

Part 1 General

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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 ADMINISTRATIVE

- .1 Coordinate with the Contract Administrator to schedule project meetings throughout the progress of the work at the call of the Contract Administrator.
- .2 Support the preparation of an agenda for meetings.
- .3 Location:
 - .1 Generally, progress meetings will be online via a Microsoft Teams or Google Meet platform.
 - .2 Selected meetings may be located at the North End Sewage Treatment Plant (NEWPCC).

1.2 PRECONSTRUCTION MEETING

- .1 Agenda to include, but not be limited to:
 - .1 Designation of personnel representing the parties.
 - .2 Schedule of Work.
 - .3 Schedule of submittals.
 - .4 Permits.
 - .5 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00- Construction Facilities.
 - .6 As-Built drawings.
 - .7 Monthly progress claims.
 - .8 Work hours.
 - .9 Emergency contacts.
 - .10 Document templates to be utilized.

1.3 PROGRESS MEETINGS

- .1 Contract Administrator will schedule regular progress meetings at Site during course of Work.
- .2 Contractor, major Subcontractors involved in Work are to be in attendance.
- .3 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.
 - .4 Problems which impede construction schedule.
 - .5 Review of off-site fabrication delivery schedules.
 - .6 Corrective measures and procedures to regain projected schedule.
 - .7 Revision to construction schedule.

- .8 Progress schedule, during succeeding work period.
- .9 Review submittal schedules: expedite as required.
- .10 Maintenance of quality standards.
- .11 Review proposed changes for effect on construction schedule and on completion date.
- .12 Other business.

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 COLLABORATION SITE

- .1 The Contract Administrator will provide access to an online Project Collaboration Site to assist with facilitation of the contract administration. The Contractor shall fully utilize the systems and processes in the Project Collaboration Site to aid in the coordination of the Work, except as indicated in Section 1.4.
- .2 The Project Collaboration Site will be utilized to:
 - .1 Monitor the overall progress of the project, with a primary focus on submittal requirements.
 - .2 Organize and transmit submittals between organizations and facilitate the review process.
 - .3 Store and transmit project documents.
 - .4 Coordinate commissioning requirements.
 - .5 Log and manage deficiencies.
 - .6 Other related contract administration functions.
- .3 The Contractor will have access to the Project Collaboration Site until Total Performance.

1.2 USERS

- .1 Submit to the Contract Administrator the names, organization, and e-mail addresses of all users who should have access to the Project Collaboration Site.
- .2 While there is no maximum number of users who may have access, ensure that all users provided with access have a legitimate need to access the Project Collaboration Site.
 - .1 Subcontractors may be designated as users.
- .3 The Contractor is responsible be ensuring only authorized users have access.

1.3 TRAINING

- .1 The Project Collaboration Site is intended to be intuitive and users who are adept with web-based platforms may be able to learn the platform without specific training.
- .2 Where possible support and train the Contractor's users who require training.
- .3 One session of training on the Project Collaboration Site will be provided upon request, via a remote meeting.

1.4 CONTINUED DEVELOPMENT OF PLATFORM

- .1 The Project Collaboration Site is a new platform that is being trialed on this project.
- .2 As possibility exists that there could be an error or issue with the platform. If an error or issue occurs, provide relevant feedback and information through the Contract Administrator.

- .3 The Project Collaboration Site will undergo continuous development. New features and capabilities may be developed over the course of the project. Accommodate and adapt to the platform changes as required.
- .4 General feedback on the use of the Project Collaboration Site is welcome.

1.5 INTEGRATION WITH CONTRACTOR SYSTEMS

- .1 The Project Collaboration Site does not currently have any automatic integration capabilities with 3rd party platforms. Integrations may be developed in the future.
- .2 Provide all required coordination with any Contractor internal systems and the Project Collaboration Site.

1.6 PROJECT RECORDS

- .1 The Contractor is responsible for downloading any project information from the Project Collaboration Site required for its internal records.
- .2 Download features are currently being developed for the Project Collaboration Site and are planned for completion prior to Total Performance. However, no guarantee is provided regarding the availability of these features. In the event these features are not complete, manual effort may be required to extract project information from the Project Collaboration Site.

1.7 POTENTIAL NON-ACCESS OF THE PROJECT COLLABORATION SITE

- .1 In the event that the Project Collaboration Site is temporarily or permanently inactive, inaccessible, or otherwise non-functional coordinate with the Contract Administrator to implement alternative coordination and communication methodologies.

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 ADMINISTRATIVE

- .1 Submit to the Contract Administrator submittals listed for review.
- .2 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.
- .3 Allow ten (10) Working Days for review of submittals by the Contract Administrator.
- .4 Do not proceed with Work affected by submittal until review is complete.
- .5 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .6 Where items or information is not produced in SI Metric units converted values are acceptable.
- .7 Review submittals prior to submission to the 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 may be returned without being examined and considered rejected.
- .8 Notify the Contract Administrator, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .9 Verify field measurements and affected adjacent Work are co-ordinated.
- .10 Contractor's responsibility for errors and omissions in submission is not relieved by the Contract Administrator's review of submittals.
- .11 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by the Contract Administrator's review.
- .12 Make any corrections required by the Contract Administrator and resubmit the required Submittals.
- .13 Keep one reviewed copy of each submission on site.

1.2 DEFINITIONS

- .1 Review Completed Status – The submittal has been reviewed and marked with a submittal status of either:
 - .1 “No exceptions noted.”
 - .2 “Exceptions/comments noted. Resubmittal is not required if exceptions/comments are addressed and included in final closeout submittals.”

1.3 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 Where specified, submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of the Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Adjustments made on shop drawings by the Contract Administrator are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Contract Administrator prior to proceeding with Work.
- .5 Make changes in shop drawings as Contract Administrator may require, consistent with Contract Documents. When resubmitting, notify Contract Administrator in writing of revisions other than those requested.
- .6 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 Other pertinent data.
- .7 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.

- .9 Single line and schematic diagrams.
- .10 Relationship to adjacent work.
- .8 Submit in the following format:
 - .1 One electronic PDF copy; and
 - .2 Microsoft Word and/or Excel files for editable files, and
 - .3 As elsewhere required in the Specifications.
- .9 Scanned files are not acceptable.
- .10 Organize information in a manner to allow for easy access and identification of information.
- .11 Provide a table of contents for all submittals exceeding ten pages in length that have multiple items.
- .12 Delete information not applicable to project.
- .13 Supplement standard information to provide details applicable to project.
- .14 Supplement standard information to provide details applicable to project.
 - .1 Provide equipment identifiers on documents as applicable to clarify the applicability of documents.
 - .2 Mark via highlighting or boxes specific model numbers and options on documents. Generic datasheets without indication of the specific product to be provided may not be accepted.
- .15 If upon review by the Contract Administrator:
 - .1 A Review Completed status is achieved, an electronic copy will be returned, and fabrication and installation of Work may proceed.
 - .2 A Review Completed status is not achieved, a noted copy will be returned. Resubmit the corrected submittals, through the same procedure indicated above, and receive a Review Completed status before proceeding with fabrication and installation of Work.
- .16 The review of shop drawings by the Contract Administrator is for the sole purpose of ascertaining conformance with the general concept.
 - .1 This review shall not mean that Contract Administrator approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting the generality of the foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.4 SCHEDULE OF SUBMITTALS

- .1 The Contract Administrator may provide a schedule of submittals in a document or online web-based format. Coordinate and organize all submittals in accordance with the schedule of submittals provided.
 - .1 Any errors or omissions on the schedule of submittals does not negate or eliminate the Contractor's requirements to provide all required submittals.

1.5 METHOD OF SUBMITTAL

- .1 Submit all submittals via the online platform, as described in 01 31 24 – Project Collaboration 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 INSPECTION

- .1 Allow the 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 the 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.

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. The cost of such services will be borne by the City.
- .2 Engagement of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .3 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 City. Pay costs for retesting and re-inspection.

1.3 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work.
- .2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

- .1 Notify appropriate agency and the Contract Administrator in advance of requirement for tests, in order that attendance arrangements can be made.

1.5 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 the Contract Administrator.
- .4 Where requested by the Contract Administrator, provide digital photographs to the Contract Administrator of corrected Work in a timely manner.

1.6 REPORTS

- .1 Submit digital copies of commissioning, inspection and test reports to the Contract Administrator.

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 ACTION AND INFORMATIONAL 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 TEMPORARY HEATING AND VENTILATION

- .1 If required, provide temporary heating 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.
 - .1 All heaters for hazardous locations shall be approved for the location.
- .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.
- .4 Maintain building temperatures of minimum 10 °C in areas where construction is in progress or affects existing areas.
- .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 Permanent heating system of building, to be used when available. Be responsible for damage to heating system if use is permitted.

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

1.4 TEMPORARY POWER AND LIGHT

- .1 City will provide electric power for construction purposes, provided such electric power is not utilized for heating purposes.
 - .1 The Contractor is responsible for locating an appropriate source of electrical power and providing all breakers, cables, and other temporary facilities for the temporary power.
 - .2 Connect to existing power supply in accordance with Canadian Electrical Code
 - .3 Submit plans for temporary power connection in accordance with 01 33 00 – Submittal Procedures.
 - .4 Upon completion of the Work, disconnect temporary power and make good all connections.
- .2 Provide and maintain temporary lighting throughout project.

1.5 TEMPORARY COMMUNICATION FACILITIES

- .1 Provide all require temporary communication facilities, and do not interconnect with the City's systems.

