



Parks
Canada

Parcs
Canada

LAKE LOUISE CAMPGROUND TRAILER SIDE ELECTRICAL UPGRADES

Lake Louise, Alberta

Project No.: 113678159

Issued for Tender
August 2nd 2018

PROJECT MANUAL

Issued by



Stantec

Division 01 - General Requirements

01 11 00	Summary of Work
01 14 00	Work Restrictions
01 31 19	Project Meetings
01 32 16	Construction Schedule
01 33 00	Submittal Procedures
01 35 29	Health and Safety Requirements
01 35 43	Environmental Procedures
01 41 00	Regulatory Requirements
01 42 19	Reference Standards
01 45 00	Quality Control
01 51 00	Temporary Utilities
01 52 00	Construction Facilities
01 56 00	Temporary Barriers and
01 61 00	Enclosures Common Product
01 62 00	Requirements Product Options and
01 73 00	Substitutions Execution
01 77 00	Closeout Procedures
01 78 00	Closeout Submittals

Division 26 – Electrical

26 05 00	Common Work Results for Electrical
26 05 20	Wire and Box Connectors (0-1000 V)
26 05 21	Wires and Cables (0-1000 V)
26 05 22	Connectors and Terminations
26 05 28	Grounding – Secondary
26 05 29	Hangers and Supports for Electrical Systems
26 05 32	Outlet Boxes, Conduit Boxes, and Fittings
26 05 34	Conduits, Conduit Fastenings, and Conduit Fittings
26 05 43.01	Installation of Cables in Trenches and in Ducts
26 08 00.11	Testing, Adjusting, and Balancing of Electrical Equipment and Systems
26 12 17	Dry Type Transformers up to 600V Primary
26 24 02.10	Disconnect Switches Fused and Non-Fused up to 600V Primary
26 24 16.01	Panelboards
26 24 16.10	Moulded Case Circuit Breakers

Division 31 – Civil

31 23 33.01	Excavating, Trenching and Backfilling
-------------	---------------------------------------

END OF SECTION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Bid Package comprises renovations to Trailer Side Electrical facilities, located at Lake Louise Campground, Banff National Park, Alberta.
- .2 Work specified in Specifications is divided into Divisions and Sections for reference purposes only. Except as may be otherwise specified in Bid Document, division of work among Contractor, Subcontractors, Sub-subcontractors and suppliers is Bidders' responsibility
- .3 Preparation of an Environmental Protection Plan for the Work.
 - .1 An "Environmental Protection Plan" (EPP) is to be prepared and followed by the successful Contractor to meet the requirements of Section 01 35 43 – Environmental Procedures, to ensure that any adverse effects are minimal. The Contractor's EPP must be approved by the Departmental Representative on behalf of Parks Canada Agency (PCA) prior to the commencement of construction. The Departmental Representative and Parks Canada's Environmental Surveillance Officer (ESO) will refer to the approved EPP in determining compliance with the plan and contract specifications. The EPP will form part of this contract.

1.2 CONTRACT METHOD

- .1 Construct Work under single stipulated price contract.

1.3 WORK SCHEDULE

- .1 Complete work of this project by October 31, 2018
- .2 The Work shall be schedule into 2 Phases
 - .1 Phase 1 shall be sites 136-189
 - .2 Phase 2 shall be site 1-34 & 72-97
- .3 The Owner may allow a revision to this phasing depending on campground occupancy. Request to revise phasing shall be made by the Contractor and approved by the Owner.
- .4 During work in Phase 2, Contractor shall maintain access and temporary electricity to Washroom Building #2 at all times. See Section 01 51 00 – Temporary Utilities
- .5 Small sections of work shall be closed off to allow Fortis to carry out their work.

1.4 CONTRACTOR USE OF PREMISES

- .1 Limit use of premises for Work, for storage, and for access, to allow:
 - .1 Public usage. Portions of RV Campground, not included in this scope of work, will remain open. Fairview Road will remain open as an access to open trailer sites and other facilities.
- .2 Co-ordinate use of premises under direction of Departmental Representative.
- .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

- .4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .5 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.
- .6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.5 Traffic Management

- .1 The Contractor is required to prepare a Traffic Management Plan before mobilization to site.
- .2 Provide for pedestrian, bicycle, vehicular, and wildlife traffic through the work areas for the duration of the construction.
- .3 Provide alternative routes for personnel, pedestrian and vehicular traffic as required to complete the Work.
- .4 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.

1.6 CONTRACTOR ACCOMMODATIONS

- .1 Contractor is permitted to camp within Lake Louise Campground subject to availability.
- .2 Contractor is permitted to camp within closed off sites/area for construction to a maximum of 10 sites. When contractor is camping within closed off sites/area for construction, fees charged for electrical hook-ups will be deducted from the rate.
- .3 Regular fees will be charged for any camping as per regular rates for respective services provided. Information available online at <https://www.pc.gc.ca/en/pn-np/ab/banff/activ/camping/lltrailer>.
- .4 Contractors are subject to all regular camping restrictions found here: <https://www.pc.gc.ca/en/pn-np/ab/banff/activ/camping/rules-regles>

1.7 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy each document as follows:
 - .1 Environmental Protection Plan.
 - .2 Contract Drawings.
 - .3 Specifications.
 - .4 Addenda.
 - .5 Reviewed Shop Drawings.
 - .6 List of Outstanding Shop Drawings.
 - .7 Change Orders.
 - .8 Other Modifications to Contract.
 - .9 Field Test Reports.
 - .10 Permits
 - .11 Copy of Approved Work Schedule.
 - .12 Health and Safety Plan and Other Safety Related Documents.

.13 Other documents as specified.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 ACCESS AND EGRESS

- .1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.
- .2 Access to trailer side shower facilities is to be maintained throughout the entirety of the project. Contractor shall provide access 24/7 such as not to disrupt use. Access shall be maintained providing minimum 1.5m pathway of acceptable grade through to the facility for wheelchair access at all times.

1.2 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 Maintain existing services to site and provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Use of site sanitary facilities is permitted, however keep facilities clean. The contractor shall confirm which facilities can be utilized per each phase of the work with the owner.
- .5 Closures: protect work temporarily until permanent enclosures are completed.

1.3 WASTE DISPOSAL

- .1 All surplus, unsuitable waste materials shall be removed from the job site to sites outside Banff National Park, unless specified otherwise in other sections of these Specifications.
- .2 All surplus, clean excavated earth waste materials may be disposed of at Pit 69, located North of the Lake Louise Overflow Campground.
- .3 Deposits of any construction debris into any waterway are strictly forbidden unless specifically instructed to within the Contract Documents or by the Departmental Representative.
- .4 Cost for waste disposal described above shall be considered incidental to the Work and no additional payment will be made.

1.4 EXISTING SERVICES

- .1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian and vehicular traffic.
- .3 Provide alternative routes for pedestrian and vehicular traffic for all areas.

- .4 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .5 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
 - .1 The contractor shall not be permitted to sever the power to the existing trailer side shower facility for extended durations. Where required as a result of the work, provide temporary power by means of generator or alternate connection to utility at existing voltage and amperage. The contractor shall confirm the extents of the any outage with the owner in writing. Work shall not commence until approval is confirmed.
- .6 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .7 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .8 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .9 Record locations of maintained, re-routed and abandoned service lines.
- .10 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.5 SPECIAL REQUIREMENTS

- .1 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .2 Keep within limits of work and avenues of ingress and egress.

1.6 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions. Smoking areas, if permitted, shall be confirmed with the owner.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

- .1 The Departmental Representative will schedule and administer project meetings throughout the progress of the work.
- .2 The Departmental Representative will prepare agenda for meetings.
- .3 The Departmental Representative will distribute written notice of each meeting four days in advance of meeting date to Owner and Contractor.
- .4 The Contractor shall provide physical space and make arrangements for meetings.
- .5 The Departmental Representative will preside at meetings.
- .6 The Departmental Representative will record meeting minutes, including significant proceedings and decisions, and identify actions by parties.
- .7 The Departmental Representative will reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and affected parties not in attendance.
- .8 Representative of Contractor, subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

- .1 Within ten (10) days after award of Contract, the Departmental Representative will request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Representatives from Parks Canada Agency, Contractor, major Subcontractors and Departmental Representative will be in attendance.
- .3 The Departmental Representative will establish time and location of meeting and notify parties concerned minimum five (5) days before meeting.
- .4 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work in accordance with Division 01.
 - .3 Schedule of submission of Shop Drawings. Submit submittals in accordance with Division 01.
 - .4 Requirements for temporary facilities, offices, storage sheds, utilities, fences.
 - .5 Health and safety requirements.
 - .6 Traffic Accommodation Strategy.
 - .7 Environmental Protection Plan.
 - .8 Quality Management.
 - .9 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, administrative requirements.

1.3 PROGRESS MEETINGS

- .1 During course of Work progress meetings will be held every two weeks.

