RADIUM HOT SPRINGS LIGHTING UPGRADES AND SITE REHABILITATION

KOOTENAY NATIONAL PARK, BC

WESTERN PROJECT # R.072512.001
TENDER PACKAGE #1

PROJECT SPECIFICATIONS

Prepared for:

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Prepared by:

Stantec

CALGARY , AB

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Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Bid Package comprises renovations to Radium Springs Lighting Upgrades and Site Rehabilitation, located at Village of Radium, British Columbia. Work of this tender package #1 includes structural, radiant heating, snow melt, storm water/heat trace, electrical and lighting, and geotechnical.

.2 Work of this contract comprises multidisciplinary upgrades and site rehabilitation of the Radium Hot Springs walkways, lighting and civil site rehabilitation as shown on the contract documents.

- Structural rehabilitation including but not limited to:
  - .1 The west ramp. The existing elevated ramp structure is to be demolished and rebuilt.
  - .2 The pool area including an existing bridge to the main pool building and surrounding walkways and stairs.
  - .3 The east ramp including modification to existing retaining walls and pathways.
- Electrical rehabilitation including but not limited to:
  - .1 Supply and installation of new LED luminaires, drivers and complete dimming system;
  - .2 Supply and installation of Electrical wiring system and materials.
  - .3 New Electrical Panel to carry the new lighting loads;
  - .4 Provision of temporary power.
- Mechanical rehabilitation including but not limited to
  - .1 Installation of a snow melt system for the east ramp, west ramp and bridge deck.
  - .2 Installation of a drainage system and heat trace for the east ramp, west ramp and bridge deck.
- Civil rehabilitation including but not limited to:
  - .1 The entry sign. Existing entry sign to be demolished and rebuilt.
  - .2 The installation of planting along the east retaining wall.
  - .3 Trenching, backfill, compaction and surface remediation.

1.2 CONTRACT METHOD

.1 Construct Work under single stipulated price contract.

1.3 WORK SCHEDULE

.1 Complete work of this project by July 1, 2017

1.4 WORK BY OTHERS

.1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Consultant.

.2 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Consultant, in writing, any defects which may interfere with proper execution of Work.

1.5 WORK SEQUENCE

.1 Construct Work in stages to accommodate Owner's continued use of premises during construction.

.2 Co-ordinate Progress Schedule and co-ordinate with Owner Occupancy during construction.

.3 Required stages:

- Tender package one (TP 1) as defined in these documents.

.4 Construct Work in stages to provide for continuous public usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.

.5 Maintain fire access/control.

1.6 CONTRACTOR USE OF PREMISES

.1 Limit use of premises for Work, for storage, and for access, to allow:

- Owner occupancy.
- Partial owner occupancy.
- Work by other contractors.
- Public usage.

.2 Co-ordinate use of premises under direction of Consultant.

.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 Consultant.

.6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.7 OWNER OCCUPANCY

.1 Owner will occupy premises during entire construction period for execution of normal operations.

.2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.8 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each document as follows:

- Contract Drawings.
- Specifications.
- Addenda.
- Reviewed Shop Drawings.
- List of Outstanding Shop Drawings.
- Change Orders.
- Other Modifications to Contract.

- Field Test Reports.
- Permits
- Copy of Approved Work Schedule.
- Health and Safety Plan and Other Safety Related Documents.
- 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 INTENT

.1 The Work shall be designed, constructed, and commissioned in a manner which is compliant with the Canada National Parks Act and Parks Canada Agency Regulations, Directives, and Guidelines.

.2 Permits are required from Parks Canada and the authority having jurisdiction.

1.2 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.

1.3 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 building and provide for personnel and vehicle access.

.3 Where security is reduced by work provide temporary means to maintain security.

.4 Provide sanitary facilities for use by Contractor's personnel. Keep facilities clean.

.5 Closures: protect work temporarily until permanent enclosures are completed.

1.4 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute work with least possible interference or disturbance to building operations, occupants, public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

1.5 EXISTING SERVICES

.1 Notify Departmental Representative, Parks Canada Representative, and private and public 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, vehicular traffic, and tenant operations.

.3 Provide alternative routes for personnel, pedestrian, and vehicular traffic if required.

.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.

.6 Provide temporary services to maintain critical building and tenant systems.

.7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.

.8 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

.9 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

.10 Record locations of maintained, re-routed and abandoned service lines.

.11 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.6 SPECIAL REQUIREMENTS

.1 The Aquacourt Pools will remain open to the public throughout the course of construction. During cutting down of the existing concrete wall and demolition work at the east end, next to the hot pool, hoarding for safety of pool users and dust abatement are a project requirement

.2 Submit schedule in accordance with Section 01 32 16 – Construction Schedule.

.3 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

.4 Keep within limits of work and avenues of ingress and egress.

.5 Ingress and egress of Contractor vehicles at site is limited to overflow lot east of the site.

.6 Deliver materials outside of traffic hours and outside of pool operation hours,10:00 pm to 9:00 am unless otherwise approved by Departmental Representative.

1.7 BUILDING SMOKING ENVIRONMENT

.1 Smoking is only allowed in designated areas.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

PAYMENT PROCEDURES FOR TESTING LABORATORY SERVICES

Part 1 General

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

.1 Particular requirements for inspection and testing to be carried out by testing laboratory designated by Departmental Representative are specified under various sections.

1.2 APPOINTMENT AND PAYMENT

.1 Departmental Representative will appoint and pay for services of testing laboratory except follows:

- .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
- .2 Inspection and testing performed exclusively for Contractor's convenience.
- .3 Tests specified to be carried out by Contractor under the supervision of Departmental Representative.
- .4 Additional tests specified as follows:
  - .1 Soil Compaction Testing

.2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.

1.3 CONTRACTOR'S RESPONSIBILITIES

.1 Provide labour, equipment and facilities to:

- .1 Provide access to Work for inspection and testing.
- .2 Facilitate inspections and tests.
- .3 Make good Work disturbed by inspection and test.

.2 Notify Departmental Representative sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.

.3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

.4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved 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 SUMMARY

.1 Coordinate between mechanical and electrical work, and work of other affected Sections in accordance with the requirements of this Section and other affected sections.

1.2 RELATED SECTIONS

.1 Section 01 91 13 – General Commissioning Requirements

.2 Structural Drawings – Concrete Forming: Placement of cut outs and sleeves.

.3 Division 23 – Common Work Results: Common work results for plumbing, and heating systems.

.4 Division 26 – Common Work Results: Common work results for electrical, systems.

.5 Section 26 50 00 – Lighting: Coordination of lighting installation with other mechanical and electrical systems.

1.3 MECHANICAL-ELECTRICAL WORK COORDINATOR

.1 Contractor shall be responsible for providing a person technically qualified and experienced in field coordination for the type of mechanical and electrical work required for this Project, for duration of construction work.

.2 Mechanical and Electrical Coordination shall be performed by a dedicated person other than the Contractor's Project Manager; who shall have extensive experience with coordinating complex mechanical and electrical work and shall be acceptable to the Departmental Representative and the Owner.

1.4 SUBMITTALS

.1 Provide required coordination documents before submitting shop drawings, product data and samples; provide information required by this Section in accordance with Section 01 33 00.

.2 Preparation of Mechanical and Electrical Coordination Drawings specified in this Section form a part of the Contractor's Submission requirements and are specifically excluded from the Mechanical and Electrical Subcontractor's Scope-of-Work as follows:

.1 Mechanical and Electrical Subcontractors shall allow for full assistance and cooperation with the General Contractor in the provision of all required information for the assembly of Coordination Drawings.

.2 Mechanical and Electrical Coordination Drawings described in this Section form a part of the General Contractor's Scope-of-Work.

.3 Submit name, qualifications, and related experience of proposed Mechanical-Electrical Coordinator to the Departmental Representative before any Work starts on site; Departmental Representative reserves the right to reject any candidate that does not appear suitable for this Project.

.4 Submit field coordination drawings for mechanical and electrical work. Coordinate with all other parts of the Work and potential interference between systems and building components.

Part 2 Products

2.1 COORDINATION DOCUMENTS

.1 Prepare Field Coordination Plan and Section Drawings indicating coordination for the following:

- .1 Installation of subgrade plumbing work.
- .2 Scale:
  - .1 Plans: Not less than 1:50 metric.
  - .2 Sections: Not less than 1:20 metric.
  - .3 Details: Not less than 1:10 metric.
- .3 Clearly indicate changes to the location, direction, route or grade of mechanical and electrical work shown in the Contract Documents that are required or necessary arising from the coordination of the Work.
- .4 Reproduce and distribute copies at Coordination Meeting to each concerned party in accordance with Section 01 31 19.
- .5 Update and revise as necessary after each Coordination Meeting.

.2 Maintain coordination documents throughout construction period, recording changes arising from modifications and adjustments; submit finalized coordination documents after completion of Project in accordance with Section 01 78 00.

Part 3 Execution

3.1 MECHANICAL AND ELECTRICAL COORDINATION

.1 Coordinate work between Divisions 2 to 14 inclusive and Divisions 21 to 28.

.2 Coordinate progress schedules, including dates for submittals and for delivery of products.

.3 Conduct conferences between Subcontractors, other contractors and other concerned entities as necessary to establish and maintain coordination and schedules and to resolve matters identified by coordination activities.

.4 Participate in Progress and Coordination Meetings; report on work requiring adjustment under coordination requirements, and any needed changes in schedules or in the work to resolve interferences between components of the Work.

.5 Transmit minutes of coordination to all attendees and concerned individuals in accordance with Section 01 31 19.

.6 Implementation of changes required as a result of coordination activities shall be performed as follows:

- .1 Work Considered as No Change to Contract: Changes that do not materially increase or decrease the Scope-of-Work of the Contract, shall not be considered as additional work under Contract.
- .2 Work Considered as Change to Contract: Changes that do materially increase or decrease the Scope-of-Work of the Contract, will be administered as a Change to the Contract in accordance with General Conditions of Contract.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

.1 Schedule and administer project meetings throughout the progress of the work as requested by the Departmental Representative.

.2 Departmental Representative shall prepare agenda for meetings.

.3 Departmental Representative shall distribute written notice of each meeting four days in advance of meeting date to all parties.

.4 Contractor to provide physical space and make arrangements for meetings in coordination with Departmental Representative.

.5 Departmental Representative to preside at meetings.

.6 Contractor shall record the meeting minutes and include significant proceedings and decisions with identification of actions by parties.

.7 Departmental Representative shall 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 Departmental Representative, 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 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Senior representatives of Departmental Representative, Departmental Representatives, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

.4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.5 Agenda to include:

.1 Appointment of official representative of participants and Reporting Relationships in the Work.

.2 Schedule of Work: in accordance with Section 01 32 16 - Construction Progress Schedules.

.3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.

.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.

.5 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

.6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

.7 Owner provided products.

.8 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.

.9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.

.10 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.

.11 Monthly progress claims, administrative procedures, photographs, hold backs.

.12 Appointment of inspection and testing agencies or firms by Contractor.

.13 Insurances, transcript of policies.

.14 Review of Health and Safety Plan and appointment of Health and Safety Co-ordinator.

.15 Review of Environmental Protection Plan and introduction of EA Officer and site review.

1.3 PROGRESS MEETINGS

.1 During course of Work and 2 weeks prior to project completion, schedule progress meetings every two weeks.

.2 Contractor, major Subcontractors involved in Work and Departmental Representative and Owner are to be in attendance in person or by teleconference.

.3 Notify parties minimum 7 days prior to meetings.

.4 Contractor to record minutes of meetings and circulate to attending parties and affected parties not in attendance within three (3) 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 Review health and safety issues.

.13 Review environmental issues.

.14 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, Samples.
.3 Permits.
.4 Mobilization.
.5 Excavation.
.6 Backfill.
.7 Building footings.
.8 Slab on grade.
.9 Structural Steel.
.10 Plumbing.
.11 Lighting.
.12 Electrical.
.13 Piping.
.14 Controls.
.15 Heating.
.16 Testing and Commissioning.
.17 Flushout (IAQ)
.18 Supplied equipment long delivery items.

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, product data, samples and mock-ups in SI Metric units.

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

.5 Review submittals prior to submission to 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 British Columbia, Canada.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow 6 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 Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that PWGSC 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 SAMPLES

.1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples to Departmental Representative at bi-weekly site meetings.

.3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern or texture is criterion, submit full range of samples.

.5 Adjustments made on samples 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 samples which Departmental Representative may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.4 MOCK-UPS

.1 Erect mock-ups in accordance with 01 45 00 - Quality Control.

1.5 PHOTOGRAPHS: DIGITAL FORMAT

.1 Progress Photographs

.1 Sizes: minimum 2 mega pixel image file size, jpeg image file.

.2 Format: CD or DVD (*.jpg).

.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.

.7 Frequency: at completion of excavation, foundation, framing, and services before concealment and at completion of each discrete phase of construction.

1.6 CERTIFICATES AND TRANSCRIPTS

.1 Submit transcription of insurance immediately after award of Contract.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 INTENT

.1 The intent of Delegated Design Submittals required by this section is to account for professional engineering responsibility for design, review and acceptance of components of Work forming a part of permanent Work in accordance with Building Code, and that has been assigned to a design entity other than Departmental Representative including, but not limited to, the following:

.1 Design requiring structural analysis of load bearing components and connections.

.2 Design requiring compliance with fire safety regulations.

.3 Design requiring compliance with life or health safety regulations.

.2 This section provides standard forms for submittal of Letter of Commitment and Letter of Compliance required complying with requirements of Building Code and design delegated to a professional Engineer within technical specification sections.

.3 Delegated Design Submittals are not required for components of Work requiring engineering for temporary Work (i.e.: crane hoisting, engineered lifts, false Work, shoring, concrete formwork) that would normally form a part of Contractor's scope of Work.

.4 The requirements of this section are in general conformance with recommended Responsibilities for Engineering Services for Building Projects published by Association of Professional Engineers and Geoscientists of British Columbia (APEGBC), with regards to duties of specialty professionals appointed during construction period.

.5 The requirements of this section do not diminish responsibilities of Departmental Representative's role as Registered Professional of Record; submittals will be used by Departmental Representative to establish that Work is substantially performed in accordance with Building Code.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittals: Submittal procedures.

.2 Section 01 45 00 - Quality Control

.3 Structural Drawings – Foundations

.4 Structural Drawings - Cast-In-Place Concrete: Concrete mix design

.5 Divisions 23 and 26 Coordinate with disciplines for items requiring delegated design submittals.

1.3 DELEGATED DESIGN

.1 Performance and Design Criteria: Provide products and systems complying with specific performance and design criteria indicated where professional design services or certifications by a design professional are specifically required of Contractor by Contract Documents.

.2 If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Departmental Representative.

.3 Delegated design will be required for elements designed by a specialty professional, which may include:

.1 Elements normally fabricated off-site

.2 Elements that require specialized fabrication equipment or a proprietary fabrication process not usually available at job site (i.e.: open web steel joists, wood trusses, combination wood and metal or plywood joists, prefabricated wood or metal buildings, noise and vibration isolation devices, elevators).

.3 Elements requiring civil engineering, not normally a part of scope of services performed by architectural; structural; mechanical; electrical; or geotechnical disciplines of Departmental Representative.

Part 2 Products

2.1 LETTER OF COMMITMENT

.1 Submit a signed and sealed Letter of Commitment on company letterhead addressed to Departmental Representative in accordance with format in Appendix A attached to the end of this Section prior to starting Work requiring design and seal of a professional engineer.

2.2 LETTER OF COMPLIANCE

.1 Submit a signed and sealed Letter of Compliance on company letterhead addressed to Departmental Representative in accordance with format in Appendix B attached to the end of this Section on completion of Work requiring design and seal of a professional engineer.

Part 3 Execution

3.1 IMPLEMENTATION

.1 Include summary of Work described in technical specification section as a part of the required Letter of Commitment.

.2 Prepare required submittals and present to Departmental Representative within sufficient time to allow for Departmental Representative’s detailed review and acceptance.

.3 In lieu of Items 2.1 and 2.2, National Building Code Compliance Schedules A, B, and C will be accepted.

END OF SECTION

APPENDIX A

LETTER OF COMMITMENT

Submit a signed and sealed letter of commitment on company letterhead in the form as follows:

[Date]

[Departmental Representative]
[Departmental Representative's Address]

Attention: [Departmental Representative's Registered Professional of Record]

Re: Letter of Commitment for Delegated Design of [System of Component of Work]
[Name of Project]
[Project Number]
[City, Province]

As the retained registered professional engineer for design and field review of the above named component of Work and project, I hereby give assurance I am qualified to perform the following Work as required by Contract Documents:

1. [List appropriate design services for System or Component of Work];
2. Preparation of shop and erection documents;
3. Review fabrication of [structural] [fire rated] [life and health safety] components;
4. Review erection of [structural] [fire rated] [life and health safety] components.
5. [Modify list to suit System of Component of Work.]

I hereby give assurance that I will be responsible for above noted Work as described in Section [Name of Section] of Project Manual, including requirements of addenda, change orders and change directives.

I also undertake to be responsible for field review of fabrication and erection of [structural] [fire rated] [life and health safety] components as required to ascertain substantial compliance with the Building Code and Contract Documents.

I will notify you in writing if my responsibility is terminated at any time during the course of Work covered by this Letter of Commitment.