1.6 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction governing codes, regulations and bylaws.
- .2 Do not burning rubbish and construction waste materials 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 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CAN/CSA-S269.2, Access Scaffolding for Construction Purposes.

1.2 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.

1.3 SCAFFOLDING

- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- .2 Provide and maintain ramps, platforms, ladders, scaffolding, and temporary stairs as required.

1.4 HOISTING

- .1 Provide, operate, and maintain hoists and cranes required for moving of materials and equipment.
- .2 Hoists and cranes to be operated by qualified operator.

1.5 CONSTRUCTION PARKING

- .1 Parking will be permitted on site at designated location, provided it does not disrupt City operations.
- .2 Provide and maintain adequate access to project site.

1.6 SECURITY

- .1 All security is the responsibility of the Contractor. Do not rely on any City security personnel, system, or facility.
- .2 Ensure that all City facilities are secure at the end of each shift and when leaving the Site.

1.7 OFFICES

- .1 If the Contractor wishes to bring a trailer to site additional coordination may be required. Coordinate with the Contract Administrator and meet the indicated requirements.

1.8 EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment, and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on the Site in a manner to cause the least interference with City's and other contractor work activities.

1.9 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.

1.10 PROTECTION AND MAINTENANCE OF TRAFFIC

- .1 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by the Contract Administrator.
- .2 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs.
- .3 Protect travelling public from damage to person and property.
- .4 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .5 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.

1.11 CLEAN-UP

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.

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 VEHICLE ACCESS AND PARKING

- .1 Limited parking will be permitted on the Site for up to three (3) vehicles, provided it does not disrupt the City's operations.
- .2 If additional parking is required, arrange for, and maintain additional off-Site parking.
- .3 Provide and maintain adequate access to the 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 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 energized electrical work.

1.3 PROTECTION OF BUILDING FINISHES

- .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Be responsible for damage incurred due to lack of or improper protection.

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 REFERENCE STANDARDS

- .1 Conform to these 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 right to have such products or systems tested to prove or disprove conformance.
 - .1 Cost for such testing will be born by City in event of conformance with Contract Documents or by 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.
- .3 Should disputes arise as to quality or fitness of products, decision rests strictly with Contract Administrator based upon requirements of Contract Documents.
- .4 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 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 the event of failure to notify the Contract Administrator at commencement of the Work, and should it subsequently appear that Work may be delayed for such reason, the Contract Administrator reserves the right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in a manner to prevent damage, adulteration, deterioration, and soiling and in accordance with the 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 the 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 panels on flat, solid supports off the ground and sloped to shed rain.
- .7 Store and mix paints in a heated and ventilated room. Remove oily rags and other combustible debris from the Site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to the satisfaction of the Contract Administrator.
- .9 Touch-up damaged factory finished surfaces to Contract Administrator's satisfaction. Use touch-up materials to match the original. Do not paint over nameplates.

1.5 TRANSPORTATION

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

1.6 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 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.

1.7 QUALITY OF WORK

- .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 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 Contract Administrator, whose decision is final.

1.8 CO-ORDINATION

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.9 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.

1.10 LOCATION OF FIXTURES

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform the Contract Administrator of conflicting installation. Install as directed.

1.11 FASTENINGS

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
 - .1 All fasteners attached to the transformer shall be stainless steel.
- .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.

1.12 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 Contract Administrator.

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 ACTION AND INFORMATIONAL 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 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 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:
 - .1 Submit request for change in materials in accordance with B7.
 - .2 The City and Contract Administrator may reject all change in materials after bid submittal. If change in materials is required to deliver the Work, submit request for substitution in accordance with Section 01 33 00- Submittal Procedures, along with a complete rationale for the substitution.
 - .1 Price is not a valid rationale for substitution after bid submission.

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.

1.4 EXECUTION

- .1 Execute cutting, fitting, and patching to complete Work.
- .2 Remove and replace defective and non-conforming Work.
- .3 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .4 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .5 Pneumatic or impact tools not allowed on masonry work without prior approval.
- .6 Restore work with new products in accordance with requirements of Contract Documents.
- .7 Fit Work airtight to pipes, sleeves, ducts, cables, conduit, and other penetrations through surfaces.
- .8 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with Section 07 84 00 - Fire Stopping, full thickness of the construction element.
- .9 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 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide and use marked separate bins for recycling.
- .5 Dispose of waste materials and debris off site.
- .6 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

- .1 When Substantially Performance is achieved, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris other than that caused by City or other contractors.
- .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .6 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .7 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .8 Remove dirt and other disfiguration from exterior surfaces.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

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 DEFINITIONS

- .1 Hazardous: Exhibiting the characteristics of hazardous substances including properties such as ignitability, corrosiveness, toxicity or reactivity.
- .2 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- .3 Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- .4 Reuse: To reuse a construction waste material in some manner on the project site.
- .5 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- .6 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Storage Requirements: Implement a recycling/reuse program that includes separate collection of waste materials as appropriate to the project waste and the available recycling and reuse programs in the project area.
- .2 Handling Requirements: Clean materials that are contaminated before placing in collection containers and ensure that waste destined for landfill does not get mixed in with recycled materials:
 - .1 Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.
 - .2 Arrange for collection by or delivery to the appropriate recycling or reuse facility.
- .3 Hazardous Waste and Hazardous Materials: Handle in accordance with applicable regulations.

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 AND DECLARATION FOR SUBSTANTIAL PERFORMANCE OF THE WORK

- .1 In addition to other requirements, Substantial Performance will not be granted until:
 - .1 The Initial Performance Test is successfully completed.
 - .2 The complete draft Operations and Maintenance Manuals have been submitted for review and are substantially complete.
- .2 Contractor's Inspection:
 - .1 Prior to application for Substantial Performance, conduct a detailed inspection of Work, identify deficiencies and defects, and repair as required to conform to the Contract Documents.
 - .2 Notify Contract Administrator in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
 - .3 Request Contract Administrator's inspection.
- .3 Contract Administrator's Inspection:
 - .1 Contract Administrator and Contractor to inspect the Work and identify defects and deficiencies.
- .4 Contractor to correct the Work as directed.

1.2 FINAL CLEANING

- .1 Clean in accordance with Section 01 74 00 — Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools, and equipment.

1.3 INSPECTION AND DECLARATION FOR TOTAL PERFORMANCE OF THE WORK

- .1 Prior to application for Total Performance, conduct a detailed inspection of Work, identify deficiencies and defects, and repair as required to conform to the Contract Documents.
- .2 Once Contractor's inspection is complete and all deficiencies have been corrected, submit a written certificate that the following has been performed:
 - .1 All Work has been completed in accordance with the Contract Documents.
 - .2 All defects and deficiencies have been corrected.
 - .3 All commissioning is complete.
 - .4 All permit certificates have been received.
 - .5 The final Closeout Submittals have been completed and delivered.
- .3 Contract Administrator's Inspection:
 - .1 Contract Administrator and Contractor to inspect the Work and identify defects and deficiencies.
- .4 Contractor to correct the Work as directed.

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 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 As-Built Documents
 - .1 Submit PDF copies of all as-built markups in accordance with Section 1.2.
- .3 Operation and Maintenance Data
 - .1 Submit Operation and Maintenance Data in accordance with Section 01 78 23 — Operation and Maintenance Data.

1.2 AS -BUILT DOCUMENTS

- .1 Maintain on site, one as-built markup copy, of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 As-built markup copy of documents may be physical or digital, provided continuous access is provided to required personnel.
- .3 Maintain as-built documents in legible condition.
- .4 Keep as-built markup documents available for inspection by the Contract Administrator.
- .5 Record information on as-built markup concurrently with construction progress .
 - .1 Do not conceal Work until required information is recorded.
- .6 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .2 Field changes of dimension and detail.
 - .3 Changes made by change orders.
 - .4 Details not on original Contract Drawings.
 - .5 Referenced Standards to related shop drawings and modifications.
- .7 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

- .2 Changes made by Addenda and change orders.
- .8 Other Documents: maintain inspection certifications, manufacturer's certifications, field test records, required by individual specifications sections.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.

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 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 — Submittal Procedures.
- .2 Operation and Maintenance Manuals
 - .1 Submit within two (2) months after Contract Award a comprehensive table of contents for the Operation and Maintenance Data.
 - .2 Prior to Substantial Performance of the Work, submit a comprehensive digital PDF copy of the Operation and Maintenance Data for review.
 - .1 Revise and resubmit the Operation and Maintenance Manuals in PDF format as required.
 - .3 After receiving a Review Completed Status:
 - .1 Submit a digital PDF copy of the final Operation and Maintenance Data via:
 - .1 Digital cloud-based delivery, and
 - .2 USB memory stick.
 - .2 Submit four (4) hardcopy copies of the final Operation and Maintenance Data.

1.2 OPERATION AND MAINTENANCE DATA

- .1 Prepare Operation and Maintenance (O&M) Manuals.
 - .1 Provide the services of qualified and experienced personnel to prepare manuals.
 - .2 Prepare sets of manuals for various divisions using identical bindings, and the same indexing system and format for all manuals (e.g. if there are X number of binders for the entire project they are to be labelled Vol. 1 of Y, Vol. 2 of Y, Vol. 3 of Y, etc.)
- .2 Hardcopy Format
 - .1 Binders: vinyl, hard covered, 3 'D' ring, loose-leaf 219 x 279 mm with spine and face pockets.
- .3 PDF Format
 - .1 Organized file structure matching the hardcopy binder organization.
 - .2 Provide 1 PDF file per content item. For example, the manual for a device would comprise one PDF file.
 - .3 All PDFs are to be in native format and text searchable. Scanned PDF documents are not permissible without the explicit permission of the Contract Administrator.