- .2 Contractor, major subcontractors involved in Work, Departmental Representative, and Owner are to be in attendance.
- .3 The Departmental Representative will notify parties minimum 5 days prior to meetings.
- .4 The Departmental Representative will record minutes of meetings and circulate to attending parties and affected parties not in attendance within 7 days after meeting.
- .5 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 affect on construction schedule and on completion date.
 - .12 Other business.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 DEFINITIONS

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.
- .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
- .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7 Milestone: significant event in project, usually completion of major deliverable.
- .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

1.2 REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.
- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.3 SUBMITTALS

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

- .2 Submit to Departmental Representative within 15 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

1.4 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Shop Drawings.
 - .3 Permits.
 - .4 Fortis Coordination
 - .5 Mobilization.
 - .6 Field Work

1.5 PROJECT SCHEDULE REPORTING

- .1 Update Project Schedule every two weeks reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.6 PROJECT MEETINGS

- .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings and product data, in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Province of Alberta, Canada as required.
- .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 Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 10 working days for Departmental Representative's review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 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.
- .8 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.
- .9 After Departmental Representative's review, distribute copies.
- .10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.

- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
- .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit electronic copies of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .16 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .17 Delete information not applicable to project.
- .18 Supplement standard information to provide details applicable to project.
- .19 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .20 The review of shop drawings by Parks Canada Agency (PCA) is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that PCA 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 generality of 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.

1.3 PHOTOGRAPHS: DIGITAL FORMAT

.1 Progress Photographs

- .1 Sizes: minimum 2 mega pixel image file size, jpeg image file.
- .2 Format: Flash Drive
- .3 Viewpoints: A minimum of four (4) photographs from three (3) different viewpoints will be required.
- .4 Number of photo sets: one (1) set per month.
- .5 Identification: referenced to photo file with name, location, purpose, and number of project and date of exposure.
- .6 Viewpoints: interior and exterior locations: viewpoints determined by Departmental Representative.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Province of Alberta
 - .1 Occupational Health and Safety Code 2009.

1.2 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative and authority having jurisdiction, weekly.
- .4 Submit copies of reports or directions issued by Federal and Provincial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets.
- .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 7 days after receipt of comments from Departmental Representative.
- .8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.3 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.

1.4 SAFETY REQUIREMENTS

- .1 Contractor shall verify that emergency procedures including appropriate First Aid facilities and First Aid personnel are in place at the Work Site.
- .2 Contractor shall also have access to the Owner's First Aid Facilities. Conditions for use will be reviewed at the Project Start-up Meeting.
- .3 Contractor shall employ a full time, on-site Construction Safety Officer (CSO) who is responsible for the following:
 - .1 Providing new employee orientation
 - .2 Overseeing site activities
 - .3 Providing appropriate training on personal protective equipment and Workplace Hazardous Materials Information System (WHMIS)
 - .4 Conducting and documenting accident investigations as required
 - .5 Conducting daily work site inspections
 - .6 Conducting weekly site safety meetings, train new employees and verifying that [Subcontractors] [Trade Contractors], sub-subcontractors, suppliers and others working on the site are aware of safety requirements
 - .7 Requirement for a full time, on-site CSO may be waived where it can be shown that the site superintendent is certified and trained to act as the Safety Officer.
 - .8 CSO shall be certified by a training program recognized by the Alberta Construction Safety Association.
- .4 Maintain on site sufficient quantities of PPE, including but not limited to: hard hats, safety glasses, hearing protection and other items of clothing or special equipment as necessary to verify that visitors to the site, the Departmental Representative and the Owner's representative are adequately protected.
- .5 Provide training and instruction to occupants of adjacent buildings being added to or renovated, and forming a part of the work of this Contract, about the dangers involved with entering the work site prior to working on site:
 - .1 Provide educational materials, brochures or pamphlets as a part of the training session.
 - .2 Provide training sessions prior to the start of work, to verify that knowledge of construction site hazards is reinforced and maintained.
- .6 Verify that all Contractor's employees, Subcontractors, sub-subcontractors, suppliers and others working on the site, meet clothing requirements of shirts with sleeves no shorter than midway between shoulder and elbow and full length pants; muscle shirts or sleeveless shirts, cut-offs or shorts will not be allowed on the work site.

1.5 MEETINGS

- .1 Schedule and administer Health and Safety meeting with Departmental Representative and Owner prior to commencement of Work.

1.6 REGULATORY REQUIREMENTS

- .1 Do Work in accordance with Section 01 41 00 - Regulatory Requirements.

1.7 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.8 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.9 COMPLIANCE REQUIREMENTS

- .1 Comply with Occupational Health and Safety Act of Alberta.

1.10 UNFORSEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

1.11 PRIME CONTRACTOR

- .1 Responsibility for Work Site Safety - This Contractor Is "Prime Contractor":
 - .1 The Contractor shall, for the purposes of the Occupational Health and Safety Act (Alberta), and for the duration of the Work of this Contract:
 - .1 Be the "Prime Contractor" for the "Work Site", and
 - .2 Meet all requirements of the Occupational Health and Safety Act and Regulations, Workers Compensation Board legislation, the Fire Code legislation and all other applicable laws that govern work place safety.
 - .2 The Contractor shall direct all Subcontractors, sub-subcontractors, Other Contractors, employees, suppliers, workers and any other persons at the "Work Site" on safety related matters, to the extent required to fulfill its "Prime Contractor" responsibilities pursuant to the Act, regardless of:
 - .1 Whether or not any contractual relationship exists between the Contractor and any of these entities, and
 - .2 Whether or not such entities have been specifically identified in this Contract.
 - .3 Safety Certification: Safety certification is a condition of contract award; Contractor is required to maintain a valid Certificate of Recognition (COR) for the duration of the Work of this Contract.

1.12 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

1.13 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.14 BLASTING

- .1 Blasting or other use of explosives is not permitted without prior receipt of written instruction by Departmental Representative.

1.15 POWDER ACTUATED DEVICES

- .1 Use powder actuated devices only after receipt of written permission from Departmental Representative.

1.16 WORK STOPPAGE

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 DEFINITIONS

- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
- .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2 CANADIAN ENVIRONMENTAL ASSESSMENT ACT (CEAA)

- .1 Execution of the work is subject to the provisions within the Canadian Environmental Assessment Act (CEAA) 2003 and subsequent amendments.
- .2 The Contractor is required to prepare an Environmental Protection Plan (EPP) before commencing construction activities or delivery of materials to site, which will include topics in the following sub sections.
- .3 Failure to comply with or observe environmental protection measures as identified in these specifications may result in the Work being suspended pending rectification of the problems.
- .4 The Contractor shall notify the ESO (Environmental Surveillance Officer) and the Departmental Representative in a reasonable timely manner of any actual or potential environmental incidents or failure of protection measures, and immediately of any violations of environmental approvals, permits, authorizations, or EPP measures

1.3 REFERENCE MATERIAL

- .1 Parks Canada has provided the following reference documentation to be reviewed and followed in preparation of an EPP:
 - .1 PCA National Best Management Practices for Roadway, Highway, Parkway and Related infrastructure 2015
 - .2 PCA National Best Management Practices for Campground and Day Use Area Maintenance and Modification 2016

1.4 FIRES

- .1 Fires and burning of rubbish on site not permitted.
- .2 A fire extinguisher will be carried and available for use on each machine in the event of fire (e.g. ignited by a spark) to prevent the fire from burning the unit or spreading to other fuels in the work area. Basic fire fighting equipment – e.g. three shovels, two pulaskis, and two 20 litre backpack pumps shall be maintained at the construction site at a location known and easily accessible to all the Contractor's staff. Contractor's staff shall receive basic training in early response to wildlife events during the "environmental briefing".

- .3 Machinery and equipment shall be operated in a manner and with all original manufacturer's safety devices to prevent ignition of flammable materials in the area.
- .4 Care shall be taken while smoking on the construction site to ensure that accidental ignition of any flammable material is prevented.
- .5 The Contractor shall maintain an awareness of the fire danger rating (Index) in the work area by contracting the Fire Duty Officer. Fire prevention care is to be commensurate with the fire Index.
- .6 In case of fire, the Contractor or worker shall take immediate action to extinguish the fire provided it is safe to do so. The ESO and the Departmental Representative shall be notified of any fire immediately.

1.5 DISPOSAL OF WASTES

- .1 Do not bury rubbish and waste materials on site unless approved by Departmental Representative.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

1.6 DRAINAGE

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2 Do not pump water containing suspended materials into waterways or drainage systems. Migration to water retention pond is allowed.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.7 SITE CLEARING AND PLANT PROTECTION

- .1 Protect trees and plants on site and adjacent properties where indicated on Drawings and in Specifications.
- .2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m.
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.
- .5 Restrict tree removal to areas indicated or designated by Departmental Representative.

1.8 WORK ADJACENT TO WATERWAYS

- .1 Do not operate construction equipment in waterways.
- .2 Do not use waterway beds for borrow material.
- .3 Do not dump excavated fill, waste material or debris in waterways.
- .4 Design and construct temporary crossings to minimize erosion to waterways.
- .5 Do not skid logs or construction materials across waterways.

- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.
- .7 Do not blast under water or within 100 m of indicated spawning beds.