Retained Professional Engineer

_____
Signature

_____
Date

(Apply seal)

APPENDIX B

LETTER OF COMPLIANCE

[Date]

[Departmental Representative]
[Departmental Representative's Address]

Attention: [Departmental Representative's Registered Professional of Record]

Re: Letter of Compliance for Delegated Design of [System of Component of Work]
[Name of Project]
[Project Number]
[City, Province]

I hereby give assurance that I have fulfilled my obligations for field review as outlined by previously submitted Letter of Commitment.

I hereby give assurance that aspects of [structural] [life and health safety] Work as defined by previously submitted Letter of Commitment substantially comply with Contract Documents and Building Code.

Retained Professional Engineer

_____
Signature

_____
Date

(Apply seal)

Part 1 General

1.1 DEFINITIONS

.1 Cutting: Means removal of existing construction necessary to permit installation or performance of other Work.

.2 Make Good/Patch/Repair: Means to identify defective or damaged locations, properly prepare identified locations for repairs, and repair (including substrates) using new materials to match construction and finish of adjacent sound locations; blend repaired area smoothly with adjacent construction so that it is not distinguishable from untreated areas in performance or appearance.

1.2 QUALITY ASSURANCE

.1 Conform to the National Building Code, the British Columbia Occupational Health and Safety Act, Regulation and Code, and other applicable standards and regulations.

.2 Comply with the ‘General Demolition Notes’ and ‘General Notes’ on the Contract Drawings.

.3 Electrical equipment and fixtures shall be CSA approved and carry appropriate CSA label.

.4 Work performed and materials used in existing building shall be of same standard of quality as that of existing finished building as a minimum, and as otherwise specified (refer to the technical Specification Sections) or indicated on the Drawings.

.5 Any welding shall be performed by Welders certified in accordance with CSA W47, and shall conform to CSA W59. Provide strict safety measures for welding in existing building. Provide and maintain a fully charged 9.4 kg (20 lbs.) CO_2 fire extinguisher within view and easy access of welding Work at all times.

1.3 BUILDING SECURITY

.1 The Contractor's forces shall comply with the security requirements of the Owner. Maintain security in a manner acceptable to the Owner throughout the duration of the Contract.

.2 Hours and days of work at the work site are restricted; comply with the Owner’s requirements, policies and procedures throughout the duration of the Contract.

.3 When working in the building, the Contractor shall engage the services of security personnel if there is not full time supervision by the Contractor.

.4 The Contractor shall engage services of security personnel if at any time the Owner’s security system is compromised by the Work.

1.4 ACCESS

.1 Coordinate access with the Owner.

.2 Public and Owner’s access to other areas must be maintained at all times.

.3 Provide and maintain temporary fire exit routing and maintain clear of obstructions during full extent of Contract.

.4 Contractor's access to Work shall be as agreed by Owner, Contractor, and Departmental Representative.

.5 Contractor, and construction forces, shall not use any facilities in existing building (washrooms, cafeteria, etc.) without Owner's approval.

.6 Required exits and exit corridors shall be maintained at all times.

.7 Protect access ways from damage during Construction. Cover surfaces with polyethylene film and cover with plywood or matting to prevent staining and scaring of existing finishes. Restore damage to condition equal to that prior to damage.

.8 Where required, provide temporary partitioning or enclosures to maintain or extend emergency and fire exits, and protect areas outside of work areas from dust, fumes and noise.

.9 Provide and maintain all necessary overhead and other protection as required in public areas during progress of Work.

1.5 SCHEDULING

.1 Schedule Work and sequence operations in cooperation with Owner and Departmental Representative. Work shall proceed in accordance with agreed upon and approved schedule.

.2 Utility and service interruptions shall be kept to a minimum and will be permitted only with written permission of Owner. Make requests for service interruptions at least seven days before proposed date. State in request number of hours of interruption. Confirm date and time forty eight hours in advance of interruption.

.3 Provide two weeks advance notice of entering existing area of Work. Confirm forty-eight hours in advance of starting date.

.4 Contractor shall request written confirmation from Owner that scheduled areas of Work do not contain any equipment or furnishings that Owner intends to salvage, prior to demolition. The Owner reserves the right of first refusal for all items identified for removal or are otherwise salvageable during demolition operations.

1.6 ENVIRONMENTAL REQUIREMENTS

.1 The Contractor shall provide insulated, air-tight, non-combustible temporary partitioning as required between work and public or occupied areas that ensure contaminants do not spread outside of work areas. Clean corridors daily and use floor mats as required to reduce dust migration into corridors.

.2 Seal off ducts, louvers, vents, openings, or ceiling spaces between construction area and remainder of building to prevent dust, dirt, contamination, or debris from entering remainder of building.

.3 Suppress dust and dirt.

.4 Prevent occurrence of unsanitary conditions, flooding or leaking.

.5 Do not allow dirt, debris or discarded materials to accumulate on site. Remove promptly each day.

.6 Keep clean, at all times, those areas adjacent to Work area to prevent dust from entering occupied areas.

.7 Maintain and keep free of debris, materials and equipment, emergency and fire exits and routes.

.8 Provide illumination for safe demolition and working conditions, but in any case not less than 275 lx (25 f.c.) in areas where Work is being done.

.9 Obtain written confirmation from Owner that services to be abandoned, removed or cut have been properly and safely shut off, capped or sealed.

.10 Take precautions to keep noise and vibration producing activities at a minimum when working within (or on) existing building.

.11 Dispose of removed material legally. Do not burn on site. Do not allow debris to enter sewers.

.12 The building is a smoke-free environment. The Contractor will not be allowed to smoke anywhere within the building.

1.7 COORDINATION OF WORK AND NOISE LEVELS

.1 Work under this contract shall be coordinated with Owner through Departmental Representative. When hours of Work, noise levels or vibration are excessive or detrimental to ongoing operation of existing building complex, an alternate time for such Work shall be scheduled through Departmental Representative.

.2 Notify Departmental Representative prior to commencing any Work that will cause undue noise or vibration.

.3 Obtain permission from Departmental Representative prior to drilling holes or cutting chases or openings in floors or ceilings, columns or walls.

1.8 WORK AREAS

.1 Limits of Work are as indicated on drawings. Work and operation of machinery, storage of equipment, and materials and/or supplies, must be contained within areas under construction.

.2 All damage caused to existing roads, lanes, paving, curbs, buildings, and equipment due to Work of this Contract, but not called for as Work under this Contract, shall be made good by Contractor at no additional cost to Owner.

.3 Contact Owner's representative and arrange for sign in/sign out procedure with authorized personnel to obtain keys as required, if requiring access to locked areas during construction; Return keys at end of Work period.

.4 Contractor shall post boundaries of working areas with suitable signs, warning own forces that areas outside of designated Work areas are out of bounds to personnel and equipment. These signs are to remain in place at all times during construction.

.5 Existing protected areas and other areas outside limits of Work area are out of bounds to personnel and equipment. These areas are not to be used for any other purpose.

.6 If revision to limits of working area becomes necessary for any compelling reason, contact Departmental Representative immediately and do not disturb additional area without authorization from Departmental Representative

1.9 EQUIPMENT

.1 Provide equipment required for safe and proper work.

1.10 PREPARATION

.1 Confirm that Owner has removed equipment and furnishings to be salvaged in accordance with agreed schedule.

.2 Provide shoring and bracing as needed to keep building structurally secure and free of deflection in all its parts, and as needed for installation of new structural members.

1.11 PROTECTION

.1 Protect remaining finishes, equipment, and adjacent Work from damage caused by cutting, moving, removal, and patching operations. Protect surfaces that will remain a part of finished Work.

.2 Protect existing and new Work from weather during cutting, moving, removal, and construction. Provide weather protection and other facilities and protection as needed to prevent damage to new Work and to remaining old Work.

.3 When using a cutting torch to remove existing framing provide flameproof screening around area of Work and cover floor area with minimum 6 mm (¼") plywood having joints taped. Allow no sparks or welding or cutting spatter to fall or hit any material or finish that may be damaged or marred.

.4 Provide protection to existing fans, motors and equipment from construction materials, dirt, dust, debris, moisture, and weld spatter.

1.12 SELECTIVE DEMOLITION

.1 Cutting, removing and demolition shall be performed to avoid cutting or removing more than is necessary and avoid damaging adjacent construction.

.2 Do not let piled material or unsanitary conditions create or endanger a structure or persons at any time.

.3 Where any material, component, assembly or item is indicated for re-use, removal shall be by a trade that normally provides or installs such an item. Items being re-used are to be carefully stored in a protected area until they are to be re installed.

.4 Items indicated for salvage are to be turned over to the Owner at a location on site as directed by the Owner and will remain property of the Owner.

.5 Where demolition Work involves cutting into any part of building structure, and materials or finishes that are to be extended, modified or joined to new Work, cutting shall be performed by the trades whose Work is encountered.

.6 Cut out and remove those assemblies, materials, items indicated for removal on the Drawings and remove from site.

.7 Coordinate with Division 02 and Drawings for more detailed requirements.

1.13 PATCHING, EXTENDING AND MATCHING

.1 Patch and extend existing Work using skilled mechanics that are capable of matching existing quality of workmanship. The quality of patched or extended Work shall not be less than that specified in the technical specification Sections.

.2 In areas where any portion of an existing finished surface is damaged, lifted, stained or otherwise made or found to be imperfect, patch or replace imperfect portion of surface with material matching adjacent sound surfaces.

.3 Do not incorporate salvaged or used material in new construction except where specified or where small quantities of finish materials that are difficult to match or duplicate are approved for patching or extending purposes by the Departmental Representative.

.4 Provide adequate support or substrate for patching of finishes.

.5 If surface found to be imperfect was painted or coated, repaint or recoat complete room. Confirm with Departmental Representative.

.6 If surrounding surface cannot be matched, repaint or recoat entire surface.

.7 Patch and repair existing wall junctions where one wall is removed and others remain.

.8 Where new gypsum board on metal stud construction is to align with existing construction (either plaster on concrete block or gypsum lath or existing gypsum board partitions) align construction to so there is no discontinuity between surfaces.

.9 Where existing floor-mounted plumbing fixtures are to be removed, remove piping and fill in existing concrete slab to match existing as specified in Division 03.

.10 Where new finishes are called for and existing finishes are other than paint, remove existing finishes. If in doubt, verify with Departmental Representative prior to removal. This shall include removal of existing corner guards. Repair and make good substrate prior to installing new finishes.

1.14 REPAIR

.1 Repair Work damaged in course of renovations, except at areas accepted otherwise by Departmental Representative for other remedial action.

.2 Where full removal of extensive amounts of almost suitable Work would be needed to replace damaged portions, then filling, straightening, spackling and similar repair techniques, followed by full painting or other finishing, may be permitted by Departmental Representative.

.3 Examples of Work that may frequently be approved by Departmental Representative for repair, rather than replacement: slightly bent ceiling runners, hairline cracks in gypsum board.

.4 If repaired Work is not brought up to standard for new Work, Departmental Representative will direct that it be cut out and replaced with new Work.

1.15 RELOCATION OF EXISTING EQUIPMENT AND FURNITURE

.1 At the Owner’s discretion, selected existing furniture and equipment items shall be temporarily removed, stored, and then relocated and reinstalled where directed by the Departmental Representative, including fastening to floor and wall substrates as required to ensure that they safely and properly function and operate as intended, including any utility hook-ups and connections that may be required.

.2 Coordinate as required to ensure that salvaged equipment and furniture is protected during the work and relocated where required by the Owner, fully functioning, clean, and in same or better condition as found at commencement of the project.

.3 This item shall be paid through Change Directive and Change Order means, pursuant to the terms and conditions of the 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 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./ SDS -Safety Data Sheets per Globally Harmonized System from Q2 of 2017.

.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.

1.2 FILING OF NOTICE

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

1.3 SAFETY ASSESSMENT

.1 Perform site specific safety hazard assessment related to project.

1.4 MEETINGS

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

1.5 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.

1.6 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.

1.7 COMPLIANCE REQUIREMENTS

.1 Comply with Occupational Health and Safety Act of British Columbia.

1.8 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.

1.9 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 (British Columbia), 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.

1.10 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.

1.11 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.

1.12 BLASTING

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

1.13 POWDER ACTUATED DEVICES

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

1.14 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 INTENT

.1 To mitigate environmental damage incurred as a result of construction activity.

1.2 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.

1.3 SUBMITTALS

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

.2 Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction.

.3 Address topics at level of detail commensurate with environmental issue and required construction tasks.

.4 Environmental protection plan, include:

.1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.

.2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.

.3 Names and qualifications of persons responsible for training site personnel.

.4 Descriptions of environmental protection personnel training program.

.5 Erosion and sediment control plan which identifies type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

.6 Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

.7 Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plans include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.

.8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Plan to include measures for marking limits of use areas including methods for protection of features to be preserved within authorized work areas.

.9 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.

.12 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.13 Waste water management plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

.14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

.15 Pesticide treatment plan: to be included and updated, as required.

.16 Include an equipment access plan.

1.4 FIRE PREVENTION AND CONTROL

.1 Carry fire extinguisher for use on each machine and at locations as required in the event of fire. Basic fire fighting equipment recommended includes three shovels, two pulaskis, and two five gallon backpack pumps) shall be maintained at the construction site at a location known and easily accessible to Contractors' staff. Contractor's staff shall receive basic training in early response to wildfire events during the "environmental briefing".

.2 A water truck may be necessary and will depend on the timing of the contract (e.g. - not required during winter or snow covered conditions).

.3 Construction 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 the accidental ignition of any flammable material is prevented.

.5 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. If not available, Banff Dispatch shall be contacted at (403) 762-4506.

.6 Fires and burning of rubbish on site not permitted.

1.5 DISPOSAL OF WASTES

.1 All garbage must be stored and handled in conformance with the National Parks Garbage Regulations.

.2 All surplus and waste materials shall be removed from the job site to approved sites outside of the National Parks. Disposal of all wastes shall be in compliance with the Environmental Contaminants Act and applicable provincial regulations while observing the Code of Good Practice for Management of Hazardous and Toxic Wastes at Federal Establishments.

.3 The closest construction waste site for this project is the Columbia Valley (hazardous material), Revelstoke, or Golden Transfer Station. Contractor shall remove all demolition, construction, and trade waste from the site and dispose of materials at designated site on a regular basis or when directed by Departmental Representative. All users and vehicles must report to the transfer scales prior to the disposal of any material. Various rate schedules apply for unsorted waste, scrap metal, asphalt shingles, appliances, and painted wood.

.4 No food, domestic garbage or hazardous wastes may be deposited in the trade waste site. Obtain bear proof garbage containers on-site for domestic garbage generated on-site by Contractor's personnel.

.5 Dispose of all hazardous wastes in conformance with the Environmental Contaminants Act and applicable provincial regulations and Section 02 50 13 while observing the Code of Good Practice for Management of Hazardous and Toxic Wastes at Federal Establishments.

.6 Maintain the site in a tidy condition, free from the accumulation of waste products, debris and litter.

.7 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

.8 No separate payment will be made for waste disposal. Costs of this work shall be considered incidental to the contract.

.9 Do not burn or bury rubbish and waste materials on-site. Clean concrete shall be deposited in an area designated for this purpose, and in accordance with demolition drawings and specification section 01 74 21.

.10 Remove all demolition, construction, and trade waste from the site and dispose outside of Parks' land to a provincial approved landfill. Other salvaged or dispose materials to location as directed herewithin this document.

.11 Remove creosote timbers from Kootenay National Park and disposed at an approved facility.

1.6 NATIONAL PARKS REGULATIONS

.1 The Contractor shall ensure that all work is performed in accordance with the ordinances, laws, rules and regulations set out in the Canada National Parks Act and Regulations.

.2 The Contractor and all sub-Contractors, each, shall obtain a business license from the Parks Canada Administration Office, Radium, British Columbia, prior to commencement of the contract.

.3 All Contractor's business and private vehicles are required to obtain a vehicle work pass from Parks Canada. These permits may be obtained free of charge at Parks Administration Office.

1.7 CANADIAN ENVIRONMENTAL ASSESSMENT ACT

.1 Execution of the work is subject to the provisions within the Canadian Environmental Assessment Act Guidelines Order of 2003 and subsequent amendments.

.2 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 problem.

1.8 WILDLIFE

.1 Avoid or terminate activities on-site that attract, disturb or harass wildlife and vacate the area and stay away from the immediate location if sheep, bears, cougars display aggressive behaviour or persistent intrusion. Wildlife must be allowed to pass through the site freely.

.2 Notify the Departmental Representative and Parks Environmental Surveillance Officer (ESO) immediately of bear, snake or cougar activity, dens, nests, or wildlife encounters on or around the site. Other wildlife encounters should be reported within 24 hours.

.3 During the Environmental Briefing all personnel shall be instructed by the ESO on procedures to follow in the event of wildlife appearance near or within the work site and any other wildlife concerns.

.4 Protect burrows and rock piles in areas identified by the Parks Canada Environmental Surveillance Officer.

.5 Pets will not be permitted on site.

1.9 DRAINAGE

.1 Provide erosion and sediment control plan that identifies type and locations of erosion and sediment controls to be provided. Plan: include monitoring and reporting requirements to assure that control measure are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

.2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sedimentations control plan.

.3 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.4 Do not pump water containing suspended materials into waterways or drainage systems. Migration to water retention pond is allowed.

.5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.10 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and plants on site and adjacent properties where indicated or as directed by the Departmental Representative. Any materials that inadvertently fall outside the work limits is to be removed promptly in a manner that does not damage trees or vegetation in that location.