- .4 Organization
 - .1 Level 1:
 - .1 Organize by discipline with the following disciplines:
 - .1 General
 - .2 Electrical
 - .3 Commissioning
 - .1 Include all testing and commissioning data and reports.
 - .2 Level 2:
 - .1 Organize by system or product class. Examples include:
 - .1 Electrical distribution equipment.
 - .2 Cables.
 - .3 Organize data as an instructional manual.
 - .4 When multiple binders are used, correlate data into related consistent groupings.
 - .1 Identify the contents of each binder on the spine.
- .5 Content and Requirements
 - .1 Cover:
 - .1 City of Winnipeg
 - .2 Project title (WTP PLC Upgrades)
 - .3 Tender No. (896-2021)
 - .4 Binder Title (e.g. Operation and Maintenance - Commissioning)
 - .5 Volume No. (e.g. Vol. X of Y)
 - .6 Contractor Name.
 - .2 Arrange each individual binder as follows:
 - .1 Title Page (first page on the inside of binder)
 - .1 Project title
 - .2 City of Winnipeg
 - .3 Tender No
 - .4 Name, address, telephone number for:
 - .1 Contractor
 - .2 Subcontractors (list all applicable to the binder contents)
 - .3 Index (follows Title Page)
 - .1 Project title
 - .2 Volume No.
 - .3 Table of Contents broken out into three columns as follows:
 - .1 Item No.
 - .2 Specification reference No.
 - .3 Description of item

- .4 Tabs
 - .1 Tab Title Page
 - .1 Item description
 - .2 Manufacturer
 - .3 Agent name
 - .4 Agent address
 - .5 Agent telephone number
 - .6 Agent e-mail address
 - .7 Item No.
 - .8 Specification reference No.
 - .9 General description
 - .2 Permit and Inspection Certificate(s).
 - .3 Contents of each product / system tab
 - .1 Part number specific to the item provided
 - .2 Product information specific to the item provided
 - .3 Operating procedures and instructions specific to the item provided
 - .4 Start-up documentation and check sheets (if applicable)
 - .5 Warranty information
 - .6 Shop Drawings: provide with reinforced punched binder tab.
 - .1 Bind in with individual content tabs; fold larger drawings to size of text pages.
 - .7 Include specific equipment identifiers to clarify the applicability of data and material.
 - .4 Pre-commissioning and Commissioning Forms and reports
 - .1 Typed
 - .5 Other data as specified and applicable.

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 SUMMARY

- .1 Section Includes:
 - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to performance verification of components, equipment, sub-systems, systems, and integrated systems.
- .2 Acronyms:
 - .1 O&M - Operation and Maintenance.

1.2 RELATED SECTIONS

- .1 Section 26 08 05 — Electrical Commissioning.

1.3 DEFINITIONS

- .1 Pre-Commissioning – Checking and testing of the equipment and construction to confirm that the equipment is in accordance with the drawings and specifications.
- .2 Cold Commissioning – Commissioning processes that are executed prior to introducing process fluids. This may include dry commissioning (without any process fluids), or wet commissioning, which includes more inert fluids, such as water.
- .3 Hot Commissioning – Commissioning processes that are executed with the design process fluid.
- .4 Start-Up – The commissioning phase when the entire plant, including all systems and sub-systems) are brought into full operation with process fluids, with the intent of complete process operation. Start-up may overlap hot commissioning.

1.4 GENERAL

- .1 Commissioning Objectives:
 - .1 Verify installed equipment, systems, and integrated systems operate in accordance with the Contract Documents, design criteria, and the associated intent.
 - .2 Ensure appropriate Commissioning Records are compiled as a record of successful Commissioning and to allow for future comparison of performance against original Commissioning.
- .2 Commissioning Leadership:
 - .1 The Contractor will lead the Commissioning process based upon the Contract Documents and best industry practices.
 - .2 Should the Contract Administrator provide any Commissioning leadership, advice, or direction; it does not in any way, reduce or eliminate the requirement of the Contractor to provide comprehensive Commissioning in accordance with the Contract Documents.

- .3 Cooperation:
 - .1 The Commissioning process will require an integrated team approach with the Contractor, City, and Contract Administrator. Work cooperatively and in the best interest of the project.
 - .2 Work cooperatively to maintain Facility Operation.

1.5 CONFLICTS

- .1 Report conflicts between requirements of this section and other sections to the Contract Administrator before Commissioning and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in the application of most stringent requirement.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 — Submittal Procedures.
- .2 Template Commissioning Records:
 - .1 Include commissioning reports and template commissioning forms.
 - .2 Submit no later than twelve (12) weeks after award of Contract and four (4) weeks prior to the start of Commissioning:
- .3 Commissioning Procedures:
 - .1 Provide commissioning procedures for any non-discrete and simple commissioning.
 - .2 Submit at least four (4) weeks prior to start of associated Commissioning.
 - .3 **Unless otherwise specified, no formal commissioning procedures are anticipated to be required for this project unless the Contractor's plan differs from that specified.**
- .4 Commissioning Records:
 - .1 Provide a set of Commissioning Records a minimum of two (2) weeks after the completion of the associated commissioning.
- .5 Additional commissioning documentation:
 - .1 Provide additional documentation relating to the Commissioning process required by Contract Administrator.

1.7 COMMISSIONING RECORDS

- .1 General requirements:
 - .1 The Commissioning Records will provide a comprehensive record of the commissioning that occurred. It shall be clear what tests and inspections were performed and the results of the tests and inspections.
 - .2 The Commissioning Records must be able to stand independent of all other documents.
- .2 Provide detailed Commissioning forms to document all Commissioning work that is repetitious or repeated more than two times.

- .3 Contract Administrator to review and approve the Commissioning Records.
- .4 Provide completed and approved Commissioning Records.
- .5 Commissioning Records:
 - .1 Format:
 - .1 Digital PDF, typed not scanned.
 - .2 Organization:
 - .1 Clearly organized by system, equipment, and test to allow for easy and rapid access to specific test results.
 - .3 Content
 - .1 Include measurements, final settings, and certified test results.
 - .2 Include completed commissioning forms.
 - .3 Bear signature of commissioning technician and independent supervisor / technician responsible for checking the work.
 - .4 Revise "as-built" documentation, commissioning reports to reflect changes, adjustments and modifications as set during commissioning.

1.8 COMMISSIONING FORMS

- .1 Where not provided within the Tender Documents, provide a comprehensive set of forms to document all aspects of the Commissioning.
- .2 All Commissioning Forms will include:
 - .1 Facility and Area.
 - .2 Project Name.
 - .3 Tender Number.
 - .4 Page Number.
 - .5 Equipment / System Identifier and Description (exactly matching the specified name and description).
 - .6 Provide an overall assessment as to whether the equipment / device / cable passed the inspection and tests.
 - .7 Date of Test.
 - .8 Name of the company performing the test (indicate subcontractor's name as applicable).
 - .9 Name of individual performing the test.
 - .10 Signature of individual performing the test (on the original).
- .3 Document each equipment, device, or cable Commissioned on a separate test form.
- .4 At the discretion of the Contract Administrator, the Contract Administrator may provide additional forms or supplant the Contractor supplied forms for use in the Commissioning process.
- .5 All forms are to be typed.
 - .1 Forms may be completed using handwriting on Site and shall be typed for final submittal.

- .6 Submit electronic PDF copies of the inspection forms. All PDF copies are to be native digital PDFs. Scanned copies are not permitted.

1.9 COMMISSIONING SCHEDULE

- .1 Provide a detailed Commissioning schedule as part of the Detailed Work Schedule in D11.
- .2 Ensure adequate time is allocated for coordination, availability of the City for process impacts, all testing activities, remediation of any potential issues, and re-commissioning of deficiencies.

1.10 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 — Closeout Submittals.
- .2 Provide an overall organized set of Commissioning Records, including a table of contents, that is included as part of the Operation and Maintenance Manuals as specified in Section 01 78 23 — Operation and Maintenance Data.

1.11 SCOPE OF COMMISSIONING

- .1 The scope of commissioning indicated here does not limit any requirements elsewhere in the Specifications.
- .2 The Contractor's scope of Commissioning includes:
 - .1 Test all primary power cables (before and after repairs):
 - .1 Test in accordance with 26 08 05 - Electrical Commissioning.
 - .2 Test all transformers (before and after repairs):
 - .1 Test in accordance with 26 08 05 - Electrical Commissioning.
 - .3 Test transformer heaters.
 - .4 Test transformer temperature alarms.
 - .5 Test the busduct for each transformer.

1.12 CONFLICTS

- .1 Report conflicts between requirements of this section and other sections to the Contract Administrator before commissioning and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.13 FAILURE OF SYSTEMS NOT WITHIN THE SCOPE OF THE CONTRACT

- .1 Investigate, at no additional cost to the Contract, failures of components and systems that are part of the scope of the commissioning process, but not supplied in the scope of this Contract.
 - .1 Investigation is to be sufficient to understand the issue, identify the scope of work, and estimate the cost of repair required. Provide associated documentation.