1.9 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this contract.
- .2 Control emissions from equipment and plant to local authorities' emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area, by providing temporary enclosures.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.10 NOTIFICATION

- .1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions will be granted or equitable adjustments allowed to Contractor for such suspensions.
- .5 Wildlife encounters and observations of carnivores shall be reported to Banff Dispatch Immediately at (403) 762-1473. A written record of the wildlife sighting must be submitted to the Parks Canada ESO within 24 hours of the sighting.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES AND CODES

- .1 Perform Work in accordance with National Building Code 2015 and the Canadian Electrical Code 2015 including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.2 NATIONAL PARK REGULATIONS

- .1 The Contractor and any sub-Contractors shall obtain a business license from Parks Canada Agency prior to commencement of the contract.
- .2 All Contractor's business and private vehicles are required to obtain a vehicle work pass from Parks Canada Agency. These permits may be obtained free of charge from the Departmental Representative.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SUMMARY

- A. All references to codes, standards and standard specifications referred to in these Specifications or used on drawings shall mean and intend to be the currently adopted edition, amendment and revision of such reference standards in effect at the time of Bid closing.
- B. In the event that the most current version of a code, standard or standard specification differs from the version indicated in these Specifications:
 - 1. Report the discrepancy to the Departmental Representative immediately.
 - 2. The most current standard at time of Tender will be used to establish the quality of the work or material being referenced.
- C. Referenced standards and code requirements shall be considered minimum requirements only. The Specifications may indicate additional requirements in excess of those established by referenced codes and standards.
- D. Applicable portions of Standards used that are not in conflict with the Contract Documents are hereby made a part of the Specifications.
- E. Modifications or exceptions to Standards shall be considered as amendments, and unmodified portions shall remain in full effect.
- F. In cases of discrepancies between the Specifications and Standards, the requirements of the Specification shall govern.
- G. In cases of discrepancies between Codes and the Specifications, the Code requirements shall govern.
- H. Where references to Codes or Standards are used in these Specifications, the Subcontractors must familiarize themselves with the applicable portions and shall be governed by the requirements affecting the Project.
- I. The Subcontractor shall provide an affidavit, when requested by the Construction Manager and/or the Departmental Representative, from manufacturers certifying that materials or products delivered to the project meet the requirements specified. Such certifications, however, shall not relieve the Subcontractors from the responsibility of complying with any added requirements specified in the Contract Documents.

1.2 STANDARDS EQUIVALENCY

- A. Documents were prepared in the United States of America and in Canada. Reference standards used to establish performance requirements listed in the technical specifications for Work of the Project were prepared using mixed reference standards from the United States of America and Canada, whereby the Canadian standard will take precedence.
 - 1. National Standards of Canada: Standards Referenced within the Alberta Building Code are National Standards of Canada as accepted by the Standards Council of Canada and enforced by the Authority Having Jurisdiction.

2. Technical Specification Content: The Departmental Representative has modified and referenced the correct listings of Referenced Standards within the technical specifications where they reference National Standards of Canada applicable to work governed by the Alberta Building Code.
3. Names of Standards Organizations: Bilateral standards published in the United States of America and containing the word "American" when referenced as National Standards of Canada have the same weight as a standard containing the word "Canadian":
 - a. Country of testing origin does not prejudice the acceptability of the listed standards.
 - b. All standards listed in the technical specifications are listed alphabetically, with no preference for country of origin.
- B. Materials, assemblies or systems that are tested in the United States of America using reference standards acceptable to Standards Council of Canada, with no equivalent Canadian reference standards are acceptable for use in Work of the Project using manufacturers' standard product data and testing meeting the listed reference standards.
- C. Provide materials, assemblies or systems meeting Canadian reference standards acceptable to Standards Council of Canada where manufacturers conduct testing concurrently with reference standards published in the United States of America; and that are different than Canadian reference standards.
- D. Submit product data indicating Canadian equivalent performance to specified United States reference standards as follows:
 1. Submit product data listing CSA, CGSB, ULC or similar reference standard indicating testing acceptable to the Authority Having Jurisdiction.
 2. Use same material, assembly or system as would be required for a tested material, assembly or system specified for the project; substitutions will not be permitted unless evidence of equivalency is confirmed.
 3. Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site; include manufacturer's printed instructions for installation.

1.3 STANDARDS ORGANIZATIONS

- A. The following list of standards organizations indicate the most common standards that may be referenced within the technical specifications:
 1. ANSI - American National Standards Institute
 2. ASTM - American Society for Testing and Materials
 3. CGA - Canadian Gas Association
 4. CGSB - Canadian General Standards Board
 5. CSA - Canadian Standards Association
 6. CAN1 - National Standard of Canada (published by CGA)
 7. CAN2 - National Standard of Canada (published by CGSB)
 8. CAN3 - National Standard of Canada (published by CSA)
 9. CAN4 - National Standard of Canada (published by ULC)
 10. ULC - Underwriters Laboratories of Canada
 11. UL or ULI - Underwriters Laboratories Inc.
 12. NFPA - National Fire Protection Agency

13. WHI - Warnock Hersey | Intertek Testing Services

- B. The following limitations on marks issued by standards organizations will apply to the standards issued by the organizations listed in above:
1. Underwriters Laboratories Inc.: Only systems designated by “cUL” or “cUL_{US}” will be acceptable for use on this project. Systems indicating “UL” or “UL_{US}” will only be considered where local authorities having jurisdiction have reviewed and accepted the systems in writing.
 2. Warnock Hersey Intertek: Only materials designated by “cWHI” or “cWHI_{US}” will be acceptable for use on this project. Materials bearing a “WH”, “WHI” or “WHI_{US}” mark will only be considered where local authorities having jurisdiction have reviewed and accepted the materials in writing.
 3. Subcontractor will be responsible for obtaining written acceptance of materials and submitting them to the Departmental Representative prior to installation.

1.4 ABBREVIATIONS

- A. Additional Technical Societies, Associations, or Standards may be referenced in these Specifications in addition to the following abbreviations:

Name of Association	Abbreviation
Acoustical Materials Association	AMA
Air Movement & Control Association	AMCA
Alberta Building Code	ABC
Alberta Floor Covering Association	AFCA
Alberta Roofing Contractors Association	ARCA
American Concrete Institute	ACI
American Iron & Steel Institute	AISI
American Society of Heating, Refrigerating and Airconditioning Engineers	ASHRAE
American Society of Mechanical Engineers	ASME
American Standards Association	ASA
American Wood Preservers' Association	AWPA
Architectural Woodwork Manufacturers Association of Canada	AWMAC
Canadian Institute of Steel Construction	CISC
Ceilings and Interior Systems Construction Association	CISCA
Canadian Sheet Steel Building Institute	CSSBI
Canadian Welding Bureau	CWB
Construction Specifications Canada	CSC
Factory Mutual	FM
Heating, Refrigerating and Airconditioning Institute of Canada	HRAI
Hydronics Institute	HI
Industrial Fabric Association International	IFAI
Insulated Glass Manufacturers Association of Canada	IGMAC

Name of Association	Abbreviation
Master Painters Institute	MPI
National Association of Architectural Metal Manufacturers	NAAMM
National Building Code	NBC
National Lumber Grades Authority	NLGA
Northwest Wall and Ceiling Bureau	NWCB
Terrazzo, Tile & Marble Association of Canada	TTMAC
The Society for Protective Coatings	SSPC

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 INSPECTION/FIELD REVIEW

- .1 Allow Departmental Representative 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 Departmental Representative 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 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Owner shall pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Owner.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection or testing, appointed agency will request additional inspection or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Owner. Pay costs for retesting and reinspection.

1.3 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

- .1 Notify appropriate agency in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

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 Departmental Representative 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 Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner 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 Departmental Representative.

1.6 REPORTS

- .1 Submit electronic copies of inspection and test reports to Departmental Representative.
- .2 Provide copies to subcontractor of work being inspected or tested and manufacturer or fabricator of material being inspected or tested.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

1.2 INSTALLATION AND REMOVAL

- .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Provide temporary utilities controls in order to provide continuous operation of the trailer side Washroom Building #2.
- .3 Remove from site all such work after use.

1.3 TEMPORARY POWER AND LIGHT

- .1 Provide and maintain temporary power and lighting as required throughout project.
- .2 Electrical power installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.

1.4 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
 - .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete, Includes Updates through No. 3 August 2006.
 - .2 CSA-0121-08 (R2013), Douglas Fir Plywood.
 - .3 CAN/CSA-S269.2-M87(R2003), Access Scaffolding for Construction Purposes.
- .3 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 2003 U.S. EPA Construction General Permit.

1.2 SUBMITTALS

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

1.3 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 Identify areas which have to be gravelled to prevent tracking of mud.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities in order to execute work expeditiously.
- .5 Remove from site all such work after use.

1.4 SCAFFOLDING

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

1.5 HOISTING

- .1 Provide, operate and maintain hoists cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
- .2 Hoists cranes to be operated by qualified operator.

1.6 SITE STORAGE/LOADING

- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.

- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.7 CONSTRUCTION PARKING

- .1 Parking will be permitted on site provided it does not disrupt performance of Work.
- .2 Provide and maintain adequate access to project site.
- .3 Clean runways and taxi areas where used by Contractor's equipment.

1.8 OFFICES

- .1 Provide marked and fully stocked first-aid case in a readily available location.

1.9 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 site in manner to cause least interference with work activities.

1.10 SANITARY FACILITIES

- .1 Use RV side washrooms during construction, keep clean.