.2 When working adjacent to existing trees and, shrubs, the Contractor shall exercise all possible care to avoid injury to vegetation. Where roots or limbs over 25 mm in diameter and bark are damaged during operations, trim damaged portion. The Departmental Representative will inspect all trimmed areas and approve them.

.3 Tree removal shall be limited to trees identified for removal by Parks Canada Environmental Surveillance Officer and as directed by Departmental Representative.

.4 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.

.5 No stripping or vegetation removal shall occur outside the designated areas or as directed by Departmental Representative or ESO.

.6 Restrict tree removal to areas indicated or designated by Departmental Representative.

1.11 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.

1.12 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.

1.13 EQUIPMENT MAINTENANCE, FUELING, AND OPERATION

.1 Provide, operate, and maintain equipment as indicated in Environmental Assessment Amendment, as indicated in Appendix A of this Project Manual and as follows:

.2 The Contractor shall ensure that all soil, seeds and any debris attached to construction equipment to be used on the project site shall be removed (e.g. power washing) outside the Kootenay National Park before delivery to the work site.

.3 Equipment fuelling sites will be identified by the Contractor and approved by the Departmental Representative and the ESO. Except for chain saws, any fuelling closer than 100 metres to any streams, wetlands, water bodies or waterways shall require the authorization and oversight of the Departmental Representative.

.4 Diesel and gasoline delivery vehicles, including bulk tankers shall be parked more than 100 metres from any streams, wetlands, water bodies or watercourses. Gravity fed fuel systems are not allowed. Manual or electric pump delivery systems shall be used. Fuelling personnel shall maintain presence at and immediate attention to the fuelling operation.

.5 Mobile fuel containers (e.g. slip tanks, small fuel carboys) shall remain in the service vehicle at all times.

.6 Equipment used on the project shall be fuelled with El0, and low sulphur diesel fuels and shall conform to local emission requirements. The Contractor is to ensure that unnecessary idling of vehicles is avoided.

.7 Oil changes, lubricant changes, greasing and machinery repairs shall be performed at locations approved by the ESO or the Departmental Representative. Waste lubrication products (e.g. oil filters, used containers, used oil, etc.) shall be secured in spill-proof containers and properly recycled or disposed of at an approved facility. No waste petroleum, lubricant products or related materials are to be discarded, buried or disposed of in borrow pits, turnouts, picnic areas, viewpoints, etc anywhere within Kootenay National Park.

.8 The Contractor shall ensure that all equipment is inspected daily for fluid/fuel leaks and maintained in good working order.

.9 Fuel containers and lubricant products shall be stored only in secure locations specified by the Departmental Representative. Fuel tanks or other potentially deleterious substance containers shall be secured to ensure they are tamperproof and cannot be drained by vandals when left overnight in Kootenay National Park.

1.14 NOISE AND VIBRATION CONTROL

.1 Low impact demolition equipment and methodologies shall be employed that do not generate significant noise or vibration levels in proximity to the thermal springs, hot pools or sensitive wildlife habitat. Ensure there is no impact to subsurface thermal springs or damage to the Hot Pools heritage building.

.2 Demolition activities shall take place with the use of low noise and low ground vibration inducing equipment and techniques for the project site and in particular in close proximity to the sensitive thermal springs, snake habitat and Hot Pools. Particularly sensitive sites include bus shelter, elevator shafts and other structures within a 100 meters radius of the Hot Pools. For example, equipment could include but is not limited to a processor or pulverizer attached to an excavator.

.3 High impact equipment known to cause higher noise levels and potential for higher ground vibrations shall be prohibited. Blasting, portable rock crushers and large jackhammers are not permitted.

.4 Contractor to submit for review a written procedure for concrete demolition at least 2 weeks prior to commencement of site work. Written procedure shall include descriptions of equipment, methods, and tools.

1.15 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 the Work. The Contractor shall prepare a dust management plan as part of their EPP to be approved by the Departmental Representative.

.5 The Contractor shall prevent any deleterious and objectionable materials from entering streams, rivers, wetlands, water bodies or watercourses that would result in damage to aquatic and riparian habitat. Hazardous or toxic products shall be stored no closer than 100 metres from any watercourse.

.6 A Spill Response Plan will be prepared as part of the EPP and shall detail the containment and storage, security, handling, use and disposal of empty containers, surplus product or waste generated in the application of these products, to the satisfaction of the Departmental Representative and the ESO and in accordance with all applicable federal and provincial legislation. The EPP shall include a list of products and materials to be used or brought to the construction site that are considered or defined as hazardous or toxic to the environment. Such products include, but are not limited to, sealer, grout, cement, concrete finishing agents, adhesives and sand blasting agents.

.7 The containment, storage, security, handling, use, unique spill response requirements and disposal of empty containers, surplus product or waste generated in the use of any hazardous or toxic products shall be in accordance with all applicable federal and

provincial legislation. Hazardous products shall be stored no closer than 100 metres from any watercourse.

.8 An impervious berm shall be constructed around fuel tanks and any other potential spill area. The berms shall be capable of holding 110% of tank storage volumes and shall be to the satisfaction of the Departmental Representative and the ESO before start-up. Measures such as collection/drip trays and berms lined with occlusive material such as plastic and a layer of sand, and double-lined fuel tanks can prevent spills into the environment.

.9 The Contractor shall prevent blowing dust and debris by covering and/or providing dust control for temporary roads and on-site work by methods that are approved by the Departmental Representative or ESO.

.10 The Contractor shall provide spill kits at re-fuelling, lubrication, and repair locations that will be capable of dealing with 110% of the largest potential spill and shall be maintained in good working order on the construction site. The ESO and Departmental Representative prior to project start-up must approve these spill kits. The Contractor and site staff shall be informed of the location of the spill response kit(s) and be trained in its use.

.11 Timely and effective action shall be taken to stop, contain and clean-up all spills as long as the site is safe to enter. The Departmental Representative and the ESO shall be notified immediately of any spill. If not available, Banff Dispatch will be contacted at (403) 762-4506. Spill response cards will be distributed during the initial Environmental Briefing with basic instructions and phone numbers.

.12 In the event of a major spill, all other work shall be stopped and all personnel devoted to spill containment and clean-up.

.13 The costs involved in a spill incident (the control, clean up, disposal of contaminants and site remediation to pre-spill conditions), shall be the responsibility of the Contractor. The site will be inspected to ensure completion to the expected standard and to the satisfaction of the Departmental Representative and ESO.

1.16 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 granted or equitable adjustments allowed to Contractor for such suspensions.

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, Departmental Representative shall pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Contractor for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.

.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 and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative, 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 Refer to Departmental Representative/Contractor Contract.

.2 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.

.3 Make good other Contractor's work damaged by such removals or replacements promptly to the satisfaction of the Departmental Representative.

.4 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative 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.

1.7 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

.2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.

1.8 MOCK-UPS

.1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.

.2 Construct in locations acceptable to Departmental Representative or as specified in specific Section.

.3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in orderly sequence, to not cause delays in Work.

.4 Failure to prepare mock-ups 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.

.5 If requested, Departmental Representative will assist in preparing schedule fixing dates for preparation.

.6 Remove mock-up at conclusion of Work or when acceptable to Departmental Representative.

.7 Mock-ups may remain as part of Work.

.8 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

.9 List of Mock ups:

.1 Light box for new hot springs sign

.2 Step lighting in metal handrail

.3 As indicated in specification sections

1.9 MILL TESTS

.1 Submit mill test certificates as requested or required of specification Sections.

1.10 EQUIPMENT AND SYSTEMS

.1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

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 Remove from site all such work after use.

1.3 DEWATERING

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

1.4 WATER SUPPLY

.1 Provide continuous supply of potable water for construction use.

.2 Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal.

.3 Pay for utility charges at prevailing rates.

1.5 TEMPORARY POWER AND LIGHT

.1 Owner will pay for temporary power during construction for temporary lighting and operating of power tools, to a maximum supply of 10.8kw.

.2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.

.3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor.

.4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 100 lx.

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

.6 Electrical power and lighting systems 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.

1.6 TEMPORARY COMMUNICATION FACILITIES

.1 Departmental Representative will provide local telephone access, Contractor to provide data and cell phone for their own use.

1.7 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.
- .4 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.

.3 U.S. Environmental Protection Agency (EPA) / Office of Water

- .1 2003 U.S. EPA Construction General Permit.
- .2 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

.4 Public Works Government Services Canada (PWGSC) standard acquisition clauses and conditions (SACC) – ID: R0202D, Title: General conditions “C”.

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 may be permitted on site at overflow parking lot east of site provided it does not disrupt performance of Work.

.2 Provide and maintain adequate access to project site.

1.8 SECURITY

.1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays.

.2 Provide fencing and additional security as deemed necessary.

1.9 OFFICES

.1 Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.

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

.3 Subcontractors to provide their own offices as necessary. Direct location of these offices.

.4 Utilities are not available in laydown area (overflow parking lot), Contractor to provide temporary power.

1.10 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.

1.11 SANITARY FACILITIES

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

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

.3 When permanent water and drain connections are completed, provide temporary water closets and urinals complete with temporary enclosures, inside building. Permanent facilities may be used on approval of Departmental Representative.

1.12 CONSTRUCTION SIGNAGE

.1 Provide and erect project sign indicating safety notification and Contractor Phone number.

.2 No other signs or advertisements, other than warning signs, are permitted on site.

.3 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.

1.13 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 Construct access and haul roads necessary.

.8 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.

.9 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.

.10 Dust control: adequate to ensure safe operation at all times.

.11 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.

.12 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.

.13 Provide snow removal for work area during period of Work.

.14 Remove, upon completion of work, haul roads designated by Departmental Representative.

1.14 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 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.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 sediment and erosion control plan, specific to site, that complies with 2003 U.S. EPA Construction General Permit 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.

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 lockable truck entrance gate and at least 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, open shafts, open stair wells, open edges of floors and roofs.

.2 Provide as required by governing authorities.

1.5 WEATHER ENCLOSURES

.1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.

.2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.

.3 Design enclosures to withstand wind pressure and snow loading.

1.6 DUST TIGHT SCREENS

.1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.

.2 Maintain and relocate protection until such work is complete.

1.7 ACCESS TO SITE

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.8 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.

1.9 FIRE ROUTES

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

1.10 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.

1.11 PROTECTION OF BUILDING FINISHES

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

1.12 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 borne by Departmental Representative 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 STORAGE, HANDLING AND PROTECTION

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

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

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

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

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

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

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

.8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.4 TRANSPORTATION

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

1.5 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.

1.6 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.

1.7 CO-ORDINATION

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

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.8 CONCEALMENT

.1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

1.9 REMEDIAL WORK

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

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

1.10 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Departmental Representative of conflicting installation. Install as directed.

1.11 FASTENINGS

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

.2 Prevent electrolytic action between dissimilar metals and materials.

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

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

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

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

1.12 FASTENINGS - EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.13 PROTECTION OF WORK IN PROGRESS

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

1.14 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, and/or building occupants and pedestrian and vehicular traffic.

.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 QUALIFICATIONS OF SURVEYOR

.1 Qualified registered land surveyor, licensed to practice in Place of Work, acceptable to Departmental Representative.

1.2 SURVEY REFERENCE POINTS

.1 Existing base horizontal and vertical control points are designated on drawings.

.2 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.

.3 Make no changes or relocations without prior written notice to Departmental Representative.

.4 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

.5 Require surveyor to replace control points in accordance with original survey control.

1.3 SURVEY REQUIREMENTS

.1 Establish two permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.

.2 Establish lines and levels, locate and lay out, by instrumentation.

.3 Stake for grading, fill and topsoil placement and landscaping features.

.4 Stake slopes and berms.

.5 Establish pipe invert elevations.

.6 Stake batter boards for foundations.

.7 Establish foundation column locations and floor elevations.

.8 Establish lines and levels for mechanical and electrical work.

1.4 EXISTING SERVICES

.1 Before commencing work, arrange and pay to establish location and extent of service lines in area of Work and notify Departmental Representative of findings.

.2 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by Departmental Representative.

1.5 SUBSURFACE CONDITIONS

.1 Promptly notify Departmental Representative in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.

.2 After prompt investigation, should Departmental Representative determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

1.6 LOCATION OF EQUIPMENT AND FIXTURES

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform Departmental Representative of impending installation and obtain approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

1.7 RECORDS

.1 Maintain a complete, accurate log of control and survey work as it progresses.

.2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.

.3 Record locations of maintained, re-routed and abandoned service lines.

1.8 SUBMITTALS

.1 Submit name and address of Surveyor to Departmental Representative.

.2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.

.3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

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

1.3 PREPARATION

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

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

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

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

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

1.4 EXECUTION

.1 Execute cutting, fitting, and patching including excavation and fill, 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.

.5 Remove samples of installed Work for testing.

.6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

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

.8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

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

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

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

.12 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material.

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

.14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.5 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 PROJECT CLEANLINESS

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

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.

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

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

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

.6 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Waste Management and Disposal.

.7 Dispose of waste materials and debris off site.

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

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

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

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

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

1.2 FINAL CLEANING

.1 Clean work prior to final review by Departmental Representative.

.2 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.3 Remove waste in accordance with Section 01 74 21 – Waste Management and Disposal.

.4 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.5 Prior to final review remove surplus products, tools, construction machinery and equipment.

.6 Remove waste products and debris including that caused by Owner or other Contractors.

.7 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.

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

.9 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.10 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.

.11 Clean lighting reflectors, lenses, and other lighting surfaces.

.12 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.13 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.

.14 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.15 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.16 Remove dirt and other disfiguration from exterior surfaces.

.17 Clean and sweep roofs, gutters, areaways, and sunken wells.

.18 Sweep and wash clean paved areas.

.19 Clean equipment and fixtures to sanitary condition.

.20 Clean mechanical equipment including replacement of filters in accordance with Section 01 47 18 – Indoor Air Quality.

.21 Clean roofs, downspouts, and drainage systems.

.22 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

.23 Remove snow and ice from access to building.

1.3 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 WASTE MANAGEMENT GOALS

.1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss PWGSC's Waste Management Plan and Goals.

.2 Accomplish maximum control of solid construction waste.

.3 Preserve environment and prevent pollution and environment damage.

1.2 DEFINITIONS

.1 Demolition Waste Audit (DWA): Relates to actual waste generated from project.

.2 Materials Source Separation Program (MSSP): Consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.

.3 Recyclable: Ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.

.4 Recycle: Process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.5 Recycling: Process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.6 Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.

.2 Returning reusable items including pallets or unused products to vendors.

.7 Salvage: Removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.8 Separate Condition: Refers to waste sorted into individual types.

.9 Source Separation: Acts of keeping different types of waste materials separate beginning from first time they became waste.

.10 Waste Management Coordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.

.11 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. Refer to Schedule B. WRW is based on information acquired from WA (Schedule A).

.12 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill. Refer to Schedule A.

.13 Class III: non-hazardous waste - construction renovation and demolition waste.

.14 Cost/Revenue Analysis Workplan (CRAW): based on information from WRW, and intended as financial tracking tool for determining economic status of waste management practices.

.15 Inert Fill: inert waste - exclusively asphalt and concrete.

1.3 DOCUMENTS

.1 Maintain at job site, one copy of following documents:

.1 Waste Audit.
.2 Waste Reduction Workplan.
.3 Material Source Separation Plan.
.4 Schedules A, B, C, D, E completed for project.

1.4 SUBMITTALS

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

.2 Prepare and submit following prior to project start-up:

.1 Submit two (2) copies of completed Waste Reduction Workplan (WRW): Schedule B.
.2 Submit two (2) copies of completed Demolition Waste Audit (DWA): Schedule C.
.3 Submit two (2) copies of Materials Source Separation Program (MSSP) description.

1.5 WASTE AUDIT (WA) SUBMITTALS

.1 Conduct WA prior to project start-up.

.2 Prepare WA: Schedule A.

.3 Record, on WA - Schedule A, extent to which materials or products used consist of recycled or reused materials or products.

1.6 WASTE REDUCTION WORKPLAN (WRW)

.1 Prepare WRW prior to project start-up.

.2 WRW should include but not limited to:

.1 Destination of materials listed.
.2 Deconstruction/disassembly techniques and sequencing.
.3 Schedule for deconstruction/disassembly.
.4 Location.
.5 Security.
.6 Protection.
.7 Clear labelling of storage areas.
.8 Details on materials handling and removal procedures.
.9 Quantities for materials to be salvaged for reuse or recycled and materials sent to landfill.

.3 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.

.4 Describe management of waste.

.5 Identify opportunities for reduction, reuse, and recycling of materials. Based on information acquired from WA.

.6 Post WRW or summary where workers at site are able to review content.

.7 Set realistic goals for waste reduction, recognize existing barriers and develop strategies to overcome these barriers.

.8 Monitor and report on waste reduction by documenting total volume and cost of actual waste removed from project.

1.7 DEMOLITION WASTE AUDIT (DWA)

.1 Prepare DWA prior to project start-up.

.2 Complete DWA: Schedule C.

.3 Provide inventory of quantities of materials to be salvaged for reuse, recycling, or disposal.

1.8 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

.1 Prepare MSSP and have ready for use prior to project start-up.

.2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by authorities having jurisdiction.

.3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide containers to deposit reusable and recyclable materials.

.5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.

.6 Locate separated materials in areas which minimize material damage.

.7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.

.1 Transport to recycling facility.