- .2 If the repair work is within the Contractor's typical scope of practice, provide a formal quotation to perform the repair in accordance with E12.
- .3 Provide associated investigation documentation and quotation to the Contract Administrator in writing.
- .4 Include all relevant information within the Commissioning Documentation.

1.14 COMMISSIONING DOCUMENTATION

- .1 Contract Administrator to review and approve Commissioning Documentation.
- .2 Provide completed and approved Commissioning Documentation to the Contract Administrator.

1.15 WITNESSING OF TESTING

- .1 Provide access to Contract Administrator to witness testing.

1.16 CITY'S PERFORMANCE TESTING

- .1 Performance testing of equipment or system by the City or Contract Administrator will not relieve Contractor from compliance with specified testing 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 SUMMARY

- .1 Section Includes:
 - .1 Coordination requirements relating to Work activities that impact Facility Operation, or have the potential to impact Facility Operation.

1.2 ACRONYMS

- .1 O&M - Operation and Maintenance.

1.3 DEFINITIONS

- .1 Facility Operation means the operation and maintenance processes and activities of the North End Sewage Treatment Plant, and all related systems.
- .2 Facility Operation Impact Request means the formal, written request, submitted with the required details in accordance with this Section, to request that an activity of Work that has, or may have, an impact to Facility Operation may be performed.

1.4 GENERAL

- .1 The North End Sewage Treatment Plant (NEWPCC) is a critical facility that provides wastewater treatment for the City Winnipeg. It is in continuous service, and all shutdowns must be scheduled. Under no circumstances shall any Work that affects, or has the potential to affect, NEWPCC operation be undertaken without prior approval.
- .2 The Contractor shall review all activities for risk and ensure that appropriate risk mitigation plans are in place prior to proceeding with the Work. If there is any doubt regarding a risk that could impact operations, the Contractor shall contact the Contract Administrator for review.
- .3 Should an unplanned incident occur that will impact operations, the Contractor shall immediately contact designated NEWPCC staff and the Contract Administrator.
- .4 The Contract Administrator and City reserve the right to stop Work and interrupt and reschedule shutdowns to accommodate unplanned operational requirements.
- .5 The City's interruption or rescheduling of the Work shall not cause a delay in the Contract Schedule or increase in Contract price where:
 - .1 A minimum of 24 hours notice is provided,
 - .2 The delay is less than four hours, or
 - .3 The Contractor can reasonably reallocate work to other Work activities.
- .6 Plan and schedule the Work to minimize the impact on Facility Operation.
- .7 Cooperate with all City and Contract Administrator directed procedures intended to maintain Facility Operation.

1.5 DETAILED WORK SCHEDULE

- .1 Provide a detailed schedule of all activities that have, or potentially have, an impact on Facility Operation as part of the Detailed Work Schedule in D11.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 — Submittal Procedures.
- .2 Submit Facility Operation Impact Requests for each activity with and impact to Facility Operation.

1.7 FACILITY OPERATION IMPACT MINIMIZATION

- .1 Schedule and perform Work activities to minimize the impact on Facility Operation.
- .2 Plan Work in accordance with the requirements within the Construction Work Plan.
- .3 Perform detailed planning and coordination to minimize the risk on Facility Operation.
- .4 Develop procedures to minimize the impact and risk on Facility Operation.
- .5 Develop response procedures to address any unexpected events.
- .6 Ensure all Contractor personnel are trained and familiar with Facility Operation requirements and all procedures to minimize the Facility Operation impact.
- .7 Upon request, demonstrate to the Contract Administrator and/or City the plans and procedures in place to minimize the risk on Facility Operation.

1.8 FACILITY OPERATION IMPACT REQUEST

- .1 For each activity of Work that has, or includes the potential risk of, an impact to Facility Operation, submit a Facility Operation Impact Request a minimum of ten (10) Working Days prior to the requested date.
 - .1 Assign an incrementing, unique number to each request, starting at 1.
 - .2 Provide a proposed date for the activity that matches the Detailed Work Schedule. If a new date is proposed, update the Detailed Work Schedule.
 - .3 Describe the Work activity.
 - .4 Describe the impact to, or potential impact to, Facility Operation.
 - .5 Describe the procedures that will be implemented by the Contractor to minimize the Facility Operation impact.
 - .6 Clearly describe any proposed deviations from the Construction Work Plan.
 - .7 Describe the proposed procedures and requirements for the City during the proposed activity.
 - .8 Describe potential risks to the activity that could have Facility Operation impact and planned mitigation to address the risks.
 - .9 Provide other comments and details to provide a comprehensive description of the request.
- .2 The Contractor shall plan the work and clearly describe on the Facility Operation Impact Request form the procedures to mitigate the risk to the facility impact.

- .3 Submit the Facility Operation Impact Request on the form provided at the end of this Section. The Contract Administrator will provide a Microsoft Word version, or a comparable online format, of this form after Contract award.
- .4 Each Facility Operation Impact Request shall address no more than one Facility Operation impact.

1.9 FACILITY OPERATION IMPACT REVIEW AND ACCEPTANCE

- .1 The City and Contract Administrator will review the Contractor's submitted Facility Operation Impact Request.
- .2 The City and Contract Administrator may reject any Facility Operation Impact Request that is incorrectly submitted, provides insufficient detail, or has insufficient planning to limit the Facility Operation impact.
- .3 Acting reasonably, the City and Contract Administrator may:
 - .1 Adjust the scheduled date to accommodate Facility Operation requirements and City's personnel availability.
 - .2 Require revised or supplemental procedures to be implemented, either by the Contractor or City.
 - .3 Require meetings to discuss, review, and plan the required procedures to mitigate risks and allow for smooth, coordinated activities.
- .4 The Contractor shall comply with all additional requirements directed to maintain Facility Operation.
 - .1 No additional payment will apply unless in, the Contract Administrator's opinion, the additional requirements significantly deviate from the directly specified and implied Work and could not be reasonably inferred from the Contract Documents.
 - .2 No modification to the Contract scheduled dates will apply unless the City delays a properly formatted, detailed, and submitted Facility Operation Impact Request by more than three (3) Working Days for a cause other than for review, meeting, or coordination.
- .5 The Facility Operation Impact Request will be returned with one of the following statuses:
 - .1 Reviewed and accepted as proposed.
 - .2 Reviewed and accepted with comments and required amendments.
 - .3 Reviewed and not accepted. Revise and resubmit.
 - .4 Rejected.
- .6 If the Facility Operation Impact Request is marked with "Reviewed and accepted with the comments and required amendments", the Contractor's decision to proceed with the activity implies that the Contractor has reviewed, understood, and accepts the comments and required amendments.
- .7 The City and Contract Administrator, acting reasonably, may add or clarify conditions that must be met prior to proceeding with the work. For example, the Contractor may

be required to first complete commissioning of one item of work prior to taking another unit of equipment out of service for commissioning.

- .8 The City and/or the Contract Administrator's review and acceptance of the Facility Operation Impact Request in no way reduces, limits, or relieves the Contractor of their obligations to avoid unintended Facility Operational impacts.

1.10 UNINTENDED FACILITY OPERATION IMPACT

- .1 This section in no way implies that a Facility Operation Impact will be accepted. The Contractor shall take all measures to avoid a Facility Operation Impact.
- .2 In the event of an unintended impact to Facility Operation caused directly or indirectly by the Contractor, or the Contractor's Work:
 - .1 Immediately notify the City's designated personnel and the Contract Administrator.
 - .2 Assist with the restoration of the Facility Operation.
- .3 Except as explicitly directed by the City, under no circumstances, shall the Contractor start or restart equipment.
- .4 The City and/or the Contract Administrator may perform a review of the incident to determine the cause and determine appropriate procedures to avoid recurrence of the event. The Contractor will:
 - .1 Provide information in a transparent manner regarding events leading up to, during, and after the incident.
 - .2 Attend meetings as requested.
 - .3 Comply with any procedures that are developed to minimize the risk of future events.
- .5 The City and the Contract Administrator retain the right to stop the Contractor's Work during the review and until appropriate procedures to prevent recurrence are in place. No Contractor claim for extension may be made by the Contractor if the stop work order is placed as a result of an unintended operation impact caused directly or indirectly by the Contractor, or the Contractor's Work.
- .6 No modification to the Contract scheduled dates and costs will apply as a result of additional meetings, review and reasonable requirements that are a result of an operational impact, whether intended or not.
- .7 Nothing in the Section precludes or restricts the City's ability to make a claim for losses incurred as a result of a Facility Operation impact caused by the Contractor.

1.11 REVIEW MEETINGS

- .1 As requested by the Contractor or the Contract Administrator, attend review and coordination meetings to plan the activity with potential Facility Operation impacts.

Part 2 **Products**

2.1 **NOT USED**

.1 Not Used.

Part 3 **Execution**

3.1 **NOT USED**

.1 Not Used.

		FACILITY OPERATION IMPACT REQUEST		Page	1 of 1
				Request Num:	
Facility:		Project Name:			
Area :		Tender No.:			

Proposed Work	
Proposed date	
Description of Work	
Impact to Facility Operation	
Contractor procedures to minimize impact	
Proposed City procedures and requirements	
Risk to Facility Operation and planned mitigation	
Other comments and details	
Submitted By	
Submitted Date	

Review	
Comments	
Required amendments	
Required conditions to be met	
Review Status	<input checked="" type="checkbox"/> Reviewed and accepted as proposed.
	<input type="checkbox"/> Reviewed and accepted with the comments and required amendments.
	<input type="checkbox"/> Reviewed and not accepted. Revise and resubmit.
	<input type="checkbox"/> Rejected.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN-ULC-S115-2018, Fire Tests of Firestop Systems.