1.11 CONSTRUCTION SIGNAGE

- .1 Provide and erect project sign, within three weeks of signing Contract, in a location designated by Departmental Representative.
- .2 Indicate on sign, name of Owner, Departmental Representative and Contractor.
- .3 No other signs or advertisements, other than warning signs, are permitted on site.
- .4 Locate project identification sign where indicated and construct as follows:
 - .1 Paint surfaces of signboard and framing with one coat primer and two coats enamel. Colour white on signboard face, black on other surfaces.
 - .2 Apply vinyl sign face overlay to painted signboard face in accordance with installation instruction supplied.
- .5 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

1.12 PROTECTION AND MAINTENANCE OF TRAFFIC

- .1 Provide access and temporary relocated roads as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .3 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

- .4 Protect travelling public from damage to person and property.
- .5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .7 Access and haul roads shall use existing roads.
- .8 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .9 Dust control: adequate to ensure safe operation at all times.
- .10 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.
- .11 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .12 Provide snow removal during period of Work.
- .13 Remove, upon completion of work, haul roads designated by Departmental Representative.

1.13 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.
- .4 Stack stored new or salvaged material not in construction facilities.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
 - .2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-O121-08 (R2013), Douglas Fir Plywood.

1.2 INSTALLATION AND REMOVAL

- .1 Provide temporary controls in order to execute Work expeditiously.
- .2 Remove from site all such work after use.

1.3 HOARDING

- .1 Erect temporary site enclosure using purpose made, prefabricated interlocking metal fence panels 2.1 m high.
- .2 Provide one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys.
- .3 Erect and maintain pedestrian walkways including roof and side covers, complete with signs and electrical lighting as required by law.
- .4 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.4 GUARD RAILS AND BARRICADES

- .1 Provide secure, rigid guard rails and barricades around deep excavations.
- .2 Provide as required by governing authorities.

1.5 ACCESS TO SITE

- .1 Parks Canada will provide and maintain access roads, and crossings as may be required for access to Work.

1.6 PUBLIC TRAFFIC FLOW

- .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

1.7 FIRE ROUTES

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.8 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

1.9 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Within text of each specifications section, reference may be made to reference standards.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be born by Owner 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 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .3 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.
- .4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

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 Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves 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 manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .5 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

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 Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative 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 Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative 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 Departmental Representative, whose decision is final.

1.8 CO-ORDINATION

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

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 EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 INTENT

- .1 This section indicates the criteria for use of optional products listed in the specification and provision for proposing changes to acceptable materials listed during the Bid Period and during the course of construction.

1.2 RELATED SECTIONS

- .1 Specification sections referencing this Section.

1.3 DEFINITIONS

- .1 Acceptable Materials: The term Acceptable Materials is used to specify products by trade name, manufacturer, catalogue number, model number, or similar reference, and is used within the Project Manual as follows:
 - .1 Acceptable Materials listings are based on Departmental Representative's determination that materials meet specified requirements and opinion of applicability to the project requirements.
 - .2 Acceptable Materials listings are deemed to establish the standard of acceptance that Departmental Representative will consider appropriate for the Work.
 - .3 Any product listed in the Acceptable Materials listing may be used to establish the Bid Price.
- .2 Basis-of-Design Materials: The term Basis-of-Design Materials is used to specify a specific material name, manufacturer, catalogue number, model number or similar reference and is used as follows:
 - .1 Basis-of-Design Materials are used to establish Departmental Representative's preference for a single source product listing based on performance, appearance or configuration.
 - .2 Use the Basis-of-Design Material to establish the Bid Price, unless an Addendum is issued adding additional Acceptable Materials.
 - .3 Basis-of-Design Materials designation does not limit the Contractor's ability to submit Proposed Substitutions in accordance with Substitutions requirements of this Section and specific performance requirements listed in Technical Specification Sections.
- .3 Non-proprietary specification means a specification which includes descriptive, reference standard or performance requirements, or any combination thereof, but does **not** include proprietary names of products or manufacturers.
- .4 Substitution means a proposal from a Contractor to provide a product, material, or item of equipment not specified in the Contract documents but functionally equivalent and readily exchangeable to a specified item; for consideration by Departmental Representative and Owner.

1.4 SUBMITTALS

- .1 When requested by Departmental Representative, submit complete data substantiating compliance of a product with requirements of Contract Documents. Include the following:
 - .1 Product identification, including manufacturer's name and address.

- .2 Written verification that the substitute products can be obtained, meet the performance required for the project, and meet requirements of the Building Code.
- .3 Manufacturer's literature providing product description, applicable reference standards, and performance and test data.
- .4 Samples, as applicable.
- .5 Name and address of projects on which product has been used and date of each installation.
- .6 For substitutions and requests for changes to accepted products, include in addition to the above, the following:
 - .1 Itemized comparison of substitution with named product(s). List significant variations.
 - .2 Designation of availability of maintenance services and sources of replacement materials.

1.5 PRODUCT OPTIONS

- .1 For products specified by non-proprietary specification:
 - .1 Select any product, assembly or material that meets or exceeds the specified standards for products specified only by referenced standards and performance criteria.
- .2 Acceptable Materials: Select any named product, assembly or material contained in the listing of Acceptable Materials.
- .3 Basis-of-Design Materials: Use the named product contained in the Basis-of-Design Material listing, unless an addendum is issued indicating acceptance of additional Acceptable Materials.

1.6 SUBSTITUTIONS

- .1 Contractor will assemble requests for substitutions requested by subcontractors and submit to Departmental Representative for review.
- .2 Departmental Representative will review proposed substitute products for acceptability only when submitted by Contractor; Departmental Representative will not review requests submitted independently by subcontractors.
- .3 No substitutions will be permitted without Departmental Representative's written acceptance; Contractor will be required to remove products and replace with specified materials or provide a credit to the value of the contract at Departmental Representative's discretion where substitutions are found in the Work that have not been formally accepted by Departmental Representative and Owner.
- .4 Departmental Representative is not obliged to accept any Proposed Substitution offered by Contractor, and reserves the right to dismiss any item with no further explanation.
- .5 Substitute Products: Where substitute products are permitted, unnamed products may be accepted by Departmental Representative, subject to the following:
 - .1 Substitute products shall be the same type as, be capable of performing the same functions as, and meet or exceed the standards of quality and

performance of the named product(s). Substitutions shall not require revisions to Contract Documents nor to work of Other Contractors.

- .6 Substitute Manufacturers: Where substitute manufacturers are permitted, unnamed manufacturers may be accepted by Departmental Representative, subject to the following:
 - .1 Substitute manufacturers shall have capabilities comparable to those of the named manufacturer(s). Substitutions shall not require revisions to Contract Documents nor to work of Other Contractors.
- .7 In making a proposal for substitution the Contractor represents:
 - .1 That they have personally investigated the proposal and (unless the proposal explicitly states otherwise) determined that it performs in a similar way or is superior to the product or method specified.
 - .2 That the same guaranty will be furnished as for the originally specified product or construction method.
 - .3 That they will coordinate installation of the accepted substitute into the Work, making such changes in the Work as may be required to accommodate the change.
 - .4 That they will bear costs and waives claims for additional compensation for costs and time that subsequently become apparent arising out of the substitution.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit written request in advance of cutting or alteration which affects:
 - .1 Efficiency, maintenance, or safety of operational elements.
 - .2 Work of Owner 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 Owner or separate contractor.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be executed.

1.2 MATERIALS

- .1 Required for original installation.
- .2 Change in Materials: Submit request for substitution in accordance with Section 01 62 00 – Product Options and Substitutions.

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

1.4 EXECUTION

- .1 Execute cutting, fitting, and patching to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 INSPECTION AND DECLARATION

- .1 Contractor's Inspection: Contractor and Subcontractors: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and that corrections have been made.
 - .2 Request Departmental Representative's review.
 - .3 Departmental Representative's Review: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor to correct Work accordingly.
- .2 Completion: submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
 - .4 Certificates required by Utility companies have been submitted.
 - .5 Operation of systems have been demonstrated to Owner's personnel.
 - .6 Work is complete and ready for final inspection.
- .3 Final Review: when items noted above are completed, request final inspection of Work by Owner, Departmental Representative, and Contractor. If Work is deemed incomplete by Owner and Departmental Representative, complete outstanding items and request reinspection.
- .4 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance shall be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
- .5 Final Payment: when Owner and Departmental Representative consider final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment. If Work is deemed incomplete by Owner and Departmental Representative, complete outstanding items and request reinspection.
- .6 Payment of Holdback: after issuance of certificate of Substantial Performance of Work, submit an application for payment of holdback amount in accordance with Construction Contract.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .3 Copy will be returned after final review, with Departmental Representative's comments.
- .4 Revise content of documents as required prior to final submittal.
- .5 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, two final copies of operating and maintenance manuals in English along with pdf version on a flash drive in English.
- .6 Furnish evidence, if requested, for type, source and quality of products provided.
- .7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .8 Pay costs of transportation.
- .9 Submit `redline` marked up construction drawings to the Departmental Representative within 30 days of Substantial Performance and prior to final completion.

1.2 FORMAT

- .1 Organize data as instructional manual.
- .2 Binders: hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, process flow, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.3 CONTENTS - EACH VOLUME

- .1 Table of Contents: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Departmental Representative and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.

- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

1.4 AS-BUILTS

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record 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 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.