1.9 STORAGE, HANDLING AND PROTECTION

.1 Unless specified otherwise, materials for removal become Contractor's property.

.2 Protect, stockpile, store and catalogue salvaged items.

.3 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to approved local facility.

.4 Protect structural components not removed for demolition from movement or damage.

.5 Support affected structures. If safety of building is endangered, cease operations and immediately notify Department having jurisdiction.

.6 Protect surface drainage, mechanical and electrical from damage and blockage.

.7 Separate and store materials produced during dismantling of structures in designated areas.

.8 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.

.1 On-site source separation is recommended.
.2 Remove co-mingled materials to off-site processing facility for separation.
.3 Provide waybills for separated materials.

1.10 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of any waste into waterways, storm, or sanitary sewers.

.3 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

.4 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

.5 Keep records of construction waste including:

.1 Number and size of bins.
.2 Waste type of each bin.
.3 Total tonnage generated.
.4 Tonnage reused or recycled.
.5 Reused or recycled waste destination.

1.11 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises.

.2 Provide security measures approved by Owner's Representative.

1.12 SCHEDULING

.1 Coordinate Work with other activities at site to ensure timely and orderly progress of Work.

Part 2 Products

2.1 Not used

Part 3 Execution

3.1 APPLICATION

.1 Do Work in compliance with WRW.

.2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 CLEANING

.1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.

.2 Clean-up work area as work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

3.3 DIVERSION OF MATERIALS

.1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Owner's Representative and consistent with applicable fire regulations.

.1 Mark containers or stockpile areas.

.2 Provide instruction on disposal practices.

.2 On-site sale or distribution of salvaged materials to third parties is not permitted.Demolition waste:

Material Type	Recommended Diversion %	Actual Diversion %
Acoustical Insulation	100	
Doors and Frames	100	
Electrical Equipment	80	
Mechanical Equipment	100	
Metals	100	
Rubble	100	

Wood (uncontaminated)	100	
Other		

.4 Construction Waste:

Material Type	Recommended Diversion %	Actual Diversion %
Cardboard	100	
Plastic Packaging	100	
Rubble	100	
Steel	100	
Wood (uncontaminated)	100	
Other		

3.4 WASTE AUDIT (WA)

.1 The following pertains to Schedule A - Waste Audit (WA). Column-1 refers to the category of waste, and a physical description of the material (e.g. off-cuts, clean drywall, etc.). Column-2 refers to the total quantity of materials received by the Contractor. Measurement units must be specified. Column-3 refers to the estimated percentage of material that is waste. Column-4 refers to the total quantity of waste (column-2 x column-3). Column-5 refers to the areas(s) in which the waste was generated. Column-6 refers to the total percentage of recycled material from the specified total quantity of waste(column-4). Column-7 refers to the total percentage of reused material from the specified total quantity of waste (column-4).

.2 Schedule A - Waste Audit (WA):

(1) Material Category	(2) Material Quantity Unit %	(3) Estimated Waste	(4) Total Quantity of Waste (unit)	(5) Generation Point	(6) % Recycled	(7) % Reused
Wood & Plastics						
Material						
Off-Cuts						
Warped						
Plastic						
Cardboard						
Other						
Doors & Windows						
Material						
Frames						
Glass						
Wood						
Metal						
Other						

3.5 WASTE REDUCTION WORKPLAN (WRW)

.1 The following pertains to Schedule B - Waste Reduction Workplan (WRW). Column-1 refers to the category and type of waste materials. Column-2 refers to the persons responsible for completing the WRW. Column-3 refers to Column-4 of Schedule A. Column-4 refers to the amount of reused waste predicted and realized. Column-5 refers to

the amount of recycled waste predicted and realized. Column-6 refers to the approved recycling facility.

.2 Schedule B:

(1) Material Quantity Category	(2) Person Amount Responsible	(3) Total of Project (units)	(4) Reused Actual	(5) Recycle Actual(s) Amount	(6) Material Destination(s)
Wood & Plastics					
Material Description					
Chutes					
Warped					
Plastic					
Cardboard Packaging					
Other					
Doors & Windows					
Material Description					
Painted					
Frames					
Glass					
Wood					
Metal					
Other					

3.6 DEMOLITION WASTE AUDIT (DWA)

.1 The following pertains to Schedule C - Demolition Waste Audit (DWA). Column-1 refers to the type of material salvaged. Column-2 refers to the material quantity shown in column-1. Several columns may be required to identify specific demolition areas. Column-3 refers to the unit of measurement used to describe Column-2. Column-4 refers to the total quantity of salvaged material. Column-5 refers to the cumulative volume of salvaged material. Column-6 refers to the total weight in kilograms. Column-7 refers to remarks and assumptions made about the specified material.

.2 Schedule C - Demolition Waste Audit (DWA):

(1) Material Description Assumptions	(2) Quantity	(3) Unity	(4) Total	(5) Volume (cum)	(6) Weight (cum)	(7) Remarks & Assumption
Wood						
Wood						
Stud						
Plywood						
Baseboard-wood						
Door						
Trim-Wood						
Cabinet						
Doors &Windows						
Panel						
Regular						

Slab Regular						
Wood						
Laminate						
Glazing						

3.7 CANADIAN GOVERMENTAL DEPARTMENTS CHIEF REPSONSIBLITY FOR THE ENVIROMENT

.1 Schedule E - Government Chief Responsibility for the Environment:

.1 Ministry of Environment Lands and Parks
810 Blanshard Street, 4th Floor
Victoria, BC, V8V 1X4
604-387-1161 / 604-356-6464

.2 Waste Reduction Commission Soils and Hazardous Waste
770 South Pacific Blvd, Suite 303
Vancouver, BC, V6B 5E7
604-660-9550 / 604-660-9596

END OF SECTION

Part 1 General

1.1 INTENT

.1 A facility start-up process shall be used to bring the facility to a fully operational state, free of deficiencies, in the most efficient and timely manner achievable.

.2 Contractor shall be responsible for testing, adjusting and balancing of all:

.1 Piped, ducted, wired and wireless services and systems, including all components and equipment forming part thereof, and

.2 Manually and mechanically operated systems including all components and equipment forming part thereof.

.3 Perform starting of each system and each item of equipment in accordance with the general requirements specified in this section and is specific to facility start-up and commissioning of the facility.

.4 This section specifies additional requirements to those required for normal Contractorès start-up of equipment and systems as contained in the General Requirements of the Contract, and as follows:

.1 Perform and record tests to confirm proper performance and compliance with requirements of Contract Documents; take corrective action as necessary.

.2 Perform adjustments to ensure proper, efficient and safe operation.

.3 Perform balancing to ensure that the various parts of system are in a proper state of equilibrium.

.5 Performance Testing will begin after declaration of Substantial Performance as described in Section 01 77 00 – Closeout Procedures and will lead to Fine Tuning of equipment and systems.

.6 Fine Tuning will occur after declaration of Substantial Performance as described in Section 01 77 00 – Closeout Procedures and will lead to Final Acceptance of the Work.

.7 A Commissioning Authority will be employed by the Owner to act on the behalf of the Owner to oversee the starting, testing, adjusting and balancing operations, and verify that equipment and systems are working as specified and within manufacturer’s operating tolerances.

1.2 RELATED SECTIONS

.1 Section 01 77 00 – Closeout Procedures

.2 Section 01 79 00 – Demonstration and Training

1.3 QUALITY ASSURANCE

.1 Contractor shall perform testing, adjusting and balancing with Contractor's qualified personnel, or employ and pay for a qualified organization to perform such services.

.2 Perform testing, adjusting and balancing after starting of equipment and systems.

.3 Provide personnel, operate systems at designated times, and under conditions required for proper testing, adjusting, and balancing.

.4 Report to Departmental Representative any deficiencies or defects noted during testing, adjusting and balancing, which cannot be promptly corrected.

Part 2 Products

2.1 MANUFACTURER'S SITE SERVICES

.1 Provide manufacturers authorized representative when specified, or when requested by the Owner at site to do the following:

- .1 Inspect, check and approve equipment and systems installation before starting.
- .2 Supervise placing equipment and systems in operation.

.2 Manufacturers' authorized representative shall provide a written report verifying that equipment:

- .1 Is properly installed and lubricated;
- .2 Is in accurate alignment;
- .3 Is free from any undue stress imposed by connecting lines or anchor bolts; and,
- .4 Is being satisfactorily operated under load conditions.

Part 3 Execution

3.1 PREPARATION

.1 Have Contract Documents, shop drawings, product data, and operation and maintenance data at hand during starting process.

.2 Coordinate sequence for starting of various equipment and systems.

.3 Prepare each system and item of equipment for testing, adjusting and balancing.

.4 Verify that each systems and equipment installation is complete and in continuous operation.

.5 Verify ambient conditions.

3.2 FACILITY START-UP

.1 Contractor shall do the following during Facility Start-Up, not necessarily in order listed:

- .1 Start equipment and systems as specified below.
- .2 Test, adjust and balance equipment and systems as specified below.
- .3 Demonstrate equipment and systems as specified in Section 01 79 00 – Demonstration and Training.
- .4 Complete and submit Facility Start-Up report forms including:
  - .1 Contractor's system and equipment start-up reports.
  - .2 Testing, adjusting and balancing reports.
  - .3 Manufacturers' equipment start-up reports.
- .5 Review Contract Documents and inspect the Work to ensure completeness of the Work and compliance with requirements of Contract Documents.
- .6 Correct Contract Deficiencies identified as a result of the foregoing and as may be identified by the Owner.
- .7 Execute Change Orders issued by the Owner.
- .8 Perform all other work and activities required for fulfillment of prerequisites to Substantial Performance of the Work as specified in Section 01 77 00.

3.3 STARTING

.1 Verify that each item of equipment has been checked for proper lubrication; drive rotation, belt tension, control sequence, and other conditions affecting starting and operation; take corrective action as necessary.

.2 Execute starting under supervision of Contractor's personnel and, when specified or requested by Owner, manufacturer's authorized representative.

.3 Place equipment and systems in operation in proper sequence and in accordance with approved Contractor's Start-Up sub-schedule.

.4 Take corrective action as necessary.

3.4 TESTING, ADJUSTING AND BALANCING

.1 Testing: Perform tests to confirm compliance with requirements of Contract Documents. Take corrective action as necessary.

.2 Adjusting: Perform adjustments to ensure proper, efficient and safe operation.

.3 Balancing: Perform balancing to ensure that the various parts of system are in a proper state of equilibrium.

.4 Provide testing, adjusting and balancing of all:

.1 Piped, ducted, wired and wireless services and systems, including all components and equipment forming part thereof as identified in technical sections, and

.2 Manually and mechanically operated systems including all components and equipment forming part thereof.

.3 Comply with the requirements of all CSA, ASTM, ASHRAE, IEEE and other standards affecting their portion of the work to ensure that systems installed will meet the Owner's testing criteria.

.4 Copies of required standards shall be kept on site during installation and be available for viewing by the Contractor and the Departmental Representative.

.5 Perform testing, adjusting and balancing after starting of equipment and systems.

3.5 FINE TUNING

.1 Fine tuning shall include, but not be limited to, the following:

.1 Balancing: final balancing for snowmelt system.

.2 Electrical Equipment and Systems: Testing of dimming systems and devices.

.3 Other systems and equipment as identified in the technical sections.

.2 Fine tuning shall commence upon Owner's acceptance of Performance Testing results.

.3 Coordinate and cooperate with the Owner's Commissioning Authority Representative.

.4 Make necessary adjustments to comply with standards established by the Specifications ready for Owner's formalized verification and commissioning process.

.5 Contractor shall do the following during Fine Tuning:

.1 Correct all Contract Deficiencies previously outstanding and those identified during Fine Tuning.

.2 Execute Change Orders issued by Owner.

.3 Perform all other work and activities required for fulfillment of prerequisites to Final Acceptance of the Work as specified in Section 01 77 00.

.6 Owner will do the following during Fine Tuning:

.1 Conduct user surveys and take environmental measurements as necessary to identify existing and potential problems.

.2 Initiate Change Orders as required.

.3 Perform other activities related to Final Acceptance of the Work as specified in Section 01 77 00.

3.6 SEASONAL CONSTRAINTS

.1 Notwithstanding all-inclusive requirements specified in this Section, additional separate cycles of Facility Start-Up, Performance Testing and Fine Tuning may be necessitated at a later time on equipment and systems whose full operation is dependent on seasonal conditions.

.2 Contractor's responsibilities with respect to such later Facility Start-Up activities shall be as specified in this Section.

3.7 PARTIAL UTILIZATION OF WORK

.1 Applicable requirements specified in this Section shall apply to the parts of the Work being utilized when partial utilization of the Work is required.

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 Operation of systems have been demonstrated to Owner's personnel.
- .5 Work is complete and ready for final inspection.

.3 Final Review: when items noted above are completed, request final inspection of Work by Departmental Representative and Contractor. If Work is deemed incomplete by 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 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. Refer to Construction Contract. If Work is deemed incomplete by 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.

1.2 CLEANING

.1 In accordance with Section 01 74 11 – Cleaning.

.2 Remove waste and surplus materials, rubbish and construction facilities from the site 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 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 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

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

.8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.9 Pay costs of transportation.

.10 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.

.9 Provide marked up red-line drawings to the Departmental Representative for submission to Consultant to update the drawings, 1:1 scaled CAD files in dwg format on CD.

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.

.6 Training: refer to Section 01 79 00 - Demonstration and Training.

1.4 AS-BUILTS AND SAMPLES

.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 depths of elements of foundation in relation to finish first floor datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 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 FINAL SURVEY

.1 Submit final site survey certificate in accordance with Section 01 71 00 - Examination and Preparation, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.7 REAL PROPERTY CERTIFICATE

.1 Supply to the Departmental Representative, as soon as construction of foundations and basic ground floor levels are completed, a survey plan from a registered British Columbia Land Surveyor.

.2 Plan shall show dimensioned building plan at ground level, distance from property lines, and elevation of the floor used as datum.

.3 This includes all buildings in Contract.

1.8 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 Provide servicing and lubrication schedule, and list of lubricants required.

.7 Include manufacturer's printed operation and maintenance instructions.

.8 Include sequence of operation by controls manufacturer.

.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.

.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control and 01 91 13 - General Commissioning (Cx) Requirements.

.15 Additional requirements: as specified in individual specification sections.

1.9 MATERIALS AND FINISHES

.1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-Protection and Weather-Exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional Requirements: as specified in individual specifications sections.

1.10 SPARE PARTS

.1 Provide spare parts, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to site, location as directed; place and store.

.4 Receive and catalogue items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

1.11 MAINTENANCE MATERIALS

.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to site, location as directed; place and store.

.4 Receive and catalogue items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

1.12 SPECIAL TOOLS

.1 Provide special tools, in quantities specified in individual specification section.

.2 Provide items with tags identifying their associated function and equipment.

.3 Deliver to site, location as directed; place and store.

.4 Receive and catalogue items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

1.13 STORAGE, HANDLING AND PROTECTION

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

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

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

1.14 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 joint 4 month and 9 month warranty inspection, measured from time of acceptance, by Departmental Representative.

.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 Listing and status of delivery of Certificates of Warranty for warranty items, to include HVAC balancing, pumps, motors, transformers, and commissioned systems such as fire protection, alarm systems, and sprinkler systems.

.3 Provide list for each warranted equipment, item, feature of construction or system indicating:

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

.5 Names, addresses and telephone numbers of sources of spare parts.

.6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of warranty period.

.9 Summary of maintenance procedures required to continue warranty in force.

.10 Cross-Reference to specific pertinent Operation and Maintenance manuals.

.11 Organization, names and phone numbers of persons to call for warranty service.

.12 Typical response time and repair time expected for various warranted equipment.

.4 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.

.5 Procedure and status of tagging of equipment covered by extended warranties.

.6 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.

1.15 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.

1.16 WARRANTY TAGS

.1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Departmental Representative.

.2 Attach tags with copper wire and spray with waterproof silicone coating.

.3 Leave date of acceptance until project is accepted for occupancy.

.4 Indicate following information on tag:

.1 Type of product/material.
.2 Model number.
.3 Serial number.
.4 Contract number.
.5 Warranty period.
.6 Inspector's signature.
.7 Construction Contractor.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of final inspection.

.2 Owner will provide list of personnel to receive instructions, and will co-ordinate their attendance at agreed-upon times.

1.2 QUALITY CONTROL

.1 When specified in individual Sections require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

1.3 SUBMITTALS

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

.2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.

.3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.4 Give time and date of each demonstration, with list of persons present.

1.4 CONDITIONS FOR DEMONSTRATIONS

.1 Equipment has been inspected and put into operation.

.2 Testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements and equipment and systems are fully operational.

.3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.5 PREPARATION

.1 Verify that conditions for demonstration and instructions comply with requirements.

.2 Verify that designated personnel are present.

1.6 DEMONSTRATION AND INSTRUCTIONS

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at [scheduled] [agreed upon] times, at the [equipment] [designated] location.

.2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.

.3 Review contents of manual in detail to explain aspects of operation and maintenance.

.4 Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

1.7 TIME ALLOCATED FOR INSTRUCTIONS

.1 Ensure amount of time required for instruction of each item of equipment or system as required and as follows:

.1 Electrical Controls: 6 hours

.2 Heat Trace and Snow Melt Systems: 5 hours

.3 Other items as directed.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.