1.2 REQUIREMENT

- .1 In the event that any busduct or cable connections are disrupted at the UV Building wall, seal and firestop the penetration(s).

1.3 PERFORMANCE REQUIREMENT

- .1 Provide firestop systems with materials and installation that achieve a fire rating of not less than the surrounding assembly, the Manitoba Building Code, or as required by the drawings or specification, whichever is greater.
- .2 Provide fire stopping systems to provide closures to fire and smoke at openings around all openings and penetrations, including joints, within fire separations and assemblies having a fire-resistance rating.

1.4 QUALITY ASSURANCE

- .1 Utilize installers experienced and specialized in the installation of fire stopping systems.
- .2 Utilize a quality control program for all fire stopping installation.

1.5 SUBMITTALS

- .1 Provide product data in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit WHMIS MSDS - Material Safety Data Sheets.
- .3 Test reports:
 - .1 Submit test reports in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
- .4 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

Part 2 Products

2.1 MATERIALS

- .1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.
 - .1 Asbestos-free materials and systems
- .2 Fire-resistance rating of installed fire stopping assembly to meet the requirements of the Manitoba Building Code, match existing wall or floor rating, or as required in the drawings or specification, whichever is greater.
- .3 Utilize fire stopping materials around cables to allow for re-entry and future modifications.
- .4 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

Part 3 Execution

3.1 GENERAL

- .1 Follow manufacturer's instructions and specifications.

3.2 INSTALLATION

- .1 Provide a smooth, neat and clean finish to all fire stopping installations.
- .2 Remove excess compound promptly as work progresses and upon completion.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CSA C22.1-2018, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
- .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
 - .1 IEEE 100-2013, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.2 DEFINITIONS

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE 100.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Certificates:
 - .1 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to the Contract Administrator and include in the O&M Manuals.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

1.6 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 These Specifications and the Drawings and Specifications of all other divisions 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.

1.7 FIELD QUALITY CONTROL

- .1 The electrical contractor shall:
 - .1 Hold an A Licence in accordance with the Winnipeg Electrical Bylaw.
- .2 The electrical work shall be supervised by an electrician with a current Master Electrician's Licence issued by the Province of Manitoba.
- .3 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.
 - .1 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.

1.8 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 the 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.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Language operating requirements: provide identification nameplates for control items in English.

2.2 MATERIALS AND EQUIPMENT

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Equipment and Material to be CSA certified. Where CSA certified equipment or material is not available, obtain and pay for special approval from the authority having jurisdiction and the Contract Administrator.

2.3 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of this Contract and the authority having jurisdiction.

2.4 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates as follows:
 - .1 Nameplates: lamacoid 3 mm thick plastic engraving sheet, matt white finish, white core, lettering accurately aligned and engraved into core.
 - .2 Nameplates to be mechanically attached with self-tapping screws, except where this would void or render ineffective the enclosure rating.
 - .3 Sizes as follows:

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

- .2 Wording on nameplates to be approved by the Contract Administrator prior to manufacture, except for those identified on a provided Lamacoid Schedule.
- .3 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .4 Terminal cabinets and pull boxes: indicate system and voltage.

2.5 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 coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for the construction of the Work.
 - .1 Inform the Contract Administrator of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied.

3.2 SAFETY

- .1 Protect those working on or in vicinity of exposed electrically energized equipment from physical danger.
- .2 Provide comprehensive safety and protect from harm any potential access from the public.

3.3 AS-BUILT DRAWINGS

- .1 Keep one (1) complete set of white prints at the Site during work, including all addenda, change orders, site instructions, clarifications, and revisions for the purpose of preparing As-Built Drawing markups . As the Work on-site proceeds, clearly record in red all as-built conditions, which deviate from the original Contract Documents.
 - .1 Alternately, a digital as-built markup system, continuously networked and backed-up to a centralized location is also acceptable, provided it will provide equivalent results and is acceptable to appropriate Contractor staff members who will be performing the work.
- .2 As-Built markups to include:
 - .1 Circuiting of all devices, conduit and feeder runs (complete with conductor size and number); and
 - .2 Dimensioned locations of all electrical equipment.
- .3 On completion of the Work, two (2) weeks prior to final inspection, submit As-Built Drawings to Contract Administrator for review.
 - .1 Certify, in writing, that the As-Built Drawings are complete and that they accurately indicate all electrical services, including exposed as well as concealed items.

3.4 ANCHORS

- .1 Exercise care where installing anchors into existing concrete elements so as not to damage existing reinforcing.
 - .1 Locate and mark the existing reinforcing prior to drilling.
 - .2 Utilize carbide tip drill bits for all anchor installation.
 - .3 In the event reinforcement is encountered while drilling, terminate the hole and reposition to clear the reinforcement.
 - .4 Do not use core bits that can easily intercept and damage/cut the reinforcing during drilling.

3.5 DRILLING, CUTTING AND PATCHING

- .1 When cutting or drilling holes in existing concrete elements, ensure that existing reinforcing is not cut or damaged:
 - .1 Locate existing reinforcing utilizing a reinforcing bar locator and mark out on the surface of the concrete.
 - .2 Firestop and seal all penetrations, regardless of whether the penetration requires a fire rating.
- .2 Return exposed surfaces to an as-found condition.

3.6 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.

3.7 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.

3.8 NAMEPLATES AND LABELS

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

3.9 MOUNTING HEIGHTS

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

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

3.10 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.11 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.12 WARNING SIGNS

- .1 As specified and to meet requirements of Electrical Inspection Department and the Contract Administrator.
- .2 Lamacoid 3 mm thick plastic engraving sheet, red face, white core, mechanically attached with self-tapping screws, 20mm text.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section includes requirements for selective demolition and removal of electrical components including removal of conduit, junction boxes, and panels to source (home run removal) and incidentals required to complete work described in this Section.

1.2 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .3 Remove and Salvage: Detach items from existing construction and deliver them to City ready for reuse. Dispose of items that the City decides not to take / reuse.
- .4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.
- .6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.3 DESIGN REQUIREMENTS

- .1 General
 - .1 Design equipment, anchorage, and support systems for vertical and lateral loading in accordance with Manitoba Building Code.
- .2 Design all transformer enclosure modifications. The designs shall be sealed by a professional engineer registered in the province of Manitoba.
- .3 Design all cable tray and busduct support structures. The designs shall be sealed by a professional engineer registered in the province of Manitoba.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.

Part 2 Products

2.1 GENERAL

- .1 Supply and install the necessary temporary bracing, supporting structures, guards, warning signs, etc. necessary to complete the project safely and in accordance with all regulations and/or codes.

2.2 REPAIR MATERIALS

- .1 Electrical Repair Materials: Use only new materials, CSA or ULC labelled as appropriate and matching components remaining after work associated with components identified for removal or demolition are completed.
- .2 Firestopping Repair Materials: Use firestopping materials compatible with existing firestopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

2.3 SALVAGE AND DEBRIS MATERIALS

- .1 Material Ownership: Demolished materials become Contractor's property and will be removed from Site; except for items indicated as being reused, salvaged, reinstalled, or otherwise indicated to remain the City's property.
- .2 Salvaged Materials: Carefully remove materials designated for salvage and store in a manner to prevent damage or devaluation of materials.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect work of this Section before tendering Bid; The City will not consider claims for extras for work or materials necessary for proper execution and completion of contract that could have been determined by a site visit.

3.2 COORDINATION

- .1 Coordinate work with the City and the Contract Administrator as required to ensure that operational impact is minimized.

3.3 PREPARATION

- .1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:
 - .1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.
 - .2 Notify the Contract Administrator and cease operations where safety of buildings being demolished, adjacent structures or services appears to be

endangered and await additional instructions before resuming demolition work specified in this Section.

- .3 Prevent debris from blocking drainage inlets.
- .4 Protect mechanical systems that will remain in operation.
- .2 Protection of Building Occupants: Sequence demolition work so that interference with use of the building by the City is minimized and as follows:
 - .1 Prevent debris from endangering safe access to and egress from occupied buildings.
 - .2 Notify the Contract Administrator and cease operations where safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

3.4 DEMOLITION

- .1 Disconnect electrical circuits and panel feeders; maintain electrical service and main distribution panel as is, ready for subsequent Work.
- .2 Perform demolition work in a neat and workmanlike manner:
 - .1 Remove tools or equipment after completion of work, and leave site clean and ready for subsequent renovation work.
 - .2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.
- .3 Remove existing conduits, boxes, cabling and wiring associated with removed luminaires, electrical devices, automation systems and equipment.

3.5 SALVAGE

- .1 Remove and handle salvageable items on site to minimize damage and to ensure that usability is maintained.
- .2 Clean all salvaged items.
- .3 Place materials on pallets or wrap in protective film to ensure that loose pieces and projections do not cause injury to personnel, and that salvaged items remain as complete units.

3.6 DISPOSAL

- .1 Take all reasonable steps to ensure that equipment removed from site is recycled.