1.5 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of drawings, and in copy of Project Manual, provided by Departmental Representative.
- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

- .2 Field changes of dimension and detail.
- .3 Changes made by change orders.
- .4 Details not on original Contract Drawings.
- .5 References to related shop drawings and modifications.
- .5 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.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.6 EQUIPMENT AND SYSTEMS

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Additional requirements: as specified in individual specification sections.

1.7 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that Owner receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
- .4 Verify that documents are in proper form, contain full information, and are notarized.
- .5 Co-execute submittals when required.
- .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct 6 month warranty inspection, measured from time of acceptance, by Departmental Representative. An alternative date will be set by the Departmental Representative if weather conditions are not favourable to carry out the warranty inspection.
- .9 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 Contractor's plans for attendance at post-construction warranty inspections.
 - .3 Procedure and status of tagging of equipment covered by extended warranties.
 - .4 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in a timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification will follow oral instructions. Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.8 PRE-WARRANTY CONFERENCE

- .1 Meet with Departmental Representative, to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Departmental Representative.
- .2 Departmental Representative will establish communication procedures for:
 - .1 Notification of construction warranty defects.
 - .2 Determine priorities for type of defect.
 - .3 Determine reasonable time for response.
- .3 Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue construction warranty work action.
- .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Definitions:
 - .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.
- .2 Reference Standards:
 - .1 CSA Group
 - .1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.

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 equipment and devices and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop drawings:
 - .1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, accessories, and other items that must be shown to ensure co-ordinated installation.
 - .2 Submit three (3) number of copies of [600 x 600] mm minimum size drawings and product data to authority having jurisdiction.
 - .3 If changes are required, notify Departmental Representative of these changes before they are made.
- .4 Certificates:
 - .1 Provide CSA certified equipment, and/or material.
 - .2 Where CSA certified equipment or material is not available, submit such equipment or material to inspection authorities for special approval before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract.
 - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.
- .5 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within [3] days of review, verifying compliance of

Work [and electrical system and instrumentation testing], as described in PART 3
- FIELD QUALITY CONTROL.

.6 Sustainable Design Submittals:

.1 Construction Waste Management:

- .1 Submit project Waste Management Plan highlighting recycling requirements.
- .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

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 project for incorporation into manual.
 - .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

1.4 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 indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect equipment and materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove and return of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 35 43 - Environmental Procedures.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 Control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

- .3 Language operating requirements: provide identification nameplates or labels for control items in English
- .4 Use one nameplate or label.

2.2 MATERIALS AND EQUIPMENT

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material or equipment to be CSA certified. Where CSA certified material or equipment are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

2.3 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of Departmental Representative.
- .2 Signs, minimum size [175 x 250 mm].

2.4 WIRING TERMINATIONS

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

2.5 EQUIPMENT IDENTIFICATION

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

- .2 Labels: embossed plastic labels with [6] mm high letters unless specified otherwise.

- .3 Wording on labels to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO. [____]" as directed by Departmental Representative
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.

2.6 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, [numbered] [coloured plastic tapes], on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.

2.7 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Prime	Auxiliary	
up to 250 V	Yellow	
up to 600 V	Yellow	Green
Communication Systems	Green	Blue

2.8 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint outdoor electrical equipment "equipment green" finish.

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 equipment installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Departmental Representative.

3.2 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.

3.3 NAMEPLATES AND LABELS

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

3.4 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
 - .1 Sleeves through concrete: sized for free passage of conduit, and/or Teck 90 cable and protruding 50 mm.

3.5 FIELD QUALITY CONTROL

- .1 Load Balance:
 - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
 - .3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
 - .1 Power distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

- .3 Check resistance to ground before energizing.
- .3 Carry out tests in presence of Departmental Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.6 SYSTEM STARTUP

- .1 Instruct Departmental Representative in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation and ensure that operating personnel are conversant with aspects of its care and operation.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean and tidy at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 35 43 - Environmental Procedures.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CSA International
 - .1 CAN/CSA-C22.2 No.18-[98(R2003)], Outlet Boxes, Conduit Boxes and Fittings.
 - .2 CAN/CSA-C22.2 No.65-[03(R2008)], Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2-[1961], Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

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 wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling requirements.

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 wire and box connectors for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

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

- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 35 43 - Environmental Procedures.

Part 2 Products

2.1 MATERIALS

- .1 Pressure type wire connectors to: [CAN/CSA-C22.2 No.65], with current carrying parts of copper, or copper alloy, or aluminum sized to fit copper or aluminum conductors as required.
- .2 Fixture type splicing connectors to: [CAN/CSA-C22.2 No.65], with current carrying parts of copper, copper alloy sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
 - .1 Connector body and stud clamp for copper, or aluminum conductors.
 - .2 Clamp for stranded copper conductors.
 - .3 Clamp for stranded aluminum, or ACSR conductors.
 - .4 Stud clamp bolts.
 - .5 Bolts for copper conductors.
 - .6 Bolts for aluminum conductors.
 - .7 Sized for conductors as indicated.
- .4 Clamps or connectors for armoured cable, or TECK cable as required to: CAN/CSA-C22.2 No.18.

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 wire and box connector's installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and/or cables and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.

- .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
- .3 Install fixture type connectors and tighten to [CAN/CSA-C22.2 No.65]. Replace insulating cap.
- .4 Install bushing stud connectors in accordance with EEMAC 1Y-2.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 35 43 - Environmental Procedures.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 PRODUCT DATA

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

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse and return of pallets, crates, padding, packaging materials in accordance with Section 01 35 43 - Environmental Procedures.

Part 2 Products

2.1 BURIED WIRES

- .1 Conductors: stranded for [10] AWG and larger. Minimum size: [12] AWG.
- .2 Copper conductors: 98% conductivity, size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE.
- .3 Ground wires shall be sized and coloured as indicated by the Canadian Electrical Code.

2.2 TECK CABLE

- .1 Conductors:
 - .1 Grounding conductor: copper.
 - .2 Circuit conductors: copper, size as indicated.
- .2 Insulation:
 - .1 Chemically cross-linked thermosetting polyethylene rated type RW90, 600 V.
- .3 Inner jacket: polyvinyl chloride material.
- .4 Armour: interlocking galvanized steel.
- .5 Overall covering: thermoplastic polyvinyl chloride material.
- .6 Fastenings:
 - .1 One hole zinc straps to secure surface cables 50 mm and smaller. Two-hole steel straps for cables larger than 50 mm.
 - .2 Channel type supports for two or more cables at 600 mm centers.
 - .3 6 mm diameter threaded rods to support suspended channels.
- .7 Connectors:
 - .1 Watertight, approved for TECK cable.

Part 3 Execution

3.1 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform cable tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

- .1 Install cable in trenches in accordance with Section 26 05 43.01 – Installation of Cables in Trenches and in Ducts.
- .2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .3 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.
- .4 Conductor length for parallel feeders to be identical.
- .5 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .6 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BURIED WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CSA Group
 - .1 CSA C22.1-[12], Canadian Electrical Code, Part 1 (23RD Edition), Safety Standard for Electrical Installations.
 - .2 CSA C22.2 No.41-[13], Grounding and Bonding Equipment (Tri-National Standard, with NMX-J-590ANCE and UL 467).
 - .3 CSA C22.2 No.65-[13], 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.
- .3 Certificates: obtain inspection certificate of compliance covering high voltage stress from Departmental Representative and include it with as-built drawings.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling requirements.

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.

1.4 DELIVERY, STORAGE AND HANDLING

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

- .4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 35 43 - Environmental Procedures.

Part 2 Products

2.1 CONNECTORS AND TERMINATIONS

- .1 Copper or Aluminum long barrel compression connectors to [CSA C22.2 No.65] as required sized for conductors.
- .2 Contact aid for aluminum cables where applicable.

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 connectors and terminations installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.
- .2 Bond and ground as required to CSA C22.2No.41.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 35 43 - Environmental Procedures
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00.

1.2 REFERENCES

- .1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE 837-[02], IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect grounding equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 35 43 - Environmental Procedures.

Part 2 Products

2.1 EQUIPMENT

- .1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.

- .2 Rod electrodes: copper clad steel 19 mm diameter by minimum 3 m long.
- .3 Grounding conductors: bare stranded copper, tinned, soft annealed, size [as indicated].
- .4 Insulated grounding conductors: green, copper conductors, size [as indicated].
- .5 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 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION GENERAL

- .1 Install complete permanent, continuous grounding system including conductors, accessories. Where EMT is used, run ground wire in conduit. All connectors shall be installed in accordance with manufacturers requirements. All frames and metallic enclosures of all electrical equipment and electrically operated equipment shall be grounded through the conduit system or via a ground wire.
- .2 All bolted connections must be accessible.
- .3 Include a separate green ground wire in all power conduits including branch circuit wiring sized to Canadian Electrical Code.
- .4 Expansion joints and telescoping sections of raceways shall be bonded using jumper cables as per Canadian Electrical Code.
- .5 Use Burndy compression connectors or approved equal for all grounding splices and terminations unless otherwise shown on the Drawings. For bolted ground connections use Burndy "Durium" or approved equal hardware.
- .6 Install rigid conduit sleeves where ground wires pass through concrete slabs.
- .7 Conduit installed buried in earth or installed in or under grade floor slabs shall have separate ground wire installed, whether the conduits are metal or not.