.2 Acronyms:

.1 AFD - Alternate Forms of Delivery, service provider.
.2 BMM - Building Management Manual.
.3 Cx - Commissioning.
.4 EMCS - Energy Monitoring and Control Systems.
.5 O&M - Operation and Maintenance.
.6 PI - Product Information.
.7 PV - Performance Verification.
.8 TAB - Testing, Adjusting and Balancing.

1.2 GENERAL

.1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:

.1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
.2 Ensure appropriate documentation is compiled into the BMM.
.3 Effectively train O&M staff.

.2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.

.1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.
.2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.

.3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

.4 AFD managed projects the term Departmental Representative in Cx specifications to be interpreted as AFD Service Provider.

1.3 COMMISSIONING OVERVIEW

.1 Section 01 91 31 - Commissioning (Cx) Plan.

.2 For Cx responsibilities refer to Section 01 91 31 - Commissioning (Cx) Plan.

.3 Cx to be a line item of Contractor's cost breakdown.

.4 Cx activities supplement field quality and testing procedures described in relevant technical sections.

.5 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.

.6 Departmental Representative will issue Interim Acceptance Certificate when:

.1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.

.2 Equipment, components and systems have been commissioned.

.3 O&M training has been completed.

1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

.1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Departmental Representative, to ensure effective performance.

.2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

1.5 PRE-CX REVIEW

.1 Before Construction:

.1 Review contract documents, confirm by writing to Departmental Representative.

.1 Adequacy of provisions for Cx.

.2 Aspects of design and installation pertinent to success of Cx.

.2 During Construction:

.1 Co-ordinate provision, location and installation of provisions for Cx.

.3 Before start of Cx:

.1 Have completed Cx Plan up-to-date.

.2 Ensure installation of related components, equipment, sub-systems, systems is complete.

.3 Fully understand Cx requirements and procedures.

.4 Have Cx documentation shelf-ready.

.5 Understand completely design criteria and intent and special features.

.6 Submit complete start-up documentation to Departmental Representative.

.7 Have Cx schedules up-to-date.

.8 Ensure systems have been cleaned thoroughly.

.9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.

.10 Ensure "As-Built" system schematics are available.

.4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

1.6 CONFLICTS

.1 Report conflicts between requirements of this section and other sections to Departmental Representative before start-up and obtain clarification.

.2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.7 SUBMITTALS

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

.1 Submit no later than 4 weeks after award of Contract:

.1 Name of Contractor's Cx agent.

.2 Draft Cx documentation.

.3 Preliminary Cx schedule.

.2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.

.3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least 8 weeks prior to start of Cx.

.4 Provide additional documentation relating to Cx process required by Departmental Representative.

1.8 COMMISSIONING DOCUMENTATION

.1 Refer to Section [01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use].

.2 Departmental Representative to review and approve Cx documentation.

.3 Provide completed and approved Cx documentation to Departmental Representative.

1.9 COMMISSIONING SCHEDULE

.1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 16 - Construction Schedule.

.2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:

.1 Approval of Cx reports.

.2 Verification of reported results.

.3 Repairs, retesting, re-commissioning, re-verification.

.4 Training.

1.10 COMMISSIONING MEETINGS

.1 Convene Cx meetings following project meetings: Section 01 32 16 - Construction Schedule and as specified herein.

.2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.

.3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

.4 At 60% construction completion stage. Section 01 32 16 - Construction Schedule. Departmental Representative to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:

.1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.

.2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.

.5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.

.6 Meeting will be chaired by Departmental Representative, Contractor] [Cx Agent], who will record and distribute minutes.

.7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.11 STARTING AND TESTING

.1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

1.12 WITNESSING OF STARTING AND TESTING

.1 Provide 14 days notice prior to commencement.

.2 Departmental Representative to witness of start-up and testing.

.3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.13 MANUFACTURER'S INVOLVEMENT

.1 Factory testing: manufacturer to:

.1 Coordinate time and location of testing.

.2 Provide testing documentation for approval by Departmental Representative.

.3 Arrange for Departmental Representative to witness tests.

.4 Obtain written approval of test results and documentation from Departmental Representative before delivery to site.

.2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative.

.1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.

.2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

.3 Integrity of warranties:

.1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.

.2 Verify with manufacturer that testing as specified will not void warranties.

.4 Qualifications of manufacturer's personnel:

.1 Experienced in design, installation and operation of equipment and systems.

.2 Ability to interpret test results accurately.

.3 To report results in clear, concise, logical manner.

1.14 PROCEDURES

.1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.

.2 Conduct start-up and testing in following distinct phases:

.1 Included in delivery and installation:

.1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.

.2 Visual inspection of quality of installation.

.2 Start-up: follow accepted start-up procedures.

.3 Operational testing: document equipment performance.

.4 System PV: include repetition of tests after correcting deficiencies.

.5 Post-substantial performance verification: to include fine-tuning.

.3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.

.4 Document require tests on approved PV forms.

.5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:

.1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.

.2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative.

.3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.

.1 Rejected equipment to be remove from site and replace with new.

.2 Subject new equipment/systems to specified start-up procedures.

1.15 START-UP DOCUMENTATION

.1 Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.

.2 Start-up documentation to include:

.1 Factory and on-site test certificates for specified equipment.

.2 Pre-start-up inspection reports.

.3 Signed installation/start-up check lists.

.4 Start-up reports,

.5 Step-by-step description of complete start-up procedures, to permit Departmental Representative to repeat start-up at any time.

1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

.1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.

.2 With assistance of manufacturer develop written maintenance program and submit Departmental Representative for approval before implementation.

.3 Operate and maintain systems for length of time required for commissioning to be completed.

.4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.17 TEST RESULTS

.1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.

.2 Provide manpower and materials, assume costs for re-commissioning.

1.18 START OF COMMISSIONING

.1 Notify Departmental Representative at least 21 days prior to start of Cx.

.2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.19 INSTRUMENTS / EQUIPMENT

.1 Submit to Departmental Representative for review and approval:

.1 Complete list of instruments proposed to be used.

.2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.

.2 Provide the following equipment as required:

.1 2-way radios.

.2 Ladders.

.3 Equipment as required to complete work.

1.20 COMMISSIONING PERFORMANCE VERIFICATION

.1 Carry out Cx:

.1 Under actual operating conditions, over entire operating range, in all modes.

.2 On independent systems and interacting systems.

.2 Cx procedures to be repeatable and reported results are to be verifiable.

.3 Follow equipment manufacturer's operating instructions.

.4 EMCS trending to be available as supporting documentation for performance verification.

1.21 WITNESSING COMMISSIONING

.1 Departmental Representative to witness activities and verify results.

1.22 AUTHORITIES HAVING JURISDICTION

.1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.

.2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.

.3 Provide copies to Departmental Representative within 5 days of test and with Cx report.

1.23 COMMISSIONING CONSTRAINTS

.1 Since access into secure or sensitive areas will be very difficult after occupancy it is necessary to complete Cx of occupancy, weather, and seasonal sensitive equipment and systems in these areas before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

1.24 EXTRAPOLATION OF RESULTS

.1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Departmental Representative in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

1.25 EXTENT OF VERIFICATION

.1 Laboratory areas:

.1 Provide manpower and instrumentation to verify up to 100% of reported results.

.2 Elsewhere:

.1 Provide manpower and instrumentation to verify up to 30% of reported results, unless specified otherwise in other sections.

.3 Number and location to be at discretion of Departmental Representative.

.4 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.

.5 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.

.6 Perform additional commissioning until results are acceptable to Departmental Representative.

1.26 REPEAT VERIFICATIONS

.1 Assume costs incurred by Departmental Representative for third and subsequent verifications where:

.1 Verification of reported results fail to receive Departmental Representative's approval.

.2 Repetition of second verification again fails to receive approval.

.3 Departmental Representative deems Contractor's request for second verification was premature.

1.27 SUNDRY CHECKS AND ADJUSTMENTS

.1 Make adjustments and changes which become apparent as Cx proceeds.

.2 Perform static and operational checks as applicable and as required.

1.28 DEFICIENCIES, FAULTS, DEFECTS

.1 Correct deficiencies found during start-up and Cx to satisfaction of Departmental Representative.

.2 Report problems, faults or defects affecting Cx to Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative.

1.29 COMPLETION OF COMMISSIONING

.1 Upon completion of Cx leave systems in normal operating mode.

.2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.

.3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

1.30 ACTIVITIES UPON COMPLETION OF COMMISSIONING

.1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

1.31 TRAINING

.1 In accordance with Section 01 91 41 - Commissioning (Cx) - Training.

1.32 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

.1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

1.33 OCCUPANCY

.1 Cooperate fully with Departmental Representative during stages of acceptance and occupancy of facility.

1.34 INSTALLED INSTRUMENTATION

.1 Use instruments installed under Contract for TAB and PV if:

.1 Accuracy complies with these specifications.

.2 Calibration certificates have been deposited with Departmental Representative.

.2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

1.35 PERFORMANCE VERIFICATION TOLERANCES

.1 Application tolerances:

.1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10% of specified values.

.2 Instrument accuracy tolerances:

.1 To be of higher order of magnitude than equipment or system being tested.

.3 Measurement tolerances during verification:

.1 Unless otherwise specified actual values to be within +/- 2% of recorded values.

1.36 OWNER'S PERFORMANCE TESTING

.1 Performance testing of equipment or system by Departmental Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Description of overall structure of Cx Plan and roles and responsibilities of Cx team.

1.2 REFERENCES

.1 Public Works and Government Services Canada (PWGSC)

.1 PWGSC - Commissioning Guidelines CP.4 -3rd edition-[03].

.2 Underwriters' Laboratories of Canada (ULC)

1.3 GENERAL

.1 Provide a fully functional facility:

.1 Systems, equipment and components meet user's functional requirements before date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under normal loads.

.2 Facility user and O M personnel have been fully trained in aspects of installed systems.

.3 Optimized life cycle costs.

.4 Complete documentation relating to installed equipment and systems.

.2 Term "Cx" in this section means "Commissioning".

.3 Use this Cx Plan as master planning document for Cx:

.1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.

.2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.

.3 Sets out deliverables relating to O M, process and administration of Cx.

.4 Describes process of verification of how built works meet design requirements.

.5 Produces a complete functional system prior to issuance of Certificate of Occupancy.

.6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:

.1 Overview of Cx.

.2 General description of elements that make up Cx Plan.

.3 Process and methodology for successful Cx.

.4 Acronyms:

.1 Cx - Commissioning.

.2 EMCS - Energy Monitoring and Control Systems.

.3 MSDS - Material Safety Data Sheets.

.4 SDS- Safety Data Sheets

.5 GHS- Globally Harmonized System

.6 PI - Product Information.

.7 PV - Performance Verification.

.8 TAB - Testing, Adjusting and Balancing.

.9 WHMIS - Workplace Hazardous Materials Information System.

.5 Commissioning terms used in this Section:

.1 Bumping: short term start-up to prove ability to start and prove correct rotation.

.2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

1.4 DEVELOPMENT OF 100% CX PLAN

.1 Cx Plan to be 100% completed within 4 weeks of award of contract to take into account:

.1 Approved shop drawings and product data.

.2 Approved changes to contract.

.3 Contractor's project schedule.

.4 Cx schedule.

.5 Contractor's, sub-contractor's, suppliers' requirements.

.6 Project construction team's and Cx team's requirements.

.2 Submit completed Cx Plan to Departmental Representative Consultant and obtain written approval.

1.5 REFINEMENT OF CX PLAN

.1 During construction phase, revise, refine and update Cx Plan to include:

.1 Changes resulting from Client program modifications.

.2 Approved design and construction changes.

.2 Revise, refine and update every 2 months during construction phase. At each revision, indicate revision number and date.

.3 Submit each revised Cx Plan to Departmental Representative for review and obtain written approval.

.4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

1.6 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

.1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.

.2 Project Manager will select Cx Team consisting of following members:

.1 PWGSC Design Quality Review Team: during construction, will conduct periodic site reviews to observe general progress.

.2 PWGSC Quality Assurance Commissioning Manager: ensures Cx activities are carried out to ensure delivery of a fully operational project including:

.1 Review of Cx documentation from operational perspective.

.2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.

.3 Protection of health, safety and comfort of occupants and O&M personnel.

.4 Monitoring of Cx activities, training, development of Cx documentation.

.5 Work closely with members of Cx Team.

.3 Authority is responsible for:

.1 Organizing Cx.

.2 Monitoring operations Cx activities.

.3 Witnessing, certifying accuracy of reported results.

.4 Witnessing and certifying TAB and other tests.

.5 Ensuring implementation of final Cx Plan.

.6 Performing verification of performance of installed systems and equipment.

.7 Implementation of Training Plan.

.4 Construction Team: contractor, sub-contractors, suppliers and support disciplines, is responsible for construction/installation in accordance with contract documents, including:

.1 Testing.

.2 TAB.

.3 Performance of Cx activities.

.4 Delivery of training and Cx documentation.

.5 Assigning one person as point of contact with Consultant and PWGSC Cx Manager for administrative and coordination purposes.

.5 Contractor's Cx agent implements specified Cx activities including:

.1 Demonstrations.

.2 Training.

.3 Testing.

.4 Preparation, submission of test reports.

.6 Property Manager: represents lead role in Operation Phase and onwards and is responsible for:

.1 Receiving facility.

.2 Day-To-Day operation and maintenance of facility.

1.7 EXTENT OF CX

.1 The General Contractor shall provide commissioning services for the following items.

.1 List of Electrical Equipment and Acceptance Tests:

.1 All new lighting as shown on the drawings

.2 Lighting control dimming equipment, integration with BMS.

.2 Heat trace wiring and controller.

.3 Snow melt system.

1.8 DELIVERABLES RELATING TO O&M PERSPECTIVES

.1 General requirements:

.1 Compile English documentation.

.2 Documentation to be computer-compatible format ready for inputting for data management.

.2 Provide deliverables:

.1 Warranties.

.2 Project record documentation.

.3 Inventory of spare parts, special tools and maintenance materials.

.4 Maintenance Management System (MMS) identification system used.

.5 WHMIS information.

.6 MSDS data sheets /SDS from Q2 of 2017.

1.9 DELIVERABLES RELATING TO THE CX PROCESS

.1 General:

.1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.

.2 Definitions:

.1 Cx as used in this section includes:

.1 Cx of components, equipment, systems, subsystems, and integrated systems.

.2 Factory inspections and performance verification tests.

.3 Deliverables: provide:

.1 Cx Specifications.

.2 Startup, pre-Cx activities and documentation for systems, and equipment.

.3 Completed installation checklists (ICL).

.4 Completed product information (PI) report forms.

.5 Completed performance verification (PV) report forms.

.6 Results of Performance Verification Tests and Inspections.

.7 Description of Cx activities and documentation.

.8 Description of Cx of integrated systems and documentation.

.9 Tests of witnessed by Departmental Representative and Cx Authority;

.10 Training Plans.

.11 Cx Reports.

.12 Prescribed activities during warranty period.

1.10 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION

.1 General:

.1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.

.2 Definitions;

.1 Cx as used in this section includes:

.1 Cx of components, equipment, systems, subsystems, and integrated system.

.2 Factory inspections and performance verification tests.

.3 Deliverables: provide:

.1 Cx Specifications;

.2 Startup, pre-Cx activities and documentation for systems, and equipment;

.3 Completed installation checklists (ICL);

.4 Completed product information (PI) report forms;

.5 Completed performance verification (PV) report forms;

.6 Results of Performance Verification Tests and Inspections;

.7 Description of Cx activities and documentation;

.8 Description of Cx of integrated systems and documentation;

.9 Tests of following witnessed by PWGSC Design Quality Review Team;

.10 Tests performed by Owner/User;

.11 Training Plans;

.12 Cx Reports;

.13 Prescribed activities during warranty period;

.4 Cx Authority to witness and certify tests and reports of results provided to Departmental Representative.

.5 Departmental Representative to participate.

1.11 START-UP

.1 Start up components, equipment and systems.

.2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction, following equipment, systems:

.3 Cx Authority to monitor some of these start-up activities.

.1 Rectify start-up deficiencies to satisfaction of Cx Authority.

.4 Performance Verification (PV):

.1 Approved Cx Agent to perform.

.1 Repeat when necessary until results are acceptable to Cx Authority.

.2 Use procedures modified generic procedures to suit project requirements.

.3 Cx Authority to witness and certify reported results using approved PI and PV forms.

.4 Cx Authority to approve completed PV reports and provide to Departmental Representative.

.5 Cx Authority reserves the right to verify up to 30% of reported results at random.

.6 Failure of randomly selected item shall result in rejection of PV report or report of system startup and testing.

1.12 CX ACTIVITIES AND RELATED DOCUMENTATION

.1 Perform Cx by specified Cx Agent using procedures developed by Cx Authority and approved by Departmental Representative.

.2 Cx Authority to monitor Cx activities.

.3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using approved PV forms.

.4 Cx Authority to witness, certify reported results of, Cx activities and forward to Departmental Representative

Cx Authority reserves the right to verify a percentage of reported results at no cost to contract.

1.13 INSTALLATION CHECK LISTS (ICL)

.1 Refer to Section [01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms].

1.14 PRODUCT INFORMATION (PI) REPORT FORMS

.1 Refer to Section [01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms].

1.15 PERFORMANCE VERIFICATION (PV) REPORT

.1 Refer to Section [01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms].

1.16 DELIVERABLES RELATING TO ADMINISTRATION OF CX

.1 General:

.1 Because of risk assessment, complete Cx of occupancy, weather and seasonal-sensitive equipment and systems in these areas before building is occupied.