3.7 CLOSEOUT ACTIVITIES

- .1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for re use or turn-over to the City.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group
 - .1 C22.2 No. 0.3, Test Methods for Electrical Wires and Cables.
 - .2 CSA-C22.2 No. 38, Thermoset-Insulated Wires and Cables.
 - .3 CSA-C22.2 No. 131, Type TECK 90 Cable.
 - .4 CSA-C22.2 No. 174, Cables and Cable Glands for Use in Hazardous Locations.
 - .5 CSA-C22.2 No. 239, Control and Instrumentation Cables.

1.2 PRODUCT DATA

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

1.3 QUALIFICATIONS

- .1 Utilize only personnel experienced in the installation, splicing, and terminations of medium-voltage voltage cable for all medium-voltage cable work.
- .2 Provide, upon request, the qualifications of the proposed personnel.

Part 2 Products

2.1 TECK 90 CABLE, MEDIUM-VOLTAGE, SPLICE KITS

- .1 Cable and connectors to:
 - .1 CSA 22.2 No. 131.
- .2 Voltage Rating: 8 kV or 15 kV
- .3 Suitable for use with a tape shield.
- .4 Approved manufacturers:
 - .1 Raychem;
 - .2 3M; or
 - .3 Approved equal in accordance with B7.

2.2 TECK 90 CABLE, MEDIUM-VOLTAGE, TERMINATIONS

- .1 Cable and connectors to:
 - .1 CSA 22.2 No. 131.
- .2 Voltage Rating: 8 kV or 15 kV
- .3 Suitable for use with a tape shield.
- .4 Heat shrink type.
- .5 Size appropriately sized for the conductor and insulation dimensions.

- .6 Approved manufacturers:
 - .1 Raychem HVT-Z;
 - .2 Approved equal in accordance with B7.

2.3 ARMoured CABLE TERMINATIONS

- .1 Approvals: CSA
- .2 Type: watertight, suitable for the application.
- .3 Accessories: locknut and grounding bushing
- .4 Sized: As required for the applicable cable.
- .5 Approved products:
 - .1 ABB (TnB) Star Tech series.
 - .2 Approved equal in accordance with B7.

Part 3 Execution

3.1 GENERAL CABLE INSTALLATION

- .1 Do not splice cables. A continuous length is required for all feeds.
- .2 Install in accordance with manufacturer's recommendations, observing requirements for minimum bending radius and pulling tensions.
- .3 Lay cable in cable trays in accordance with Section 26 05 36 - Cable Trays for Electrical Systems.
- .4 Maintain cable spacing a minimum of one cable diameter apart; unless otherwise indicated on the drawings or specifications.
- .5 Support cables utilizing appropriate metal clamps for the application.
- .6 Cable Colour Coding:
 - .1 To Section 26 05 00 - Common Work Results for Electrical.
- .7 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .8 Installations in Category 1 Locations
 - .1 Install the cable with a minimum of 12 mm space from the supporting surface.
 - .2 Install every joint and cable connectors to be water-tight.
 - .3 Install grounding and bonding conductors to be protected from corrosion.
- .9 Installations in Category 2 Wet Locations:
 - .1 Comply with all requirements of Category 1 locations.

3.2 CABLE RE INSTALLATION

- .1 Replace all cable glands / fittings on all re-installed cables.

3.3 INSTALLATION OF TECK90 CABLE (0 -1000 V)

- .1 Group cables wherever possible on channels and cable tray. Unless otherwise specified on the drawings, more than two conductors in parallel shall be installed in cable tray.
- .2 Install cable exposed, securely supported by straps, hangers, and cable tray.
- .3 Where surface mounted, provide clamps spaced a maximum of 1 m apart, unless otherwise indicated.

3.4 INDENTIFICATION

- .1 Install cable tags on all cables.
- .2 Install wire tags on all switched and control wiring, or on any wiring where the cable tag together with the wire phase color does not simply identify the wires.

3.5 TESTING

- .1 Test all existing power conductors prior to removal in accordance with 26 08 05 – Electrical Commissioning.
- .2 Test all conductors 10 AWG and larger, as well as all gas detection annunciation wiring (regardless of size), in accordance with 26 08 05 – Electrical Commissioning.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.
 - .2 CSA C22.2 No.41 (R2017), Grounding and Bonding Equipment (Tri-National Standard, with NMX-J-590ANCE and UL 467).
 - .3 CSA C22.2 No.65-18, Wire connectors (Tri-National Standard, with UL 486A-486B NMX-J-543-ANCE).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for connectors and terminations and include product characteristics, performance criteria, physical size, finish, and limitations.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for connectors and terminations for incorporation into manual.

Part 2 Products

2.1 CONNECTORS AND TERMINATIONS

- .1 Connectors and terminations to CSA C22.2 No. 65.
- .2 Configuration:
 - .1 Long-barrel.
 - .2 Compression type.
 - .3 2-hole lugs for 2/0 AWG and larger conductors. Smaller conductors may use 1-hole lugs.
- .3 Material: of same material as conductor metal. Copper connectors to be tin-plated.
- .4 Connectors suitable for 75°C termination.
- .5 Hardware for bolting shall be Grade 5, chrome-plated.
- .6 Contact aid for aluminum cables where applicable.

- .7 Acceptable manufacturers:
 - .1 Burndy;
 - .2 Thomas & Betts; or
 - .3 Approved equal in accordance with B7.

Part 3 Execution

3.1 INSTALLATION

- .1 Install connectors and terminations in accordance with manufacturer's instructions.
- .2 Bond and ground as required to CSA C22.2 No. 41.
- .3 Splices shall not be utilized, except where shown on the drawings or with the written permission of the Contract Administrator.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

Part 2 Products

2.1 EQUIPMENT

- .1 Bare grounding conductors: bare stranded copper, tinned, soft annealed, size as indicated.
- .2 Insulated grounding conductors: green, copper conductors, RW90, size as indicated .
- .3 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Bolted type conductor connectors.
 - .4 Thermit welded type conductor connectors.
 - .5 Bonding jumpers, straps.
 - .6 Pressure wire connectors.

Part 3 Execution

3.1 INSTALLATION GENERAL

- .1 Install connectors in accordance with manufacturer's instructions.
- .2 Protect exposed grounding conductors from mechanical injury.
- .3 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .4 Soldered joints not permitted.
- .5 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

3.2 EQUIPMENT GROUNDING

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems,

frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting, cable trays.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data for channels.
- .3 Submit shop drawings, sealed by a professional engineer, showing the complete cable tray and busduct support structure for the transformers.
 - .1 Provide appropriate plan and section drawings to allow for clarity in the Work.

1.2 DESIGN REQUIREMENTS

- .1 Provide a design in accordance with Manitoba Building Code requirements.
- .2 Provide a design that meets the existing and proposed new site loads.
 - .1 Including appropriate snow and wind loads.
- .3 Perform Site investigations as required to identify existing loads.

Part 2 Products

2.1 FRAMING AND SUPPORT CHANNELS

- .1 Configuration:
 - .1 U shape, sized as required for the application.
 - .2 Employ a complete system from a single manufacturer, complete with all connecting components.
- .2 Size:
 - .1 As per design by Contractor.
- .3 Materials:
 - .1 Channels & components: galvanized steel.
 - .2 Nuts, bolts, machine screws: stainless steel.
- .4 Manufacturer and Model
 - .1 Atkore Unistrut;
 - .2 ABB (Thomas and Betts); or
 - .3 Approved equal in accordance with B7.

2.2 CONCRETE AND MASONRY ANCHORS

- .1 Materials:
 - .1 Hardened steel inserts, zinc plated for corrosion resistance.
- .2 Components:

- .1 Non-drilling anchors for use in predrilled holes, sized to safely support the applied load with a minimum safety factor of four.
- .3 Manufacturers:
 - .1 Hilti (Canada) Limited; or
 - .2 Approved equal in accordance with B7.

Part 3 Execution

3.1 INSTALLATION

- .1 Secure equipment to solid masonry, tile and plaster surfaces with galvanized anchors.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .5 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole aluminum straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole aluminum straps for conduits and cables larger than 50 mm.
- .6 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm diameter stainless steel threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.
- .7 For surface mounting of two or more conduits or cables, use channels, spaced as required.
- .8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .10 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of the Contract Administrator.
- .12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.
- .13 Touch up abraded surfaces and cut ends of galvanized members with an approved galvanizing repair compound.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CAN/CSA C22.1 No.126-M91(R2002) , Cable Tray Systems.
- .2 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA VE 2, Cable Tray Installation Guidelines.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit manufacturer's product data sheets for cable tray indicating dimensions, materials, and finishes, including classifications and certifications.

1.3 DESIGN REQUIREMENTS

- .1 Design, supply and install cable tray as required for a complete installation.

Part 2 Products

2.1 CABLE TRAY

- .1 Provide cable tray to match existing for any modified or replaced components.
- .2 Ground cable trays with 2/0 AWG bare copper conductor attached to each tray section in accordance with CEC requirements.

2.2 SUPPORTS

- .1 Provide splices, supports for a continuously grounded system as required.

2.3 FIRESTOPPING

- .1 Provide ULC approved fire stop system at all wall and floor penetrations.
 - .1 Fire stop system to be one-hour fire rated, or to the required rating of the fire separation, whichever is greater.
- .2 Ensure provided system is configured to allow for re-entry as part of future work, without excessive work.

Part 3 Execution

3.1 INSTALLATION

- .1 Install complete cable tray system in accordance with NEMA VE 2.
- .2 Install cable tray in accordance with the manufacturer's recommendations.

