 30 days prior to the planned initiation of the work. The conduit route must be approved a minimum of 15 days prior to the installation.

.8 A cable pulling and splicing work plan shall be submitted a minimum of 30 days prior to the planned initiation of cable pulling. The cable pulling and splicing

work plan must be approved a minimum of 15 days prior to pulling cable. Work plan shall include the following:

.1 Pull tension calculations

.2 Calculated amount of lubrication required

.3 Detailed description of pull operation methods for all conduit runs

.4 Tools and equipment to be used for cable installation and testing

.5 Physical location of equipment setup and type

.6 Detailed schedule for pulling and testing cables

.9 Testing related submittals.

.1 Catalog data on all testing devices proposed for use plus certifications of accuracy, calibration, and traceability to standards of the National Institute for Standards and Testing

.2 Provide a final test report containing a summary of test results and all associated test data.

.10 Operation and Maintenance Data: As specified in Section 01 78 00, Closeout Submittals including the following:

.1 Updated versions of Hardware Shop Drawings Submittals.

.2 Component Manufacturers' O&M Manuals: Instructions for installation, operation, maintenance, and troubleshooting.

.3 List of spare parts provided.

.4 List of recommended additional spare parts.

.11 As-Built Drawings

.1 In accordance with Section 01 78 00, upon completion of the buried fibre cable, provide accurate UTM coordinates for the underground structures, and the marked up As-Built Drawings.

1.4 ENVIRONMENTAL REQUIREMENTS

.1 Optical Fibre Cable and Cable Splice Centers:

.1 Outside, Underground/Submerged: Minus 20 to 40 degrees C.

.2 Outside, Overhead: Minus 40 to 80 degrees C.

.3 Outside, Aboveground in Conduit: Minus 40 to 75 degrees C.

.4 Inside: 0 to 40 degrees C.

.2 Equipment:

.1 Outside, Aboveground: Minus 40 to 75 degrees C.

.2 Control Rooms, Equipment Rooms and Telecommunications Closets: 30 to 55 percent relative humidity, 18 to 24 degrees C.

.3 Other Interior Areas: 0 to 100 percent relative humidity, 5 to 35 degrees C.

Part 2 Products

2.1 OUTDOOR FIBRE OPTIC CABLE

.1 Fibre Requirements:

.1 Single mode

.2 Comply with the standards on References section.

.3 Fibre Category: OS2

.4 Maximum Attenuation: 0.4 / 0.3 dB/km

.2 Cable Requirements:

.1 Type: Loose Tube, double jacket, chemical resistant, non conductive

.2 Application: Aerial, Direct Buried, Duct, Tray Rated

.3 Flame Rating: LSZH (OFN-LS)

.4 Product Type: Dielectric

.5 Temperature Range (operation): Minus 50 to plus 75 degrees C

.6 Fibre Count: 36

.7 Fibres per Tube: 12

.8 Tape: Water-swellable

.9 Inner Jacket: FRNC/LSZH Material

.10 Tensile Strength Elements: Dielectric strength members

.11 Outer Jacket: FRNC/LSZH Material

.12 Max. Tensile Strength, Short-Term: 4500 N

.13 Max. Tensile Strength, Long-Term: 1500 N

.14 Compressive Loading: 2400 N/cm

.15 Impact Resistance: 11.8 N*m

.16 Min. Bend Radius Installation: 264 mm

.17 Min. Bend Radius Operation: 176 mm

.18 Nominal Outer Diameter: 17.6 mm

.19 Chemical Resistance: RoHS

.20 Approvals: CSA FT-4-ST1

.3 Manufacturer and Model:

.1 Corning 036EUL-T3601D2M

.2 Or approved equal in accordance with B7.

2.2 INDOOR FIBRE OPTIC CABLE

.1 In accordance with requirements of EIT/EIA 568, section 12.5

.2 Provide cables so that the number of fibres matches the required number of fibres shown on the drawings.

.3 Features:

.1 Low Loss,

.2 2 fibres, LC duplex to TBC,

.3 Single mode (OS2)

.4 Zip Cord Tight buffered cable,

.5 Riser, 2.0 mm legs.

.6 Insertion loss, typical: 0.15 dB

.7 Insertion loss, max.: 0.2 dB

.8 Flame Rating: OFNR

.9 Length: As required for installation

.4 Manufacturer:

.1 Corning 04cc02R51200xxM (where cc is connector type to be confirmed with Contract Administrator during construction and xx is length in metres)

.2 Or approved equal in accordance with B7.

2.3 FIBRE OPTIC ENVIRONMENTAL DISTRIBUTION CENTER (EDC)

.1 Function: Protects fibre optic connection and splices in indoor and outdoor environment.