- .8 Protect exposed grounding conductors from mechanical injury.
- .9 Soldered joints shall not be permitted.
- .10 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .11 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.
- .12 Ground secondary service pedestals.

3.3 ELECTRODES

- .1 Install rod, electrodes and make grounding connections as indicated.
- .2 Bond separate, multiple electrodes together.
- .3 Use size copper conductors for connections to electrodes, as indicated.
- .4 Make special provision for installing electrodes that will give [acceptable] resistance to ground value where rock or sand terrain prevails. Ground as indicated.

3.4 SYSTEM AND CIRCUIT GROUNDING

- .1 Install system and circuit grounding connections to neutral of 600 V system,

3.5 EQUIPMENT GROUNDING

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, distribution panels, outdoor lighting.

3.6 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 35 43 - Environmental Procedures
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCES

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 hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.3 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect hangers and supports from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section
- .5 Packaging Waste Management: remove for reuse and return of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 35 43 - Environmental Procedures.

Part 2 Not used

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 hangers and supports installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Secure equipment to poured concrete with expandable inserts.
- .2 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .3 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
 - .3 Beam clamps to secure conduit to exposed steel work.
- .4 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm diameter 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.
- .5 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .6 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .7 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .8 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative
- .9 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 35 43 - Environmental Procedures

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-[15], Canadian Electrical Code, Part 1, 23rd Edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.

2.2 GALVANIZED STEEL OUTLET BOXES

- .1 One-piece electro-galvanized construction.
- .2 Single and/or multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

2.3 CONDUIT BOXES

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

2.4 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

- .1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size [76 x 50 x 63] mm with two double clamps to take non-metallic sheathed cables.

2.5 FITTINGS - GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA C22.2 No. 18-[98(R2003)], Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45-[M1981(R2003)], Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-[04], Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 211.2-[M1984(R2003)], Rigid PVC (Unplasticized) Conduit.
 - .5 CAN/CSA C22.2 No. 227.3-[05], Non-metallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
- .3 Quality assurance submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

Part 2 Products

2.1 CABLES AND REELS

- .1 Provide cables on reels or coils.
 - .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.

- .2 Each coil or reel of cable to contain only one continuous cable without splices.
- .3 Identify cables for exclusively dc applications.

2.2 CONDUITS

- .1 HDPE conduit: to UL 651B
- .2 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel or hot dipped galvanized steel, or aluminum threaded.
- .3 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .4 Rigid PVC conduit: to CSA C22.2 No. 211.2.
- .5 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3

2.3 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller.
 - .1 Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Threaded rods, 6 mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 27 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 21 mm deflection.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 FISH CORD

- .1 Polypropylene: minimum #8 AWG.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Use HDPE conduit underground of size as indicated on drawings.
- .2 Minimum conduit size for lighting and power circuits: NPS 3/4 (21 mm).
- .3 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .4 Mechanically bend steel conduit over 21 mm diameter.
- .5 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .6 Install fish cord in empty conduits.
- .7 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .8 Dry conduits out before installing wire.

3.3 CONDUITS UNDERGROUND

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 Excavation and Backfilling: Division 03

1.2 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Execution

2.1 CABLE INSTALLATION IN DUCTS

- .1 Install cables as indicated in ducts.
- .2 Do not pull spliced cables inside ducts.
- .3 Install multiple cables in duct simultaneously.
- .4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.
- .6 Before pulling cable into ducts and until cables properly terminated, seal ends of lead covered cable with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .7 After installation of cables, seal duct ends with duct sealing compound.

2.2 MARKERS

- .1 Mark cable every 150 m along duct runs and changes in direction.
- .2 Where markers are removed to permit installation of additional cables, reinstall existing markers.

2.3 FIELD QUALITY CONTROL

- .1 Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .2 Check phase rotation and identify each phase conductor of each feeder.
- .3 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.
- .4 Pre-acceptance test.
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
 - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .5 Acceptance Tests
 - .1 Ensure that terminations and accessory equipment are disconnected.
 - .2 Ground shields, ground wires, metallic armour and conductors not under test.

- .3 High Potential (Hipot) Testing.
 - .1 Conduct hipot testing in accordance with manufacturer's recommendations.
- .4 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.
- .5 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

Part 1 General

1.1 RELATED WORK

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

1.2 WORK INCLUDED

- .1 Except where otherwise specified, arrange and pay for testing, adjusting, balancing and related requirements specified herein.
- .2 If test results do not conform with applicable requirements, repair, replace, adjust or balance equipment and systems. Repeat testing as necessary until acceptable results are achieved.
- .3 Provide all labour, materials, instruments and equipment necessary to perform the tests specified.
- .4 All tests shall be witnessed by persons designated by the Owner, who shall also sign the test documentation.
- .5 Submit procedures proposed in writing for approval two (2) weeks prior to test.

1.3 MANUFACTURER'S PRODUCTION TEST RECORDS

- .1 If requested, submit copies of production test records for production tests required by EEMAC and CSA standards for manufactured electrical equipment.

1.4 SITE TESTING REPORTS

- .1 Log and tabulate test results on appropriate test report forms.
- .2 Submit forms to Departmental Representative for approval prior to use.
- .3 Submit completed test report forms as specified, immediately after tests are performed.

1.5 REFERENCE DOCUMENTS

- .1 Perform tests in accordance with:
- .1 The Contract Documents
 - .2 Requirements of authorities having jurisdiction
 - .3 Manufacturer's published instructions
 - .4 Applicable CSA, IEEE, IPCEA, EEMAC and ASTM standards
- .2 If requirements of any of the foregoing conflict, notify Departmental Representative before proceeding with test and obtain clarification.

1.6 MANUFACTURER'S SITE SERVICES

- .1 Arrange and pay for the site services of qualified manufacturer's representatives where site testing, adjusting, or balancing of electrical equipment or systems' performed by Manufacturer's representatives is:
- .1 Specified, or
 - .2 Otherwise required to ensure that electrical equipment and systems are operational in full compliance with the Contract Documents

1.7 SEQUENCING AND SCHEDULING

- .1 Except where otherwise specified, perform all testing, adjusting, balancing and related requirements specified herein prior to Interim Acceptance of the Work.
- .2 Perform voltage testing and adjusting after user occupancy or utilization of facility.

Part 2 Products

2.1 TEST EQUIPMENT

- .1 Provide all equipment and tools necessary to perform testing, adjusting and balancing specified herein and as otherwise required.

Part 3 EXECUTION

3.1 MAIN DISTRIBUTION PANEL

- .1 Enclosure:
 - .1 Visually inspect.
 - .2 Torque all bus connections to manufacturer's requirements and seal with red lacquer.
 - .3 Megger test main bus at 1000 V.
 - .4 Check phasing and continuity of horizontal and vertical bus. This includes phasing and phase rotation of incoming services or supplies.
- .2 Wiring Checks:
 - .1 Check all control, relaying and instrumentation wiring against vendor wiring schematics, three line diagrams and project specifications.
 - .2 Test each circuit for continuity using a buzzer or similar device.
 - .3 All current transformer circuits shall be injected, all voltage transformer circuits shall be powered at 120 Volts, all devices functioned and checked against control schematic diagram.
 - .4 Check polarity and verify phase relationships on all three phase metering circuits.
 - .5 Where errors are discovered and changes are required, mark up and note required corrective action on vendor prints.
 - .6 Function test secondary transfer schemes (if any) by simulated loss of incoming feeders to ensure proper operation.
- .3 Instrumentation:
 - .1 Test and calibrate all meters in accordance with manufacturers bulletins.
 - .2 Check calibration on all ammeters using 5 Amp secondary injection test.
 - .3 Perform wiring checks as listed above.
- .4 Breakers - Molded Case Breakers 150 Amp Frame and Larger:
 - .1 Visually inspect.
 - .2 Ductor test.
 - .3 Megger test.

- .4 Mechanical function test.
- .5 Set all units with adjustable magnetic trip units.
- .6 Where solid state protection is provided with large breakers, test units as follows:
 - .1 Inspect and test in accordance with manufacturer's most recent installation and maintenance brochure.
 - .2 Perform tests using manufacturer's relay test unit as applicable, with corresponding test instruction.
 - .3 If manufacturer's tester is not available, use an approved relay tester unit with proper test data and test accessories.
 - .4 Proof test each relay in its control circuit by simulated trip tests to ensure total and proper operation of breaker and relay trip circuit by injection of relay circuit to test trip operation.
 - .5 Check C/T and P/T ratios and compare to coordination data.

3.2 CENTRAL DISTRIBUTION PANELS AND PANEL BOARDS

- .1 Enclosure:
 - .1 Visually inspect.
 - .2 Torque all bus connections to manufacturer's specifications.
- .2 Breakers - moulded Case Breakers 150 Amp Frame and Larger:
 - .1 Visually inspect.
 - .2 Ductor test.
 - .3 Megger test.
 - .4 Mechanical function test.
 - .5 Set all units with adjustable magnetic trip units.
 - .6 Where solid state protection is provided with large breakers, test units as follows:
 - .1 Inspect and test in accordance with manufacturer's most recent installation and maintenance brochure.
 - .2 Perform tests using manufacturer's relay test unit as applicable, with corresponding test instruction.
 - .3 If manufacturer's tester is not available, use an approved relay tester unit with the proper test data and test accessories.
 - .4 Proof test each relay in its control circuit by simulated trip tests to ensure total and proper operation of breaker and relay trip circuit by injection of relay circuit to test trip operation.
 - .5 Check C/T and P/T ratios and compare to coordination data.