- .3 Install cable tray parallel to structure walls, straight and plumb.
- .4 Support cable tray on both sides.
- .5 Size support system for the maximum allowable load, based upon the CSA Class of the cable tray.
- .6 The drawings may not show all details required for mounting or installation. Supply and install any additional items required to complete the installation.
- .7 Minimum cable and channel tray fitting radius shall meet or exceed the minimum bending radius of the cables installed.
- .8 Install cable tray supports at regular intervals as required, exceeding minimum support requirements.
- .9 Support cable tray fittings, including expansion joints, within 600mm of both sides of the connection.
- .10 Locate splice plates within 600mm of a support.
- .11 Expansion joints:
 - .1 Install expansion joints complete with ground bond as indicated on the drawings.
 - .2 Install expansion joints at intervals not exceeding 30 m.
- .12 Remove sharp burrs or projections to prevent damage to cables or injury to personnel.
- .13 Install a barrier between 600V power cables and lower voltage instrumentation cables.
- .14 Provide a cover for vertical cable trays that are accessible to personnel.

3.2 BONDING

- .1 Bond all cable trays in accordance with Canadian Electrical Code requirements.
- .2 Install a copper grounding conductor in each cable tray.
- .3 Bond the conductor to the cable tray at intervals not exceeding 6000 mm and at all separate joints, fittings, tray sections.
- .4 Utilize 2/0 AWG copper bonding conductors, unless otherwise indicated on the drawings.
- .5 Conductor type:
 - .1 Bare in general locations; and
 - .2 Insulated RW90 in corrosive locations.

3.3 CABLES IN CABLE TRAY

- .1 Install cables individually.
- .2 Lay cables into cable tray. Use rollers when necessary to pull cables.
- .3 Secure cables in horizontal cable tray at 4.5 m centres, with nylon ties, or as shown on the drawings.

- .4 Secure cables in vertical cable tray at intervals not exceeding 1.2 m using approved cable clamps.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ANSI/NETA
 - .1 ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems - 2017 Edition
 - .2 MTS - Standard for Maintenance Testing Specifications for Electrical Power Equipment and Systems - 2019 Edition

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Qualifications
 - .1 Submit qualifications of technicians performing testing and commissioning.
- .3 Testing Report
 - .1 Provide a draft report a minimum of two weeks after the completion of the associated testing.
 - .2 Provide the following in accordance with 01 78 00 - Closeout Submittals:
 - .1 Five (5) paper copies;
 - .2 Digital PDF of the report.
 - .1 Summary PDF of the entire report and all tests; and
 - .2 A separate PDF for each equipment tested.
 - .3 Microsoft Word version of all completed test forms.

1.3 CLOSEOUT SUBMITTALS

- .1 Final Report:
 - .1 Include measurements, final settings, and certified test results.
 - .2 Include completed commissioning forms.
 - .3 Bear signature of commissioning technician and independent supervisor / technician responsible for checking the work.
 - .4 Revise "as-built" documentation, commissioning reports to reflect changes, adjustments and modifications as set during commissioning and submit to the Contract Administrator in accordance with Section 01 78 00 - Closeout Submittals.

1.4 INSPECTION AND COMMISSIONING FORMS

- .1 The Contract Administrator will provide a base set of standard inspection and commissioning forms. They may be included in the tender package in PDF format.

- .2 Supplement the provided forms as required to make a complete commissioning report package. Utilize all Contract Documents together with all submittals, shop drawings and manufacturer's data as the basis for preparation of the additional commissioning forms.
- .3 Microsoft Word form templates will be provided prior to the work being initiated.
 - .1 Make appropriate print-outs of the inspection forms and utilize for entry of data and test results on site.
 - .2 Utilizing the Microsoft Word form templates, enter the data recorded manually into the forms electronically.
 - .3 Complete the inspection forms in the entirety and include them in the report.
- .4 Submit electronic PDF copies of the inspection forms.
- .5 The scope of work required in the specifications is in no way limited by the inspection forms, or spaces provided. Provide additional pages, documents, and forms as required to provide a complete report.

Part 2 Products

2.1 Not Used

- .1 Not Used

Part 3 Execution

3.1 GENERAL

- .1 Perform all testing in accordance with manufacturer's recommendations, which shall supersede the requirements of this specification. If manufacturer's recommendations contradict or limit the application of the specified tests, notify the Contract Administrator and include any modified tests in the report.

3.2 TESTING EQUIPMENT

- .1 Equipment function:
 - .1 Utilize test equipment appropriate for the test being performed.
- .2 Equipment condition and calibration:
 - .1 Ensure all test equipment is in good mechanical and electrical condition.
 - .2 Utilize a testing organization with a calibration program which assures that all applicable test instruments are maintained within rated accuracy for each test instrument calibrated. The calibration program will include the following:
 - .1 Maintain up-to-date instrument calibration instructions and procedures for each test instrument calibrated.
 - .2 Calibrated in within the prior 12 months.
 - .3 Ensure calibration labels are visible on all test equipment.
 - .4 Keep and provide access to records showing the date and results of instruments calibrated or tested.

- .3 Insulation resistance meters.
 - .1 Utilize specialized digital units, designed for the intended purpose.
- .4 Low-resistance meters:
 - .1 Utilize specialized digital units, designed for the intended purpose
 - .2 Resistance range from 1 $\mu\Omega$ to 1000 Ω minimum.
 - .3 Standard electrician multimeters will not be accepted.

3.3 TESTING REPORT

- .1 Provide an overall inspection and test report that details all investigations and tests.
- .2 Include the following:
 - .1 Summary of project.
 - .2 Testing equipment utilized
 - .1 Detail the type, manufacturer, model, and last calibration date of all testing equipment.
 - .3 List of equipment tested.
 - .4 Typed inspection forms including:
 - .1 Identification of the testing organization.
 - .2 Equipment identification.
 - .3 Humidity, temperature, and other conditions that may affect the results of the tests/calibrations.
 - .4 Date of inspections, tests, maintenance, and/or calibrations.
 - .5 Identification of the testing technician.
 - .6 Indication of inspections, tests, maintenance, and/or calibrations performed and recorded, along with charts, and graphs as applicable. Include all measurements and readings taken Where repairs are made, include measurements and readings before and after the repair.
 - .7 Indication of expected results, when calibrations are to be performed.
 - .8 Indication of "as-found" and "as-left" results, as applicable.
 - .5 Deficiency list:
 - .1 Itemized list of all repaired deficiencies.
 - .2 Itemized list of all unrepaired deficiencies, including a detailed description of the deficiency.

3.4 SCOPE OF TESTING

- .1 The scope of testing is to include, but not be limited to:
 - .1 Transformers:
 - .1 UVT-2
 - .2 UVT-3
 - .3 LST-4
 - .4 LST-5

- .2 Primary cables feeding the transformers
- .3 Secondary busduct feeding power from the transformers to the switchgear.
- .4 Instrumentation cables

3.5 TESTING IN HAZARDOUS LOCATIONS

- .1 Perform all tests in accordance with the applicable hazardous location requirements. Refer to E12.

3.6 INSPECTION, TESTING AND MAINTENANCE PROCEDURES

- .1 General
 - .1 All tests are based on NETA (InterNational Electrical Testing Association) standard ATS-2017. Where manufacturer's specifications, tolerances, and/or published data are not available, refer to the appropriate tables in ATS-2017.
 - .2 Torque all accessible bolted electrical connections. Additional requirements apply as specified.
 - .3 Utilize the existing drawings for reference while performing the specified electrical inspection work. Where the existing installation deviates from that shown on the drawings, mark-up the drawings with red pen as required to reflect the installation. Include the marked-up drawings in the report.
 - .4 The scope of required drawing checks is limited to the equipment and components that are part of the electrical inspection work.
 - .5 Any repairs made that affect the accuracy of the drawings shall be marked up on the drawings.
 - .6 Drafting of drawings is not required.
 - .7 All inspection values, readings, corrections, and assessments shall be clearly recorded for inclusion within the report.
 - .8 Where corrections or repairs are made, record both as found/as left test readings on the inspection sheet. If space is not provided on the inspection form, record the readings in the Note fields or on a separate sheet.
- .2 Specific Requirements:
 - .1 Perform insulation resistance temperature correction calculations utilizing the correction tables in ATS-2017.
 - .2 Perform winding resistance temperature correction calculations in accordance with ATS-2017.

3.7 BUSDUCT, < 1000 V

- .1 Visual Inspection
 - .1 Inspect end sections of busway and bends for any physical damage and evidence of overheating. Inspect bends for any thermo mechanical stresses and insulator stressing.
 - .2 Inspect anchorage, alignment, and grounding.
 - .3 Inspect bonding.

- .4 Inspect busduct support.
- .5 Confirm physical orientation in accordance with manufacturer's labels to insure adequate cooling.
- .6 Examine outdoor busway for removal of "weep-hole" plugs, if applicable, and for the correct installation of joint shield.
- .7 Inspect and clean ventilating openings.
- .8 Verify operation of busway heaters (if present).
- .2 Testing shall include the following:
 - .1 Test bolted electrical connections using a low-resistance ohmmeter for:
 - .1 Compare bolted connection resistance values to values of similar connections.
 - .2 Investigate and correct values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 - .2 Measure the total resistance of the busway on each phase, and the total inductance of the bus on each phase.
 - .3 Perform an insulation-resistance test on each conductor.
 - .1 Disconnect conductors at both ends before carrying out any testing.
 - .2 Individually test each conductor with all other conductors and shields grounded.
 - .3 Test voltage:
 - .1 300 V rated busduct: 500 VDC; and
 - .2 600 V or 1000 V rated busduct. 1000 VDC.
 - .4 Test duration: one minute.
 - .5 Investigate resistances less than 1000 megaohms.
- .3 Other actions:
 - .1 Torque all accessible bolted electrical connections.
 - .2 Clean the area within the enclosures where the busduct is terminated.