.2 Requirements:

.1 6 CCH connector panels. Quantity as indicated on the drawings. No Holes

.2 Wall Mountable, NEMA 4X

.3 Included Connector Housing Panel (CCH) , LC Duplex,12 F, OS2

.4 Included NEMA 4 Rated Conduit Fitting for 2 inch conduit

.5 Splice Technology: Fusion Splice

.6 Splice Protectors Type: Heat-Shrink

.7 Splice Tray: Standard with organizers for heat-shrink fusion splice protectors. Quantity as indicated on the drawings

.8 Splice Tray Capacity: 24 Splices

.3 Manufacturer and Model:

.1 Corning EDC-6P-NH

.2 Corning CCH-CP12-A9 Connector Panel (CCH)

.3 Corning EDC-2N4-KIT Conduit Fitting

.4 Corning, M67-078 Splice Tray

.5 Or approved equal in accordance with B7.

2.4 FUSION SPLICE PROTECTOR

.1 Heat shrinkable splice protects the fusion splice on fibres securely.

.2 Requirements:

.1 Multifibre or single fibre Sleeve, 40 or 60 mm length.

.2 Fibre Diameter: 250 or 900 µm

.3 Heating Time: 64 Sec. for single fibre sleeve and 80 sec. for multi fibre sleeve.

.3 Manufacturer and Model Number:

.1 Corning, 2806031-01

.2 Or approved equal according to B7.

Part 3 Execution

3.1 FIBRE OPTIC CABLE

.1 Install cable without splices between network components. Any splicing required must be approved by the Contract Administrator.

.2 Installation by manufacturer certified installer.

.3 Install cables in accordance with manufacturer's requirements.

.4 Install cable directly from shipping reels. Ensure that cable is not:

- .1 Dented, nicked, or kinked.
- .2 Subjected to pull stress greater, or bend radius less, than manufacturer's specification.
- .3 Subjected to treatment that may damage fibre strands during installation.

.5 Crushed or kinked cable shall be replaced with new cable. Repair of cable jacket shall not be permitted. Jacket damage shall require removal and re-installation of a new cable run at the Contractor's expense.

.6 Cables Per Conduit: One cable maximum

.7 Provide a minimum of 3.0 metres of extra cable in each handhole and pullbox. Coil the cable and secure with cable ties. Ensure that the minimum bending radius is not compromised when preparing the coil.

.8 Identification: Identify cable on both ends and in access holes, handholes and pull points it goes through. Identify with tags in accordance with Division 26. Use water proof tags.

3.2 TESTS AND INSPECTION

.1 Test components of installation in accordance with standards and specifications.

.2 Provide equipment, instrumentation, supplies and skilled staff necessary to perform testing.

.3 Cable Inspection:

- .1 Compare cable, connector, and splice data with drawings and specifications.
- .2 Inspect cable and connections for physical and mechanical damage.
- .3 Clean fibre connectors with specialty formulated cleaning solution if required, Follow cleaning kit manufacturer's instruction.

.4 Pre-Installation Tests

- .1 The purpose of these tests is to perform acceptance tests on the cable prior to installation to verify that the cable conforms to the manufacturer's specifications, and is free of defects, breaks and damages by transportation and manufacturing processes.
- .2 Prior to removal of each cable from the delivery reel, test end-to-end length and attenuation with an OTDR and compare to the manufacturers test report. Gross dissimilarities shall be noted and remedied between the contractor and

manufacturer. In all cases, all fibres must meet the optical attenuation specifications prior to cable installation.

.3 Attenuation loss of each fibre in dB/km shall be within manufacturer's specification. Replace any cable in which any fibre does not meet this requirement.

.4 Advise the Contract Administrator five days prior to the start of testing.

.5 Document and submit testing results to the Contract Administrator for review prior to installing cable.

.5 Post-Installation Tests

.1 Field test all fibres for end to end attenuation of an installed link as per TIA-568-C.0. Test all spare fibres from patch panel to patch panel.

.2 All tests shall be bi-directional.

.3 Perform cable length measurement, fibre fracture inspection and construction defect inspection using an Optical Time Domain Reflectometer (OTDR). The OTDR signal shall be analyzed for excessive connection, splice or cable backscatter by viewing the reflected power/distance graph.

.4 Perform connector and splice integrity test using an OTDR. The OTDR signal shall be analyzed for excessive connection, splice or cable backscatter by viewing the reflected power/distance graph.

.5 Perform cable attenuation loss measurement with an optical power loss test set. Attenuation loss of each fibre in dB/km shall be within manufacturer's recommendation.

.6 Perform connector and splice attenuation loss measurement from both ends of the optical cable with an optical power loss test set. Attenuation loss in shall be within manufacturer's recommendation.

.7 Until requirements are met, replace and retest all cables that do not meet attenuation standards. The installation will not be considered complete until all requirements are met in all fibres even if communication is occurring.

.8 Advise the Contract Administrator five days prior to the start of testing.

.9 Submit a test report summary and all associated test data to the Contract Administrator at the completion of the testing.

END OF SECTION