1.17 CX SCHEDULES

.1 Prepare detailed Cx Schedule and submit to Departmental Representative for review and approval same time as project Construction Schedule. Include:

.1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:

.1 Design criteria, design intents.

.2 Pre-TAB review: 28 days after contract award, and before construction starts.

.3 Cx agents' credentials: 60 days before start of Cx.

.4 Cx procedures: 3 months after award of contract.

.5 Cx Report format: 3months after contract award.

.6 Notification of intention to start TAB: 21 days before start of TAB.

.7 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.

.8 Notification of intention to start Cx: 14 days before start of Cx.

.9 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14 days before start of integrated system Cx.

.10 Identification of deferred Cx.

.11 Implementation of training plans.

.12 Cx reports: immediately upon successful completion of Cx.

.2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Departmental Representative.

.3 Six (6) months in Cx schedule for verification of performance in all seasons and wear conditions.

.2 After approval, incorporate Cx Schedule into Construction Schedule.

.3 Consultant, Contractor, Contractor's Cx agent, and Departmental Representative will monitor progress of Cx against this schedule.

1.18 CX REPORTS

.1 Submit reports of tests, witnessed and certified by Cx Authority to Departmental Representative who will verify reported results.

.2 Include completed and certified PV reports in properly formatted Cx Reports.

.3 Before reports are accepted, reported results to be subject to verification by Cx Authority.

1.19 ACTIVITIES DURING WARRANTY PERIOD

.1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:

.1 Adjustment of lighting controls, including Q settings.

1.20 TESTS TO BE PERFORMED BY OWNER/USER

.1 None is anticipated on this project.

1.21 TRAINING PLANS

.1 Refer to Section 01 91 41 - Commissioning (Cx) - Training.

1.22 FINAL SETTINGS

.1 Upon completion of Cx to satisfaction of Cx Authority and the Departmental Representative lock control devices in their final positions, indelibly mark settings marked and include in Cx Reports.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Commissioning forms to be completed for equipment, system and integrated system.

.2 Related Requirements

.1 Section 01 91 13 - General Commissioning (Cx) Requirements.

.2 Section 01 91 31 – Commissioning (Cx) Plan

.3 Section 01 91 41 – Commissioning Training

1.2 RELATED WORKS

.1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.3 INSTALLATION/START-UP CHECK LISTS

.1 Include the following data:

.1 Product manufacturer's installation instructions and recommended checks.

.2 Special procedures as specified in relevant technical sections.

.3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.

.2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Departmental Representative supplemental additional data lists will be required for specific project conditions.

.3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.

.4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Cx Authority. Check lists will be required during Commissioning and will be included in the Building Maintenance Manual (BMM) at completion of project.

.5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

1.4 PRODUCT INFORMATION (PI) REPORT FORMS

.1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.

.2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Departmental Representative's approval.

1.5 PERFORMANCE VERIFICATION (PV) FORMS

.1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.

.2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.

.3 Prior to PV of integrated system, complete PV forms of related systems and obtain Departmental Representative's approval.

1.6 COMMISSIONING FORMS

.1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.

.2 Strategy for Use:

- .1 Contractor project-specific Commissioning forms with Specification data included.
- .2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
- .3 Confirm operation as per design criteria and intent.
- .4 Identify variances between design and operation and reasons for variances.
- .5 Verify operation in specified normal and emergency modes and under specified load conditions.
- .6 Record analytical and substantiating data.
- .7 Verify reported results.
- .8 Form to bear signatures of recording technician.
- .9 Submit immediately after tests are performed.
- .10 Reported results in true measured SI unit values.
- .11 Provide Departmental Representative with originals of completed forms.
- .12 Maintain copy on site during start-up, testing and commissioning period.
- .13 Forms to be both hard copy and electronic format with typed written results.

1.7 LANGUAGE

.1 To suit the language profile of the awarded contract.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 This Section specifies roles and responsibilities of Commissioning Training.

.2 Related Requirements

.1 Section 01 91 13 - General Commissioning (Cx) Requirements

.2 Section 01 91 31 - Commissioning Plan

.3 Section 01 91 33 - Commissioning Forms

1.2 TRAINEES

.1 Trainees: personnel selected for operating and maintaining the roadway lighting system, Includes Facility Manager, building operators, maintenance staff, security staff, and technical specialists as required.

.2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

1.3 INSTRUCTORS

.1 Engineer will provide:

.1 Descriptions of systems.

.2 Instruction on design philosophy, design criteria, and design intent.

.2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:

.1 Start-Up, operation, shut-down of equipment, components and systems.

.2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.

.3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.

.3 Contractor and equipment manufacturer to provide instruction on:

.1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

1.4 TRAINING OBJECTIVES

.1 Training to be detailed and duration to ensure:

.1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.

.2 Effective on-going inspection, measurements of system performance.

.3 Proper preventive maintenance, diagnosis and trouble-shooting.

.4 Ability to update documentation.

.5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.5 TRAINING MATERIALS

.1 Instructors to be responsible for content and quality.

.2 Training materials to include:

.1 "As-Built" Contract Documents.

.2 Operating Manual.

.3 Maintenance Manual.

.4 TAB and PV Reports.

.3 Project Manager, Commissioning Manager and Facility Manager will review training manuals.

.4 Training materials to be in a format that permits future training procedures to same degree of detail.

.5 Supplement training materials:

.1 Transparencies for overhead projectors.

.2 Multimedia presentations.

.3 Manufacturer's training videos.

.4 Equipment models.

1.6 SCHEDULING

.1 Include in Commissioning Schedule time for training.

.2 Deliver training during regular working hours, training sessions to be 8 hours in length.

.3 Training to be completed prior to acceptance of facility.

1.7 RESPONSIBILITIES

.1 Be responsible for:

.1 Implementation of training activities,

.2 Coordination among instructors,

.3 Quality of training, training materials,

.2 Departmental Representative will evaluate training and materials.

.3 Upon completion of training, provide written report, signed by Instructors, witnessed by Departmental Representative.

1.8 ELECTRICAL SYSTEM TRAINING

.1 Training to include demonstrations by Instructors using the installed equipment and systems.

.2 Content includes:

.1 Functional requirements.

.2 System philosophy, limitations of systems.

.3 Review of system layout, equipment, components and controls.

.4 Maintenance and servicing.

.5 Trouble-shooting diagnosis.

.6 Inter-Action among systems during integrated operation.

.7 Review of O&M documentation.

.3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Definitions:

.1 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, include but not limited to: poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or materials that endanger human health or environment if handled improperly.

.2 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating related, required submittal and reporting requirements.

.3 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill.

.4 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.

.2 Reference Standards:

.1 Canadian Environmental Protection Act (CEPA)

.1 CCME PN 1326-2008, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems for Petroleum Products and Allied Petroleum Products.

.2 CSA International

.1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

.3 Department of Justice Canada (Jus)

.1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.

.2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.1 SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.

.2 SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations.

.3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

.4 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S660-08, Standard for Nonmetallic Underground Piping for Flammable and Combustible Liquids.

.2 ULC/ORD-C58.15, Overfill Protection Devices for Flammable Liquid Storage Tanks.

.3 ULC/ORD-C58.19, Spill Containment Devices for Underground Flammable Liquid Storage Tanks.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings:

.1 Convene pre-installation meeting 1 week prior to beginning on-site installation, with Departmental Representative in accordance with Section 01 31 19 - Project Meetings to:

.1 Verify project requirements.

.2 Verify existing site conditions adjacent to demolition work.

.3 Co-ordination with other construction sub-trades.

.2 Hold project meetings every as per Section 01.

.3 Ensure Departmental Representatives attend.

.4 WMC must provide written report on status of waste diversion activity at each meeting.

.5 Departmental Representative will provide written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.

.2 Scheduling:

.1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.

.1 In event of unforeseen delay notify Departmental Representative in writing.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures and Section 01 74 21 - Construction/Demolition Waste Management Disposal.

.2 WMC is responsible for fulfilment of reporting requirements.

.3 Prior to beginning of Work on site submit detailed Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal and indicate:

.1 Descriptions of and anticipated quantities of materials to be salvaged reused, recycled and landfilled.

.2 Schedule of selective demolition.

.3 Number and location of dumpsters.

.4 Anticipated frequency of tippage.

.5 Name and address of haulage and waste receiving organizations.

.4 Submit certified receipts from authorized disposal sites and reuse and recycling facilities for material removed from site upon request of Departmental Representative.

.1 Written authorization from Departmental Representative is required to deviate from haulage and waste receiving organizations listed in Waste Reduction Workplan.

.5 Shop Drawings:

.1 Submit for review and approval demolition drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning.

.2 Submit demolition drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.

.6 Sustainable Design Submittals:

.1 Erosion and Sedimentation Control: submit erosion and sedimentation control plan in accordance with [authorities having jurisdiction.

.2 Construction Waste Management:

.1 Submit project Waste Management highlighting recycling and salvage requirements.

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements: Ensure Work is performed in compliance with applicable Federal, Provincial/Territorial and Municipal regulations.

1.5 SITE CONDITIONS

.1 Environmental protection:

.1 Ensure Work is done in accordance with Section 01 35 43 - Environmental Procedures.

.2 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.

.3 Fires and burning of waste or materials is not permitted on site.

.4 Do not bury rubbish waste materials.

.5 Do not dispose of waste or volatile materials including but not limited to: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.

.1 Ensure proper disposal procedures are maintained throughout project.

.6 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.

.7 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction or as directed by Departmental Representative.

.8 Protect trees, plants and foliage on site and adjacent properties where indicated.

.9 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.

.10 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all temporary roads.

1.6 EXISTING CONDITIONS

.1 If material resembling spray or trowel applied asbestos or other substance listed as hazardous be encountered in course of demolition, stop work, take preventative measures, and notify Departmental Representative immediately. Proceed only after receipt of written instructions have been received from Departmental Representative.

.2 Structures to be demolished are based on their condition at time of examination prior to tendering.

.1 Remove, protect and store salvaged items as directed by Departmental Representative. Salvage items as identified by Departmental Representative.

Part 2 Products

2.1 EQUIPMENT

.1 Equipment and heavy machinery:

.1 Demolition equipment to be used shall be included in the demolition plan and approved for use by the Department Representative.

Part 3 Execution

3.1 PREPARATION

.1 Temporary Erosion and Sedimentation Control:

.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 (including the pool area and waterway), according to requirements of authorities having jurisdiction.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during demolition.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal after completion of demolition work.

.2 Protection of in-place conditions:

.1 Work in accordance with Section 01 35 43 - Environmental Procedures.

.2 Prevent movement, settlement or damage of adjacent structures, services, walks, paving, parts of existing building to remain.

.1 Provide bracing, shoring and underpinning as required.

.2 Repair damage caused by demolition as directed by Departmental Representative.

.3 Support affected structures and, if safety of structure being demolished or adjacent structures or services appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative.

.4 Prevent debris from blocking surface drainage system, mechanical and electrical systems which must remain in operation.

.3 Surface Preparation:

.1 Underground storage tanks and piping: remove and dispose in accordance with record drawings.

.2 Do not disrupt active or energized utilities designated to remain undisturbed.

3.2 DEMOLITION

.1 Do demolition work in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

.2 Blasting operations not permitted during demolition.

.3 Remove contaminated or dangerous materials as defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

.4 Prior to start of Work remove contaminated or hazardous materials as directed by Departmental Representative from site and dispose of in safe manner and in accordance with TDGA and other applicable requirements. Refer Existing Conditions in PART 1.

.5 Demolish structures as indicated in the demolition drawings.

.6 Prior to demolishing existing foundations for the existing historic bridge, uncover and request permission from the Departmental Representative. All parties should be notified of foundation review for the existing historic bridge at least 48 hours prior.

.7 Do not demolish foundations supporting the existing roadway bridges, waterway support structures, pool structures.

.8 At end of each day's work, leave Work in safe and stable condition.

.9 Demolish to minimize dusting. Keep materials wetted as directed by Departmental Representative.

.10 . Demolish masonry and concrete walls in pieces suitable for reuse as specified.

.11 Remove and dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.

.12 Use natural lighting to do Work where possible.

.1 Shut off lighting except those required for security purposes at end of each day.

.2 All additional construction lighting requirements shall be reviewed and approved by the Departmental Representative prior to implementation.

3.3 CLEANING

.1 Develop Waste Reduction Workplan related to Work of this Section.

.2 Designate appropriate security resources / measures to prevent vandalism, damage and theft.

.3 Stockpiles:

.1 Any site stockpiling shall be reviewed and approved by the Department Representative and shall minimize disruption to existing services

.2 Locate stockpiled materials convenient for use in new construction. Eliminate double handling wherever possible.

.3 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Definitions:

.1 Dangerous Goods: product, substance, or organism specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.

.2 Hazardous Material: product, substance, or organism used for its original purpose; and is either dangerous goods or material that will cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.

.3 Hazardous Waste: hazardous material no longer used for its original purpose and that is intended for recycling, treatment or disposal.

.4 VOC: Volatile organic compound.

.2 Reference Standards:

.1 Canadian Environmental Protection Act,1999 (CEPA 1999)

.1 Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149).

.2 Department of Justice Canada (Jus)

.1 Transportation of Dangerous Goods Act, 1992 (TDG Act) [1992], (c. 34).

.2 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2001-286).

.3 Green Seal Environmental Standards (GS)

.1 GS-11-2008, 2nd Edition, Paints and Coatings.

.2 GS-36-00, Commercial Adhesives.

.4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.2 Safety Data Sheets (SDS) per GHS from Q2 of 2017.

.5 National Research Council Canada Institute for Research in Construction (NRC-IRC)

.1 National Fire Code of Canada-2005.

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 hazardous materials and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit PDF copies of WHMIS MSDS - Material Safety Data Sheets/ SDS -Safety Data Sheets per GHS from Q2 of 2017 to Departmental Representative for each hazardous material required prior to bringing hazardous material on site.

.3 Submit hazardous materials management plan to Departmental Representative that identifies hazardous materials, usage, location, personal protective equipment requirements, and disposal arrangements.

.3 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Reduction Workplan in accordance with Section 01 35 43 - Environmental Procedures.

.2 Low-Emitting Materials: submit listing of adhesives, sealants, paints and coatings used in building, comply with VOC and chemical component limits or restrictions requirements.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance 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 Transport hazardous materials and wastes in accordance with Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.

.1 When exporting hazardous waste to another country, ensure compliance with Export and Import of Hazardous Waste and Hazardous Recyclable Materials Regulations.

.4 Storage and Handling Requirements:

.1 Co-ordinate storage of hazardous materials with Departmental Representative and abide by internal requirements for labelling and storage of materials and wastes.

.2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.

.3 Store and handle flammable and combustible materials in accordance with National Fire Code of Canada requirements.

.4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.

.1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.

.2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Departmental Representative.

.5 Transfer of flammable and combustible liquids is prohibited within buildings.

.6 Transfer flammable and combustible liquids away from open flames or heat-producing devices.

.7 Solvents or cleaning agents must be non-flammable or have flash point above 38 degrees C.

.8 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.

.9 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.

.10 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:

- .1 Store hazardous materials and wastes in closed and sealed containers.
- .2 Label containers of hazardous materials and wastes in accordance with WHMIS.
- .3 Store hazardous materials and wastes in containers compatible with that material or waste.
- .4 Segregate incompatible materials and wastes.
- .5 Ensure that different hazardous materials or hazardous wastes are stored in separate containers.
- .6 Store hazardous materials and wastes in secure storage area with controlled access.
- .7 Maintain clear egress from storage area.
- .8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.
- .9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.
- .10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.
- .11 When hazardous waste is generated on site:
  - .1 Co-ordinate transportation and disposal with Departmental Representative.
  - .2 Comply with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.
  - .3 Use licensed carrier authorized by provincial authorities to accept subject material.
  - .4 Before shipping material obtain written notice from intended hazardous waste treatment or disposal facility it will accept material and it is licensed to accept this material.
  - .5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.
  - .6 Only trained personnel handle, offer for transport, or transport dangerous goods.
  - .7 Provide photocopy of shipping documents and waste manifests to Departmental Representative.
  - .8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide photocopy of completed manifest to Departmental Representative.

.9 Report discharge, emission, or escape of hazardous materials immediately to Departmental Representative and appropriate provincial authority. Take reasonable measures to control release.

.10 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.

.11 Report spills or accidents immediately to Departmental Representative. Submit a written spill report to Departmental Representative within 24 hours of incident.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 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 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.

.4 Recycle hazardous wastes for which there is approved, cost effective recycling process available.

.5 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.

.6 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.

.7 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.

.8 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.

.9 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.

.10 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:

.1 Hazardous wastes recycled in manner constituting disposal.

.2 Hazardous waste burned for energy recovery.

.3 Lead-acid battery recycling.

.4 Hazardous wastes with economically recoverable precious metals.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

- .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
- .3 CSA O121-08 (R2013) - Douglas Fir Plywood.
- .4 CSA O151-09 (R2014) - Canadian Softwood Plywood.
- .5 CSA O153-13 - Poplar Plywood.
- .6 CAN/CSA-O325.0-92R2003, Construction Sheathing.
- .7 CAN/CSA-S269.3-M92R2013 - Concrete Formwork, National Standard of Canada

.2 Underwriters' Laboratories of Canada (ULC)

.3 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit shop drawings for formwork and falsework.