3.8 CABLES, < 1000 V

- .1 Visual Inspection:
 - .1 Inspect compression applied connectors for correct cable match and indentation.
 - .2 Inspect bonding.
 - .3 Inspect cable/conduit support.
 - .4 Verify that visible cable bends meet or exceed the minimum allowable bending radius.
 - .5 Measure length of cable/conduit and record in meters.
- .2 Inspection and testing shall include the following:
 - .1 Test bolted electrical connections using a low-resistance ohmmeter for:
 - .1 Cables and wires 4/0 AWG or larger; or

- .2 Cables and wires 10 AWG or larger in a hazardous location
- .3 Compare bolted connection resistance values to values of similar connections.
- .4 Investigate and correct values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
- .2 Perform an insulation-resistance test on each conductor.
 - .1 Disconnect cables at both ends before carrying out any testing.
 - .2 Individually test each conductor with all other conductors and shields grounded.
 - .3 Test voltage:
 - .1 300 V rated cables: 500 VDC; and
 - .2 600 V or 1000 V rated cables. 1000 VDC.
 - .4 Test duration: one minute.
 - .5 Investigate resistances less than 1000 megaohms.
- .3 Other actions:
 - .1 Torque all accessible bolted electrical connections.
 - .2 Clean the area within the enclosures where the cables is terminated.

3.9 CABLES, MEDIUM VOLTAGE

- .1 Visual inspection
 - .1 Inspect exposed sections of cables for physical damage and evidence of overheating and corona.
 - .2 Proper connections in accordance with single-line diagram.
 - .3 Proper circuit and phase identification.
 - .4 Inspect terminations and splices for physical damage and evidence of overheating and corona.
 - .5 Check for proper lug installation.
 - .6 Inspect compression applied connectors for correct cable match and indentation.
 - .7 Inspect bonding.
 - .8 Inspect cable/conduit support.
 - .9 Verify that visible cable bends meet or exceed the minimum allowable bending radius.
- .2 Testing shall include the following:
 - .1 Test bolted electrical connections using a low-resistance ohmmeter for:
 - .1 Cables and wires 4/0 AWG or larger; or
 - .2 Cables and wires 10 AWG or larger in a hazardous location
 - .3 Compare bolted connection resistance values to values of similar connections.

- .4 Investigate and correct values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
- .2 Perform a shield-continuity test on each power cable by ohmmeter method. The shielding must exhibit continuity. Investigate resistance values in excess of 10 ohms per 1000 feet of cable.
- .3 Torque all accessible bolted electrical connections.
- .4 Perform an insulation-resistance test on each conductor.
 - .1 Disconnect cables at both ends before carrying any testing.
 - .2 Individually test each conductor with all other conductors and shields grounded.
 - .3 Test voltage:
 - .1 300 V rated cables: 500 VDC; and
 - .2 600 V or 1000 V rated cables. 1000 VDC.
 - .3 5000 V to 15,000 V rated cables. 2500 VDC.
 - .4 Test duration: one minute.
 - .5 Investigate resistances less than 5000 megaohms.
- .3 Other actions:
 - .1 Torque all accessible bolted electrical connections.
 - .2 Clean the area within the enclosures where the cables are terminated.

3.10 TRANSFORMER ENCLOSURE

- .1 Transformer Enclosure Integrity Test
 - .1 With the transformer de-energized, utilize a hose to continuously douse all areas of the transformer roof with water for 30 minutes. Inspect the transformer interior with care to identify any water ingress.
 - .1 Take comprehensive photos of the transformer interior after the test.

3.11 TRANSFORMERS, DRY-TYPE, MEDIUM VOLTAGE

- .1 Include the following:
 - .1 Record the nameplate data for inclusion in the report.
 - .2 Inspect physical and mechanical condition.
 - .3 Inspect anchorage and alignment.
 - .4 Inspect grounding.
 - .5 Record the tap setting.
 - .6 Perform insulation-resistance tests in accordance with NETA ATS.
 - .1 Test each winding-to-winding and winding-ground.
 - .2 Test 4160V windings at 2500 V DC.
 - .3 Test 600V windings at 1000 V DC.
 - .4 Test 480V windings at 500 V DC.
 - .5 Calculate polarization index.

- .7 Perform a turns-ratio tests at the designated tap position.
 - .1 Test results should not deviate more than one-half percent from either the adjacent coils or the calculated ratio.
 - .8 Measure the resistance of each winding.
 - .9 Measure core insulation resistance at 500 Vdc if the core is insulated and if the core ground strap is removable.
 - .10 Verify correct secondary voltages after energization and prior to loading.
 - .1 Ensure voltages are in accordance with nominal values. Coordinate with the Contract Administrator as required.
 - .11 Test the transformer temperature monitoring circuits and all other transformer monitoring circuits.
 - .12 Test the heater circuits. Validate operation and measure current flow per phase.
 - .13 Perform insulation power-factor or dissipation-factor tests on all windings. Maximum winding insulation power-factor / dissipation-factor values shall be in accordance with NETA published data. In the absence of NETA published data, identify and investigate values > 3%.
- .2 Clean the transformer.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CAN/CSA-C22.2 No.47, Air-Cooled Transformers (Dry Type).
 - .2 CSA C9, Dry-Type Transformers.
- .2 NEMA
 - .1 ST 20, Dry-Type Transformers for General Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings, sealed by a professional engineer, showing the complete design and required construction work for the transformer roof replacement.
 - .1 Provide appropriate plan and section drawings to allow for clarity in the Work.
 - .2 Submit product data for materials.

1.3 DESIGN REQUIREMENTS

- .1 Design, supply and install a new enclosure roof for the medium voltage transformers.
- .2 Each transformer enclosure roof will:
 - .1 Be designed to meet appropriate, current standards for transformer construction.
 - .2 Be designed to meet all Canadian Electrical Code requirements.
 - .3 Be constructed of stainless steel, grade 316 or better.
 - .4 Utilize appropriate bolting hardware grade and materials to avoid corrosion.
 - .5 Be sloped with a minimum slope of 1:50 on the two sections not containing busduct connections.
 - .6 Avoid water pooling on the transformer.
 - .7 Prevent water ingress into the transformer under all environmental conditions.
 - .1 Design appropriate gaskets and seals to prevent water ingress.
 - .8 Be designed to NEMA 3R standards or better.
 - .9 Be able to support the weight of workers (up to 136 kg) and local snow loads without deforming.
 - .10 Support the entry of:
 - .1 the primary cables,
 - .2 the secondary busduct, and
 - .3 the other auxiliary cables,without water ingress into the transformer.
 - .11 Avoid galvanic corrosion.

- .12 In no way impair or limit transformer operation of or degrade any features of the existing transformer.
- .13 Be insulated with a minimum of R-5 insulation, mechanically attached.
 - .1 Non-foil-based insulation is preferred but will be allowed with adequate protection to ensure foil facing cannot fall onto the transformer.
- .14 Have an insulating barrier, such as fibreboard to sandwich the insulation and prevent any insulation from falling onto the transformers.
- .3 The transformer roof design shall allow for continued operation to the specified requirements for a minimum of 40 years without significant maintenance.
- .4 Take responsibility for the design and construction of any related modifications required to the transformer or connections to accommodate the new roof.

1.4 PAINT REQUIREMENTS

- .1 Paint the transformers gray to be ANSI 61 gray.
- .2 Paint to be epoxy-based, compatible with the existing transformer finish.
- .3 Paint system utilized to have a minimum service life of ten years.

Part 2 Products

2.1 GENERAL

- .1 As required to meet the Specifications and Drawings.

Part 3 Execution

3.1 GENERAL

- .1 Coordinate Work to minimize the outage time of the transformer.
- .2 Only one transformer may be taken out of service at any one time.

3.2 REMOVAL OF EXISTING ROOF

- .1 Test installation in accordance with 26 08 05 – Electrical Commissioning, prior to Work on the transformer.
- .2 Take care during the removal to avoid damage to the existing transformer, cabling, or associated systems.
- .3 Carefully note and record all existing connections to allow for reconnection later.

3.3 INSTALLATION OF THE NEW ROOF

- .1 Install new roof to meet the specified design requirements.
- .2 Provide high-quality workmanship.
- .3 Minimize field welding, and if required, appropriately protect the transformers.

- .4 Ensure the new roof is rigid, tightly in place, and square with the transformer enclosure.
- .5 Replace existing cables and busduct, and support independently of the transformer.

3.4 RE-INSTALLATION OF CABLES

- .1 Re-install all primary cables and secondary busduct after installing the new roof with the associated structure to support the cables.
- .2 Re-install all auxiliary cables, currently entering the transformer via a roof entry, with the new entry location to be on the right-side of the transformer (between the transformer and the building).

3.5 BONDING

- .1 Bond the roof to the transformer ground. Grounding may be direct and/or indirect, as required by appropriate transformer manufacturing standards.

3.6 COMMISSIONING

- .1 Upon completion of the modifications, perform tests in accordance with Section 26 08 05 – Electrical Commissioning.

END OF SECTION