3.3 FUSED AND UNFUSED DISCONNECT SWITCHES

- .1 Visually inspect and clean.
- .2 Ductor test across switch blade contact surfaces.
- .3 Megger test.

- .4 Mechanical function test.

3.4 TRANSFORMERS - UNDER 225 KVA - LOW VOLTAGE

- .1 Visual inspection of enclosure and all accessories.
- .2 Torque test all bus connections and cable terminations.
- .3 Megger test.

3.5 TESTING OF WIRING AND WIRING DEVICES

- .1 Test conductors at distribution centres and panelboards for insulation resistance to ground (megger test).
- .2 Test service grounding conductors for ground resistance.
- .3 Test all wiring devices for correct operation and circuitry.

3.6 GROUND RESISTANCE TESTING

- .1 Measure ground resistance of ground grids with earth test megger to verify compliance with CSA C22.2 No. 0.4-04 (R2013) and Canadian Electrical Code.

3.7 VOLTAGE TESTING AND ADJUSTING

- .1 Test voltage at all panelboards.
- .2 Adjust transformer tap settings to compensate for under-voltage or over-voltage conditions, if directed to do so by Departmental Representative.

END OF SECTION

Part 1 General

1.1 Related Work

- .1 Common Work Results for Electrical Section 26 05 00
- .2 Testing, Adjusting and Balancing of
Electrical Equipment and System Section 26 08 00.11

1.2 Work Included

- .1 Provide enclosed dry type transformers 600 V primary to 120/208 V and 600 V
primary to 120/240 V
- .2 Product Data - Three Phase, Four Wire Secondary
 - .1 Submit product data in accordance with Section 26 05 00- Common Work
Results for Electrical.

1.3 References, Codes and Standards

- .1 All Codes, Standards, Rules, Regulations, Bulletins, By-laws etc., shall be those
that are currently enforced, in particular, the following:
 - .1 CSA C22.2 No. 47-13 – Air-Cooled Transformers (Dry-Type)
 - .2 CSA C9-02 (R2016) – Dry-Type Transformers
 - .3 CAN/CSA C802.2-12 – Minimum Efficiency Values for Dry-Type
Transformers
 - .4 CSA C22.1-15 – Canadian Electrical Code, Part 1
 - .5 Transformers shall meet relevant NEMA/EEMAC, cUL, NFPA, EPA and
ANSI/IEEE C57 standards.

Part 2 Products

2.1 Transformers

- .1 General: Dry type, air cooled, self ventilated. Enclosures to be EEMAC-1 type,
code gauge steel, complete with ventilating openings, access panels, mounting
brackets, and solderless primary and secondary cable connectors. Enclosures to
have zinc chromate prime coat and enamel finish coat per Section 26 05 00 –
Common Work Results for Electrical. Transformers to be single or three phase
as noted on the drawings.
- .2 Design: General Energy Efficient
 - .1 Type: ANN
 - .2 3 phase, kVA as noted on drawings, 600V input, 208/120V and 240/120V
output as indicated on drawings, 60 Hz.
 - .3 Voltage primary taps: 2.5% Full capacity above and below normal
 - .4 Insulation: Class R.
 - .5 Basic Impulse Level (BIL): 10 KV B.I.L.
 - .6 Hipot: 4 KV

- .7 Average Sound Level: To meet the local municipal & building codes and meet at minimum the following criteria:
 - 45 dB max. up to 45 kVA
 - 50 dB max. up to 150 kVA
 - 55 dB max. up to 300 kVA
 - 60 dB max. above 500 kVA
- .8 Impedance at 170°C:
 - 6.0% max. up to 112½ kVA
 - 5.5% max. above 112½ kVA
- .9 Enclosure: Removable metal front panel
- .10 Finish: In accordance with Section 26 05 00 - Common Work Results for Electrical
- .11 Three Phase Windings: Arrange with three primary windings connected in delta and three secondary windings connected in wye.
- .12 Max. Winding Temperature: 150°C rise with temperature continuous full load
- .13 Max. Lead Connection: 55°C rise with temperature continuous full load
- .14 Copper windings
- .15 Minimum efficiency: 98%

2.2 Equipment Identification

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

Part 3 Execution

3.1 Installation

- .1 Ensure adequate clearance around transformer for ventilation.
- .2 Install transformers in level upright position away from combustible surfaces.
- .3 Remove shipping supports only after transformer is installed and just before putting into service.
- .4 Loosen isolation pad bolts until no compression is visible.
- .5 Make primary and secondary connections in accordance with wiring diagram.
- .6 Mount transformers as indicated on drawings and connect primary, secondary, neutral and ground conductors. Ensure all transformers have good ventilation.
- .7 Do not use permanent distribution system dry type transformers for temporary power distribution without permission for the Consultant.
- .8 Mount transformers to reduce direct and transmitted noise. Mount core and coils of transformers on vibration and sound absorbing pads.
- .9 Record secondary voltage when transformers are carrying approximately 75% of full load. Adjust tap connections to give a continuous secondary voltage of 120 V phase to neutral. Set tap connections for above 120 V rather than below.

- .10 Connections to transformers shall be in flexible conduit and shall enter the enclosure below the coils.
- .11 Before energization, keep transformers or storage room enclosures above 10°C ambient.

END OF SECTION

Part 1 General

1.1 RELATED WORK

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

1.2 WORK INCLUDED

- .1 Provide disconnect switches for 347/600 V distribution as indicated on the drawings, as manufactured by Cutler Hammer, Schneider or Square D or approved equal.

1.3 REFERENCES, CODES AND STANDARDS

- .1 All Codes, Standards, Rules, Regulations, Bulletins, By-laws etc., shall be those that are currently enforced, in particular, the following:
- .1 CAN/CSA C22.2 No. 4 – Enclosed and Dead-Front Switches
 - .2 CAN/CSA C22.2 No. 39 – Fuseholder Assemblies
 - .3 NEMA/EEMAC
- .2 All disconnect switches to be CSA, cUL certified for the area in which they are mounted.

Part 2 Products

2.1 DISCONNECT SWITCHES

- .1 Ratings: 1000 Volts for 347/600 volt distribution, 240 volts for 120/208 volt distribution. Unless otherwise shown, 3 pole for 3 phase, 3 wire distribution, 3 pole and solid neutral for 3 phase 4 wire distribution. Ampere ratings as shown on the drawings or to suit load requirements. For motors, use disconnect switches with HP ratings at least equal to motor HP.
- .2 Enclosures: CSA code gauge galvanized steel, hinged doors, external operating handles. Disconnect switches in dry locations shall be EEMAC-1 and EEMAC-3 where exposed to weather. Provide ON-OFF switch position indication on switch enclosure cover.
- .3 Finish: One primer coat and one finish coat on all metal surfaces, colours as per Section 26 05 00 - Common Work Results for Electricals.
- .4 Switch mechanisms: Quick make and quick break action with self wiping contacts, solderless pressure lug connectors. For switches 100 amperes and over, provide non-tracking arc shrouds. All switch poles to operate together from a common operating bar. Provide for padlocking disconnect switches in "Off" position. Doors to be interlocked and complete with defeat mechanism, to prevent opening when handle in ON position.
- .5 Neutral Bars: Where distribution system has grounded neutral conductor, provide neutral bar where required with ampere rating equal to switch rating, in enclosure. Provide ground bar for terminating ground conductors.

- .6 Fuse Holders: Provide fuse holders (relocatable and suitable without adapters) on load side of switches, ampere rating equal to switch ratings, suitable for fuses specified.

2.2 FUSES

- .1 All fuses to be 100,000 ampere (minimum) interrupting capacity of the current limiting type. In addition, fuses feeding motors to be of the time delay type. Provide one full set of spare fuses, three for each different ampere rating used, stored in suitable enclosure.

Part 3 Execution

3.1 DISCONNECT SWITCHES

- .1 Mounting: Provide supports independent of conduits. Wall mount where possible, otherwise provide Unistrut frame support. Where switches are grouped, mount in uniform arrangement.
- .2 Wiring: Connect line and load cable to all switches.
- .3 Fuse Rating: Install so that rating is visible.
- .4 Identification: Provide lamacoid plate in accordance with Section 26 05 00 - Common Work Results for Electricals, on each switch showing voltage, source of supply and load being fed, for example:
 - .1 Door Controller
 - .2 120/208 Volts
 - .3 Fed from PPA

END OF SECTION

Part 1 General

1.1 RELATED WORK

- | | | |
|----|------------------------------------|---------------------|
| .1 | Common Work Results for Electrical | Section 26 05 00 |
| .2 | Moulded Case Circuit Breakers | Section 26 24 16.10 |
| .3 | Grounding-Secondary | Section 26 05 28 |

1.2 WORK INCLUDED

- .1 This section covers the supply and installation of all distribution and power panelboards, including mounting hardware and breakers.