.3 Submit WHMIS MSDS - Material Safety Data Sheets /Safety Data Sheets (SDS) per Globally Harmonized System from Q2 of 2017 in accordance with Section 01 47 15 - Sustainable Requirements: Construction and Section 02 81 01 - Hazardous Materials.

- .1 Form release agent

.4 Co-ordinate submittal requirements and provide submittals required by Section 01 47 15 - Sustainable Requirements: Construction.

.5 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CAN/CSA-S269.3 for formwork drawings.

.6 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.

.7 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

- .1 Form release agent

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 47 21 - Construction/Demolition Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Divert wood materials from landfill to a recycling reuse facility as approved by Departmental Representative.

.4 Divert plastic materials from landfill to a recycling facility as approved by Departmental Representative.

.5 . Divert unused form release material from landfill to an official hazardous material collections site as approved by the Departmental Representative.

Part 2 Products

2.1 MATERIALS

.1 Materials and resources in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

.2 Formwork materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121.

.2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.

.3 Rigid insulation board: to CAN/ULC-S701.

.3 Form ties:

.1 For concrete not designated as exposed to view, use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.

.2 For concrete to be exposed to view, do not use ties on surfaces designated as exposed.

.4 Form release agent: non-toxic, biodegradable, low VOC.

.5 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal 15 to 24 mm^3 /s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.

.6 Sealant: to Section 07 92 00 - Joint Sealants.

Part 3 Execution

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Refer to architectural drawings for concrete members requiring architectural exposed finishes.

.3 Do not place shores and mud sills on frozen ground.

.4 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.5 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.

.6 Align form joints and make watertight.

.1 Keep form joints to minimum.

.7 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, only where detailed.

.8 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.9 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.

.1 Ensure that anchors and inserts will not protrude beyond surfaces unless indicated otherwise.

.10 Line forms for following surfaces:

.1 Outer face of slab edge and curbs all around.

.2 Secure lining taut to formwork to prevent folds.

.3 Pull down lining over edges of formwork panels.

.4 Ensure lining is new and not reused material.

.5 Ensure lining is dry and free of oil when concrete is poured.

.6 Application of form release agents on formwork surface is prohibited where drainage lining is used.

.7 If concrete surfaces require cleaning after form removal, use only pressurized water stream so as not to alter concrete's smooth finish.

.8 Cost of textile lining is included in price of concrete for corresponding portion of Work.

.11 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2 REMOVAL AND RESHORING

.1 Leave formwork in place for following minimum periods of time after placing concrete.

.1 3 days for walls and sides of slabs.

.2 3 days for columns.

.3 28 days for beam soffits, slabs, decks and other structural members, or 10 days when replaced immediately with adequate shoring to standard specified for falsework.

.4 2 days for footings and abutments.

.2 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Concrete Institute (ACI)

.1 SP-66-04, ACI Detailing Manual 2004.

.2 ASTM International

.1 ASTM A1064/A1064M-15 Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.2 ASTM A123/A123M-15 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.3 ASTM A 143/A 143M-07(2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

.4 ASTM A934/A934M-13 Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.

.3 CSA International

.1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 A23.3-14 - Design of Concrete Structures.

.3 CSA-G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement.

.4 G40.20-13/G40.21-13 - General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel.

.4 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Prepare reinforcement drawings in accordance with RSIC-2004 Reinforcing Steel Manual of Standard Practice and SP-66(04) ACI Detailing Manual-2004.

.3 Shop Drawings:

.1 Indicate placing of reinforcement and:

.1 Bar bending details.

.2 Lists.

.3 Quantities of reinforcement.

.4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.

.5 Indicate sizes, spacings and locations of chairs, spacers and hangers.

.2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.

.1 Provide type A tension lap splices unless otherwise indicated.

1.3 QUALITY ASSURANCE

.1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.

.1 Mill Test Report: upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel.

.2 Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

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 off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by Departmental Representative.

.2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.

.3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.

.4 Cold-drawn annealed steel wire ties: to ASTM A 82/A 82M.

.5 Welded steel wire fabric: to ASTM A 185/A 185M.

.1 Provide in flat sheets only.

.6 . Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2. Use non-corroding, non-staining materials only.

.7 Mechanical splices: subject to approval of Departmental Representative.

.8 Galvanizing of non-prestressed reinforcement: to, minimum zinc coating 600 g/m^2.

.1 Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.

.2 If chromate treatment is carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.

.1 Temperature of solution equal to or greater than 32 degrees and galvanized steels immersed for minimum 20 seconds.

.3 If galvanized steels are at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.

.1 In this case, no restriction applies to temperature of solution.

.4 Chromate solution sold for this purpose may replace solution described above, provided it is of equivalent effectiveness.

.1 Provide product description as described in Part 1 – SUBMITTALS.

.9 Plain round bars: to CSA-G40.20/G40.21.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2, SP-66 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.1 SP-66 unless indicated otherwise.

.2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.

.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis.

.2 Upon request inform Departmental Representative of proposed source of material to be supplied.

Part 3 Execution

3.1 PREPARATION

.1 Galvanizing to include chromate treatment.

.1 Duration of treatment to be 1 hour per 25 mm of bar diameter.

.2 Conduct bending tests to verify galvanized bar ductility is in accordance with ASTM A143/A143M.

3.2 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.

.2 When field bending is authorized, bend without heat, applying slow and steady pressure.

.3 Replace bars, which develop cracks or splits.

3.3 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.

.2 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.

.3 Ensure cover to reinforcement is maintained during concrete pour.

.4 Touch up damaged and cut ends of galvanized reinforcing steel with compatible finish to provide continuous coating.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Abbreviations and Acronyms:

- .1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement.
  - .1 Type GU, GUb and GUL - General use cement.
  - .2 Type MS and MSb - Moderate sulphate-resistant cement.
  - .3 Type MH, MHb and MHL - Moderate heat of hydration cement.
  - .4 Type HE, HEb and HEL - High early-strength cement.
  - .5 Type LH, LHb and LHL - Low heat of hydration cement.
  - .6 Type HS and HSb - High sulphate-resistant cement.
- .2 Fly ash:
  - .1 Type F - with CaO content less than 15%.
  - .2 Type CI - with CaO content ranging from 15 to 20%.
  - .3 Type CH - with CaO greater than 20%.
- .3 GGBFS - Ground, granulated blast-furnace slag.
- .4 CSF - Condensed silica fume.

.2 Reference Standards:

- .1 ASTM International
  - .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
  - .2 ASTM C309-11 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  - .3 ASTM C494/C494M-15a Standard Specification for Chemical Admixtures for Concrete.
  - .4 ASTM C1017/C1017M-13e1 Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-51.34-M86 (R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .3 CSA International
  - .1 A23.1-14/A23.2-14 - Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete.
  - .2 CSA A283-06 (R2011), Qualification Code for Concrete Testing Laboratories.
  - .3 CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation Meetings: in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart, convene pre-installation meeting one week prior to beginning concrete works.

.1 Ensure key personnel, site supervisor, Departmental Representative, specialty contractors - finishing and forming - attend.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 At least 2 weeks prior to beginning Work, provide Departmental Representative with concrete mix designs for each class of concrete specified.

.3 Provide testing results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.

.4 Concrete records: provide accurate records of concrete items cast indicating date and location of placement, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.

.5 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 90 minutes for concrete to be delivered to site of Work and discharged after batching.

.6 Provide two copies of WHMIS MSDS/ SDS per GHS from Q2 of 2017 in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.

1.4 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.

.1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.

.3 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:

.1 Falsework erection.

.2 Hot weather concrete.

.3 Cold weather concrete.

.4 Curing.

.5 Finishes.

.6 Formwork removal.

.7 Joints.

.4 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:

.1 Concrete hauling time: deliver to site of Work and discharged within 90 minutes maximum after batching.

.1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.

.2 Deviations to be submitted for review by Departmental Representative.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

Part 2 Products

2.1 DESIGN CRITERIA

.1 Alternative 1 - Performance: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

2.2 PERFORMANCE CRITERIA

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.3 MATERIALS

.1 Portland Cement: to CSA A3001, Type GU.

.2 Blended hydraulic cement: Type GUb to CSA A3001.

.3 Portland-limestone cement: Type GUL to CSA A23.1.

.4 Water: to CSA A23.1.

.5 Aggregates: to CSA A23.1/A23.2.

.6 Admixtures:

.1 Air entraining admixture: to ASTM C 260.

.2 Chemical admixture: to ASTM C 494 and ASTM C 1017. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

.3 Corrosion-inhibiting admixture: to ASTM C 494. \

.4 Lithium-based admixture: to ASTM C 494.

.5 Shrinkage-reducing admixture (SRA): to ASTM C494 and ASTM WK 23938.

.7 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.

.1 Compressive strength: 50 MPa at 28 days.

.2 Net shrinkage at 28 days: maximum 0%.

.8 Non-premixed dry pack grout: composition of non-metallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 50 MPa at 28 days.

.9 Curing compound: to CSA A23.1/A23.2 and ASTM C 309, Type 1-chlorinated rubber.

.10 Pre-moulded joint fillers:

.1 Bitumen impregnated fiber board: to ASTM D 1751.

.2 . Sponge rubber: to ASTM D 1752, Type I, firm grade.

.11 . Weep hole tubes: plastic.

2.4 MIXES

.1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.

.1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.

.2 Provide concrete mix to meet following plastic state requirements:

.1 Workability: free of surface blemishes, loss of mortar, colour variations and segregation.

.2 Finishability: Surface sheen is not present under controlled conditions. No amount of bleeding.

.3 Set time: 4 hours maximum.

.3 Provide concrete mix to meet following hard state requirements:

.1 Durability and class of exposure: C-XL for structural slabs and beams, ramp slabs on grade, grade beams, slab beams and curbs. Refer to controlled concrete table drawing S0.2 for all concrete.

.2 Compressive strength refer to drawing S0.2.

.3 Aggregate size refer to drawing S0.2

.4 Volume stability: acceptable volume change range 0.03% due to shrinkage, creep and freeze thaw cycle.

.5 Other special requirements: Finish slab surfaces with light broom finish.

.4 Provide quality management plan to ensure verification of concrete quality to specified performance.

.5 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

Part 3 Execution

3.1 PREPARATION

.1 Obtain Departmental Representative's written approval before placing concrete.

.1 Provide 48 hours minimum notice prior to placing of concrete.

.2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 During concreting operations:

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

.4 Pumping of concrete is permitted only after approval of equipment and mix.

.5 Ensure reinforcement and inserts are not disturbed during concrete placement.

.6 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing.

.7 Protect previous Work from staining and damage.

.8 Clean and remove stains prior to application for concrete finishes.

.9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.10 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.

.1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.

.11 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 INSTALLATION/ APPLICATION

.1 Do cast-in-place concrete work to CSA A23.1/A23.2.

.2 Sleeves and inserts:

.1 Where approved by Departmental Representative, set sleeves, ties and other inserts and openings as indicated or specified elsewhere.

.2 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Departmental Representative prior to installation.

.3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.

.4 Confirm locations and sizes of sleeves and openings shown on drawings.

.3 Anchor bolts:

.1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.

.2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Departmental Representative.

.1 Drilled holes: to manufacturers' recommendations.

.3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.

.4 Set bolts and fill holes with epoxy grout.

.4 . Drainage holes and weep holes:

.1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Forming and Accessories. If wood forms are used, remove them after concrete has set.

.2 Install weep hole tubes and drains as indicated.

.5 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.

.6 Finishing and curing:

.1 Finish concrete to CSA A23.1/A23.2.

.1 Schedule: Slabs - Light Broom. Walls, Beams and Curbs – Steel Trowel

.2 Use procedures in conformance with those noted in CSA A23.1/A23.2, and as reviewed by Departmental Representative to remove excess bleed water. Ensure surface is not damaged.

.3 Use curing compounds compatible with applied finish on concrete surfaces. Applied finish on concrete: Light Broom finish. Provide written declaration that compounds used are compatible.

.4 Finish concrete slab to CSA A23.1/A23.2 Class B.

.5 Concrete slabs to have finish hardness equal to or greater than 6.5 Mohs hardness to CSA A23.1/A23.2.

.6 . Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.

.7 Waterstops:

.1 Install waterstops to provide continuous water seal.

.2 Do not distort or pierce waterstop in way as to hamper performance.

.3 Do not displace reinforcement when installing waterstops.

.4 Use equipment to manufacturer's requirements to field splice waterstops.

.5 Tie waterstops rigidly in place.

3.3 SURFACE TOLERANCE

.1 Concrete tolerance to CSA A23.1. Equivalent in plane surface tolerances to FF = 25: FL = 20 Waviness Index Method. Slab surface is to be sloped and sufficiently flat and planar to drain completely without low spot ponding.

3.4 FIELD QUALITY CONTROL

.1 Site tests: Conduct tests as follows in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS. Testing is to be undertaken at point of final discharge on slab. For each Concrete Casting:

.1 Slump.

.2 Air content.

.3 Compressive strength at 7 and 28 days.

.4 Air and concrete temperature.

.2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.

.1 Ensure testing laboratory is certified to CSA A283.

.2 Contractor will coordinate and arrange for inspection and testing with designated testing laboratory.

.3 Ensure test results are distributed for discussion at post-casting concrete meeting between Contractor and Departmental Representative.

.4 Departmental Representative will pay for costs of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services.

.5 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.6 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.

.7 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

3.5 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Divert unused concrete materials from landfill to local facility.

.2 Provide appropriate area off job site where concrete trucks and be safely washed.

.3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by Departmental Representative.

.4 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

.5 Prevent admixtures and additive materials from entering drinking water supplies or streams.

.6 Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal.

.7 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM International

- .1 ASTM A 53/A 53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .2 ASTM A 307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .3 ASTM A108, “Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality”. CAN/CSA-G40.21-98, “Structural Quality Steels”.
- .4 ASTM A123, “Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products”.

.2 CSA International

- .1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CSA S16-14, Design of Steel Structures.
- .4 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
- .5 CSA W59-13, Welded Steel Construction (Metal Arc Welding).
- .6 CAN/CSA-S6, “Canadian Highway Bridge Design Code”.

.3 Environmental Choice Program

- .1 CCD-047-98(R2005), Architectural Surface Coatings.
- .2 CCD-048-98(R2006), Surface Coatings - Recycled Water-borne.

.4 Green Seal Environmental Standards (GS)

- .1 GS-11-2011, 3rd Edition, Paints and Coatings.

.5 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

- .1 Material Safety Data Sheets (MSDS).
- .2 Safety Data Sheets (SDS) per Globally Harmonized System effective from Q2 of 2017.

.6 . The Master Painters Institute (MPI)

- .1 Architectural Painting Specification Manual - current edition.

1.2 QUALIFICATIONS

.1 The organization undertaking to weld under this section is to be fully approved by the Canadian Welding Bureau under the requirements of CSA-W47.1, Division 1 or 2.1 only. Division 3 qualification is not sufficient.

.2 Weld inspection: The organization undertaking to perform weld inspection under this section is to be fully approved by the Canadian Welding Bureau under the requirements of CSA-W178.

.3 Engage a professional structural engineer registered in the Province of British Columbia fully qualified and experienced in the design of bearings and welded components to be responsible for the design of these bearings and welded components.

1.3 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 sections, plates, pipe, tubing and bolts and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit two copies of WHMIS MSDS/SDS -Safety Data Sheets in accordance with Section 01 35 29.06 - Health and Safety Requirements, 01 35 43 - Environmental Procedures.

.1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.

.2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

.3 Steel Laminated Elastomeric Bearing Pads:

.1 Submit design calculations for each bearing indicating how it satisfies the design criteria indicated on the Contract Drawings and in the Specifications.

.1 The bearings are to be designed to be integrated with the bearing plates on girders and substructure elements.

.2 The bearing elements supplied are to meet the design forces and deformations shown on the plans.

.2 The design calculations are to be signed and sealed by a professional engineer registered in the Province of British Columbia.

.3 Submit in writing evidence of qualifications for welding under the Canadian Welding Bureau.

.4 Submit copies when requested of mill test reports properly correlated to the materials used.

.5 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01300.

.2 Clearly indicate plate sizes, connection attachments, anchorage sizes and types of fasteners and accessories where applicable.

.3 Include bearing layout drawings, erection drawings, elevations, and details where applicable.

.4 Clearly indicate welded connections using CISC standard welding symbols including net weld lengths where applicable.

.5 The drawings are to be signed and sealed by a professional engineer registered in the Province of British Columbia.

1.4 QUALITY ASSURANCE

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 . The Contractor’s Professional Engineer responsible for the design of bearings is to inspect the fabrication and erection of these components in accordance with APEGBC.

1.5 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 off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan.

Part 2 Products

2.1 MATERIALS

.1 Steel sections and plates: to CSA G40.20/G40.21, Grade 300W, 350W, hot dipped galvanized.

.2 Steel pipe: to ASTM A 53/A 53M standard weight, extra strong, double extra strong, hot dipped galvanized.

.3 Welding materials: to CSA W59.

.4 Welding electrodes: to CSA W48 Series.

.5 Bolts and anchor bolts: as per design notes on S0.2.

.6 Aluminum Plate and Tube: 6061 alloy, T6 temper, 275 kPa yield.

.7 Grout: non-shrink, non-metallic, dry pack, 50 MPa at 28 days.

.8 Fabricate the bearings from 100% virgin polyisoprene (reclaimed material is not acceptable) of nominal 60 ±5 Durometer hardness.