1.3 REFERENCES, CODES AND STANDARDS

- .1 All Codes, Standards, Rules, Regulations, Bulletins, By-laws etc., shall be those that are currently enforced, in particular, the following:
- .1 CSA C22.2 No. 29 – Panelboards and Enclosed Panelboards

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

Part 2 Products

2.1 PANELBOARDS

- .1 All panelboards shall be supplied by one manufacturer.
- .1 Install circuit breakers in panelboards before shipment.
- .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 120/208V, 120/240V & 600V panelboards: bus and breakers rated interrupting capacity as indicated on drawings.
- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .4 Panelboards mains, number of circuits, and number and size of branch circuit breakers as indicated on the drawings.
- .5 Two keys for each panelboard and key panelboards alike.
- .6 Copper bus with neutral of same ampere rating as mains.
- .7 Mains: suitable for bolt-on breakers.
- .8 Trim with concealed front bolts and hinges.
- .9 Trim and door finish: baked grey enamel.

2.2 CUSTOM BUILT PANELBOARD ASSEMBLIES

- .1 Double stack panels as indicated.
- .2 Contactors in mains as indicated.

- .3 Feed through lugs as indicated.
- .4 Isolated ground bus.

2.3 BREAKERS

- .1 Refer to Section 26 24 16.10 - Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Main breaker: shall be separately mounted on top or bottom of panel to suit cable entry as required. When mounted vertically, down position should open breaker.
- .4 Lock-on devices for 10% of 15 to 30A breakers installed as indicated. Turn over unused lock-on devices to Owner.
- .5 Breakers shall be compatible with fault current rating of the panel.

2.4 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00.11 - Electrical General Requirements.
- .2 Nameplate for each panelboard size 4 engraved as indicated.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit.
- .5 Fault current rating to be indicated on nameplated.

Part 3 Execution

3.1 INSTALLATION

- .1 Panelboards shall be surface mounted inside NEMA 4 enclosure as indicated on plan drawings.
- .2 Install panelboards plumb and level.

3.2 GROUNDING

- .1 Bond all panelboards per C.E.C.

3.3 IDENTIFICATION

- .1 Provide name plates per Section 26 05 00.
- .2 Paint panelboards as required per Section 26 05 00.

END OF SECTION

PART 1 - General

1.1 RELATED WORK

- .1 Common Work Results for Electrical Section 26 05 00
- .2 Panelboards- Breaker Type Section 26 24 16.01

1.2 WORK INCLUDED

- .1 This section covers the supply and installation of all magnetic and thermal magnetic circuit breakers.

1.3 REFERENCES, CODES AND STANDARDS

- .1 All Codes, Standards, Rules, Regulations, Bulletins, By-laws etc., shall be those that are currently enforced, in particular, the following:
 - .1 CSA C22.2 No.5 – Molded-Case Circuit Breakers

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Include time-current characteristic curves for breakers with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

PART 2 - Products

2.1 BREAKERS GENERAL

- .1 Bolt-On Moulded Case Circuit Breaker, quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.
- .2 All Circuit breakers shall have an interrupting rating greater than the available short circuit current. Series ratings shall not be accepted.
- .3 Common-Trip Breakers: With single handle for multi-pole applications.
- .4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3 to 8 times current rating.
- .5 Circuit breakers with interchangeable trips as indicated.
- .6 Provide solid-state tripping system for all breakers larger than 225 amps with long, short, instantaneous function and ground fault protection. The instantaneous override shall be stated on the shop drawings.

2.2 THERMAL MAGNETIC BREAKERS

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 MAGNETIC BREAKERS

- .1 Magnetic circuit breaker to operate by means of magnetic tripping for short circuit protection (motor starter).

2.4 OPTIONAL FEATURES

- .1 Include where indicated on drawings:
 - .1 Shunt trip.
 - .2 Auxiliary switch.
 - .3 On-off locking device
 - .4 Handle mechanism.
 - .5 Non-auto.

2.5 ENCLOSURE FOR INDIVIDUALLY MOUNTED BREAKERS

- .1 Enclosure shall be CSA code gauge galvanized steel, hinged door, front mounted external operating handle, lockable in "off" position, EEMAC-1 unless shown otherwise. Use EEMAC-4 for industrial application, enclosure for wet environment or as shown "WP" on drawings. Increase enclosure size above standard for large cables.
- .2 Where distribution system has grounded neutral conductor, provide neutral bar, with ampere rating equal to breaker/switch rating in enclosure.

PART 3 - Execution

3.1 INSTALLATION

- .1 Install circuit breakers as indicated.

3.2 IDENTIFICATION

- .1 Provide lamacoid plate on each breaker showing voltage, source of supply and load being fed. Example, 120/208 V, 3 phase, 4W fed from LDP No.1 to Splitter Trough No. 1.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C117, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422-63, Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .5 ASTM D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .6 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

1.2 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock: solid material in excess of 1.5 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment. Frozen material not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Topsoil:
 - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
 - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded and required for construction of fill areas or for other portions of Work.

- .6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .7 Unsuitable materials:
 - .1 Weak, chemically unstable, compressible materials, frozen material.
- .8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.3 MEASUREMENT AND PAYMENT

- .1 Refer to Section 01 29 00 – Payment Procedures for more details.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality Control: in accordance with Section 01 45 00 - Quality Control:
 - .1 Submit condition survey of existing conditions as described in article 1.6 - Existing Conditions of this Section.
 - .2 Submit for review by Departmental Representative proposed dewatering and heave protection methods as described in article 3.6 - Dewatering and Heave Protection.
 - .3 Submit to Departmental Representative written notice when bottom of excavation is reached.
 - .4 Submit to Departmental Representative testing and inspection results as described in Part 3 of this Section.
- .3 Preconstruction Submittals:
 - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
 - .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority, location plan of relocated and abandoned services, as required.
- .4 Sustainable Design Submittals:
 - .1 Erosion and Sediment Control: Prior to beginning the Work on site submit an Erosion and Sediment Control Plan in accordance with authorities having jurisdiction and Section 01 35 43 - Environmental Procedures.
 - .2 Construction Waste Management: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures.
 - .3 Erosion and Sediment Control Plan and Waste Reduction Workplan are to include details related to the Work of this Section.

1.5 EXISTING CONDITIONS

- .1 Buried services:
 - .1 Before commencing work verify location of buried services on and adjacent to site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
 - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .5 Prior to beginning excavation Work, notify applicable authorities having jurisdiction and establish location and state of use of buried utilities and structures. Departmental Representative to clearly mark such locations to prevent disturbance during Work.
 - .6 Confirm locations of buried utilities by careful soil hydrovac methods.
 - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing. Costs for such Work shall be considered incidental to the Contract.
 - .9 Record location of maintained, re-routed and abandoned underground lines.
 - .10 Confirm locations of recent excavations adjacent to area of excavation.
- .2 Existing buildings and surface features:
 - .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
 - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.
 - .3 Where required for excavation, cut roots or branches as directed by Departmental Representative.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Temporary erosion and sedimentation controls to be provided, in accordance with Erosion and Sediment Control Plan, including:

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to Erosion and Sediment Control Plan, specific to site, that complies with DFO Land Development Guidelines for the Protection of Aquatic Habitat or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly.

3.3 PREPARATION/PROTECTION

- .1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

3.4 STOCKPILING

- .1 Stockpile fill materials in areas designated by Departmental Representative.
 - .1 Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.5 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29 - Health and Safety Requirements.
 - .1 Where conditions are unstable, Departmental Representative to verify and advise methods.

3.6 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Departmental Representative review details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
 - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Erosion and Sediment Control Plan and in a manner not detrimental to public and private property, or portion of Work completed or under construction.
 - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

3.7 TOPSOIL SALVAGE

- .1 conserve topsoil for future replacement and reclamation. The Contractor shall make every effort to minimize the degradation of topsoil through compaction, rutting, loss of organic matter, or soil mixing so that successful reclamation can occur.
- .2 Protect stockpiled topsoil and subsoil materials to prevent loss, degradation, contamination or compaction.
- .3 Cover topsoil that has been piled for long term storage, with trefoil or grass to maintain agricultural potential of soil.

3.8 EXCAVATION

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as indicated.
- .3 Do not disturb soil within branch spread of trees or shrubs that are to remain.
 - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .4 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .5 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .6 Restrict vehicle operations directly adjacent to open trenches.
- .7 Obtain Departmental Representative approval of completed excavation.

- .8 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .9 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with concrete specified for footings.
- .10 Hand trim, make firm and remove loose material and debris from excavations.
 - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
 - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.

3.9 BACKFILLING

- .1 Vibratory compaction equipment: vibratory rollers or vibrating plate compactors capable of obtaining required density in materials on project.
- .2 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative has inspected and approved installations.
 - .2 Departmental Representative has inspected and approved of construction below finish grade.
 - .3 Inspection, testing, approval, and recording location of underground utilities.
 - .4 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.
- .5 Place backfill material in uniform layers not exceeding 300 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Backfilling around installations:
 - .1 Place bedding and surround material as specified elsewhere.

3.10 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Replace topsoil as indicated.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Reinstate pavements, gravelled roads, and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstate areas affected by Work as directed by Departmental Representative.

- .6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.
- .7 During the guarantee period, the Contractor is responsible for extra road maintenance required as a result of trench settlement or disruption of surface drainage at no cost to the Owner.

END OF SECTION