.9 The elastomer compound shall conform to Grade 5 low temperature behaviour.

.10 The steel laminations shall be rolled mild steel sheets, between 3 mm and 5 mm thickness, having a minimum yield of 230 MPa.

.11 Shear stud connectors: Headed concrete anchors conforming to ASTM A108.

.12 Finish all steel components of bearings including top plates and base plates in accordance with the following:

.1 Blast cleaned in accordance with SSPC-SP6 “Commercial Blast Cleaning”.

.2 Hot dip galvanized in accordance with ASTM A123.

.13 All anchorage assemblies are to be galvanized.

.14 All other mechanical fasteners including bolts, nuts, washers and pintels are to be galvanized.

.15 The physical properties of the natural rubber shall conform to CAN/CSA-S6.

2.2 FABRICATION

.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Where possible, fit and shop assemble work, ready for erection.

.3 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

.4 Tolerances:

.1 Overall dimensions of assembled bearings are to be ±3 mm in plan and height.

.2 When designed to be parallel, the tolerance of parallelism of the upper surface of a bearing with respect to the lower surface of the bearing as datum is to be 0.2% of the diameter for surfaces circular in plan and 0.2% of the longer side for surfaces rectangular in plan.

2.3 FINISHES

.1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m² to CAN/CSA-G164.

.2 Zinc primer: zinc rich, ready mix to MPI- EXT 5.2C

2.4 ISOLATION COATING

.1 Isolate aluminum from following components, by means of bituminous paint:

.1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.

.2 Concrete, mortar and masonry.

.3 Wood.

2.5 SHOP PAINTING

.1 Primer: VOC limit 100 g/L maximum to GS-11.

.2 Apply one shop coat of epoxy based compatible primer to galvanized metal items calling for paint, with exception of concrete encased items.

.3 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.

.4 Shop apply 2 finish coats of epoxy paint with an airless spray system to Departmental Representative's colour requirements.

.5 Clean surfaces to be field welded; do not paint.

2.6 PIPE AND STEEL HOLLOW TUBE RAILINGS

.1 Steel pipe and structural steel tube: formed to shapes and sizes as indicated.

.2 Galvanize exterior railings after fabrication. Shop coat prime exterior railings after galvanizing.

2.7 BEARING ASSEMBLIES

.1 Bearings are to be steel laminated elastomeric bearings and related attachments.

.2 Bearings are to be supplied complete with the following items: sole plates complete with all anchorages, guide plates, sliding surfaces, and elastomeric pads. Bearings to conform to CAN/CSA-S6 except where otherwise specified herein.

.3 The bearings are to have the properties shown on the drawings and be capable of accommodating all loads, movements and rotations indicated.

.4 Serviceability Limit State: The design should be such that bearings will not suffer damage that would affect their correct functioning or incur excessive maintenance costs during their intended life.

.5 Ultimate Limit State: The strength and stability of bearings should be adequate to withstand the ultimate design loads and movement of the structure.

.6 Design life: Bearings and their installations should be designed to be compatible with the design life of the bridge, taking into account the consequences of maintenance and/or replacement.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications 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.

.2 Steel Laminated Elastomeric Bearings:

.1 Materials and workmanship may, at the Departmental Representative’s discretion, be subject to inspection and testing by an inspection and testing firm certified in accordance with CSA-W178, retained and paid for by the Contractor in accordance with Section 01400 of these Specifications.

.2 The Departmental Representative may request additional testing of welds and bolts to ascertain the full extent of defects if the test noted above indicates excessive deficiencies. Additional costs for extra testing to be borne by the Contractor.

.3 Pay all costs of re-testing and re-inspection as a result of defective workmanship.

.4 Pay all costs of repairs to correct defective work.

.5 Inspection and testing firm to submit to the Departmental Representative a final report certifying all welds and connections, including confirmation that required repairs have been completed. This report is to be submitted under the seal and signature of a professional structural engineer registered in the Province of British Columbia.

.6 Notify Departmental Representative and inspection and testing firm twenty-four (24) hours prior to commencement of shop work for all testing and inspection.

3.2 ERECTION

.1 Do welding work in accordance with CSA W59 unless specified otherwise.

.2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.3 Provide suitable means of anchorage acceptable to Departmental Representative.

.4 Exposed fastening devices to match finish and be compatible with material through which they pass.

.5 Supply components for work by other trades in accordance with shop drawings and schedule.

.6 Weld field connection.

.7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.

.8 Touch-up field welds, bolts and burnt or scratched surfaces with primer after completion:

.1 Primer: maximum VOC limit 100 g/L to GS-11.

.9 Properly prepare and touch-up galvanized surfaces with zinc rich primer where burned by field welding.

.1 Primer: maximum VOC limit 100 g/L to GS-11.

.10 Steel Laminated Elastomeric Bearings

.1 All bearings are to be clearly coded by the manufacturer. The codings are to prevent mix-up and are to remain clearly visible on the bearings. They are also to be marked with their position on site and direction of installation, which must correspond with the information contained on the approved drawings for the bearings.

.2 Protect bearings during handling, transport, storage and installation from damage or distortion, and keep clean and protected from excessive heat, contaminants, and other deleterious matter.

.3 Provide suitable handling devices as required. Use temporary clamping devices to maintain correct orientation of the parts, but do not use for slinging or suspending bearings unless specifically designed for this purpose.

.4 Install bearings in the structures as specified or as reviewed by the Departmental Representative.

.5 After installation, leave bearings and their surrounding areas clean.

.6 Locate bearings so that their centre lines are within ±3 mm of their correct positions. Level of a single bearing or the mean levels of more than one bearing at any support to be within ±5 mm. Set bearings to their correct inclination to the horizontal within a tolerance of ±0.1° in any direction.

.7 Relative location of upper and lower sections of bearing assembly to reflect average structure temperature at time of installation. Provide details of temperature measurement and position of installed bearing reviewed by bearing supplier and copy to the Departmental Representative.

3.3 PIPE AND STEEL HOLLOW TUBE RAILINGS

.1 Install steel railings to curbs and beams as indicated.

.2 Weld railing standards to embedded anchors in concrete. Properly prepare and touch up welds with epoxy primer and two coats of epoxy paint.

3.4 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 reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by metal fabrications installation.

3.6 GUARANTEE

.1 The performance of the bearings is to be guaranteed in writing by the bearing supplier for a period of five years from the date of issuance of the Construction Completion Certificate. The guarantee is to provide for the replacement of the bearings at no cost to the owner in the event that the bearing does not perform satisfactorily in the range of design movement and under the design loads. It is the bearing supplier's responsibility to ensure that the bearings are installed in a manner that will not void the guarantee.

.2 Certify at the completion of work all bearings fabricated and erected by the fabricator under the seal and signature of the Contractor's professional engineer responsible for this work.

.3 Certify that all designed components are fabricated and erected in accordance with the reviewed shop drawings.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 All standards to be latest issue at time of tender.

.2 CAN/CSA-G40.21, “Structural Quality Steels”.

.3 CAN/CSA-S6, “Canadian Highway Bridge Design Code”.

.4 ASTM A123, “Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products”.

.5 American Society for Testing and Materials (ASTM) where noted.

.6 SSPC-SP6, “Commercial Blast Cleaning”.

.7 CSA-W59, “Welded Steel Construction (Metal Arc Welding)”.

.8 ASTM A108, “Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality”. CAN/CSA-G40.21-98, “Structural Quality Steels”.

1.2 QUALIFICATIONS

.1 The organization undertaking to weld under this section is to be fully approved by the Canadian Welding Bureau under the requirements of CSA-W47.1, Division 1 or 2.1 only. Division 3 qualification is not sufficient.

.2 Weld inspection: The organization undertaking to perform weld inspection under this section is to be fully approved by the Canadian Welding Bureau under the requirements of CSA-W178.

.3 Engage a professional structural engineer registered in the Province of British Columbia fully qualified and experienced in the design of bearings and welded components to be responsible for the design of these bearings and welded components.

1.3 DESIGN

.1 The bearings are to be designed to be integrated with the bearing plates on girders and substructure elements.

.2 The bearing elements supplied are to meet the design forces and deformations shown on the plans.

1.4 QUALITY CONTROL

.1 The Contractor’s Professional Engineer responsible for the design of bearings is to inspect the fabrication and erection of these components in accordance with APEGBC.

1.5 INSPECTION AND TESTING

.1 Materials and workmanship may, at the Departmental Representative’s discretion, be subject to inspection and testing by an inspection and testing firm certified in accordance with CSA-W178, retained and paid for by the Contractor in accordance with Section 01400 of these Specifications.

.2 The Departmental Representative may request additional testing of welds and bolts to ascertain the full extent of defects if the test noted above indicates excessive deficiencies. Additional costs for extra testing to be borne by the Contractor.

.3 Pay all costs of re-testing and re-inspection as a result of defective workmanship.

.4 Pay all costs of repairs to correct defective work.

.5 Inspection and testing firm to submit to the Departmental Representative a final report certifying all welds and connections, including confirmation that required repairs have been completed. This report is to be submitted under the seal and signature of a professional structural engineer registered in the Province of British Columbia.

.6 Notify Departmental Representative and inspection and testing firm twenty-four (24) hours prior to commencement of shop work for all testing and inspection.

1.6 SUBMITTALS

.1 Submit design calculations for each bearing indicating how it satisfies the design criteria indicated on the Contract Drawings and in the Specifications.

.2 The design calculations are to be signed and sealed by a professional engineer registered in the Province of British Columbia.

.3 Submit in writing evidence of qualifications for welding under the Canadian Welding Bureau.

.4 Submit copies when requested of mill test reports properly correlated to the materials used.

1.7 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01300.

.2 Clearly indicate plate sizes, connection attachments, anchorage sizes and types of fasteners and accessories where applicable.

.3 Include bearing layout drawings, erection drawings, elevations, and details where applicable.

.4 Clearly indicate welded connections using CISC standard welding symbols including net weld lengths where applicable.

.5 The drawings are to be signed and sealed by a professional engineer registered in the Province of British Columbia.

Part 2 Products

2.1 BEARING ASSEMBLIES

.1 Bearings are to be steel laminated elastomeric bearings and related attachments.

.2 Bearings are to be supplied complete with the following items: sole plates complete with all anchorages, guide plates, sliding surfaces, and elastomeric pads. Bearings to conform to CAN/CSA-S6 except where otherwise specified herein.

.3 The bearings are to have the properties shown on the drawings and be capable of accommodating all loads, movements and rotations indicated.

.4 Serviceability Limit State: The design should be such that bearings will not suffer damage that would affect their correct functioning or incur excessive maintenance costs during their intended life.

.5 Ultimate Limit State: The strength and stability of bearings should be adequate to withstand the ultimate design loads and movement of the structure.

.6 Design life: Bearings and their installations should be designed to be compatible with the design life of the bridge, taking into account the consequences of maintenance and/or replacement.

2.2 MATERIALS

.1 Fabricate the bearings from 100% virgin polyisoprene (reclaimed material is not acceptable) of nominal 60 ±5 Durometer hardness.

.2 The elastomer compound shall conform to Grade 5 low temperature behaviour.

.3 The steel laminations shall be rolled mild steel sheets, between 3 mm and 5 mm thickness, having a minimum yield of 230 MPa.

.4 Shear stud connectors: Headed concrete anchors conforming to ASTM A108.

.5 Finish all steel components of bearings including top plates and base plates in accordance with the following:

.1 Blast cleaned in accordance with SSPC-SP6 “Commercial Blast Cleaning”.

.2 Hot dip galvanized in accordance with ASTM A123.

.6 All anchorage assemblies are to be galvanized.

.7 All other mechanical fasteners including bolts, nuts, washers and pintels are to be galvanized.

.8 The physical properties of the natural rubber shall conform to CAN/CSA-S6.

.9 Submit to the Departmental Representative test reports confirming conformance to all of the above physical properties for elastomeric material used in bearings.

2.3 TOLERANCES

.1 Overall dimensions of assembled bearings are to be ±3 mm in plan and height.

.2 When designed to be parallel, the tolerance of parallelism of the upper surface of a bearing with respect to the lower surface of the bearing as datum is to be 0.2% of the diameter for surfaces circular in plan and 0.2% of the longer side for surfaces rectangular in plan.

Part 3 Execution

3.1 EXAMINATION OF WORK BY OTHER TRADES

.1 Before commencing fabrication of the work of this section, the supplier is to inspect and take field measurements of work done by other trades which may affect the work and is to notify the Departmental Representative in writing of his or her acceptance of the work done under other sections or by other trades. If any conditions exist that will prejudice a proper installation of the work, the supplier is to notify the Contractor in writing and is not to proceed with installation of the work until deficiencies are corrected and the Engineer has received the letter of acceptance.

3.2 COOPERATION

.1 Where items of other trades are to be built into the work of this section or items of this section are to be built into the work of other trades, such items are to be procured or provided in ample time to avoid delay.

.2 The Contractor is to attend upon and cooperate with other trades with respect to the work of this section and is to do everything necessary to enable the work of other trades to be fitted in a first class manner without delay.

3.3 MANUFACTURE

.1 Manufacture of all steel components of bearing assemblies to be governed by the requirements set forth in Section 05500 of this Specification.

3.4 INSTALLATION

.1 All bearings are to be clearly coded by the manufacturer. The codings are to prevent mix-up and are to remain clearly visible on the bearings. They are also to be marked with their position on site and direction of installation, which must correspond with the information contained on the approved drawings for the bearings.

.2 Protect bearings during handling, transport, storage and installation from damage or distortion, and keep clean and protected from excessive heat, contaminants, and other deleterious matter.

.3 Provide suitable handling devices as required. Use temporary clamping devices to maintain correct orientation of the parts, but do not use for slinging or suspending bearings unless specifically designed for this purpose.

.4 Install bearings in the structures as specified or as reviewed by the Departmental Representative.

.5 After installation, leave bearings and their surrounding areas clean.

.6 Locate bearings so that their centre lines are within ±3 mm of their correct positions. Level of a single bearing or the mean levels of more than one bearing at any support to be within ±5 mm. Set bearings to their correct inclination to the horizontal within a tolerance of ±0.1° in any direction.

.7 Relative location of upper and lower sections of bearing assembly to reflect average structure temperature at time of installation. Provide details of temperature measurement and position of installed bearing reviewed by bearing supplier and copy to the Departmental Representative.

3.5 CERTIFICATION

.1 Certify at the completion of work all bearings fabricated and erected by the fabricator under the seal and signature of the Contractor's professional engineer responsible for this work.

.2 Certify that all designed components are fabricated and erected in accordance with the reviewed shop drawings.

3.6 GUARANTEE

.1 The performance of the bearings is to be guaranteed in writing by the bearing supplier for a period of five years from the date of issuance of the Construction Completion Certificate. The guarantee is to provide for the replacement of the bearings at no cost to the owner in the event that the bearing does not perform satisfactorily in the range of design movement and under the design loads. It is the bearing supplier's responsibility to ensure that the bearings are installed in a manner that will not void the guarantee.

END OF SECTION

Part 1 General

The work shall consist of furnishing and installing an elastomeric joint seal in accordance with the details shown on the plans and the requirements of the specifications.

Manufacturer shall have a minimum ten (10) years experience specializing in the design and manufacture of expansion control systems

Part 2 Quality Control

Manufacturer shall be ISO-9001:2008, RC14001:2008 certified and shall provide written confirmation that a formal Quality Management System and Quality Processes have been adopted in the areas of, (but not limited to) Engineering, Manufacturing, Quality Control and Customer Service for all processes, products, and their components. Alternate manufacturers will be considered provided they submit written proof that they are ISO 9001:2008, RC14001:2008 certified prior to the project bid date.

Part 3 Product

Provide an elastomeric joint seal that is capable of accommodating movements as shown in the contract plans. The expansion joint seal shall be a rapid cure, two component silicone seal. The silicone seal shall be designed to accept +100% / -50% of the joint installation opening and bond to the joint interface.

Part 4 Component and Materials

The Contractor shall furnish a manufacturer’s certification that the materials proposed have been pre-tested and will meet the requirements as set forth in the specification.

4.1 ELASTOMERIC SEAL

Material shall be a cold applied, two component, self-leveling, low modulus silicone sealant exhibiting the physical properties listed in the table below. When properly mixed, the sealant cures rapidly to form a well-bonded elastomeric seal.

AS SUPPLIED PROPERTIES	PART A	PART B
Color	White	Gray
Extrusion Rate (ASTM C 1183)	200-600 ml/min.	200-600 ml/min.

MIXED PROPERTIES	TEST METHOD	REQUIREMENT
Leveling	ASTM C639	self levels
Tack Free Time	ASTM C679	60 min. max
Joint Elongation	ASTM D5329 (1)(2)	600% min.
Joint Modulus, 100% extension	ASTM D5329 (1)(2)	15 psi max.
Cure Evaluation	ASTM D5893	Pass @ 4hr max
Ultimate Elongation	ASTM D 412 Die C (1)	1000% min.
Stress at 150% Elongation	ASTM D 412 Die C (1)	25 psi max.
Shore Hardness, 00	ASTM C 661 (1)	40 – 80
Specific Gravity	ASTM D 792 (1)	1.20 – 1.40

Note: (1) Specimens cured at 77 ± 3°F. and 50 ± 5% R.H. for 7 days.

(2) Specimens size is ½" wide by ½" deep by 2" long.

Part 5 Construction Requirements

The Contractor shall submit product information and necessary details after the award of the contract. At the discretion of the Engineer, the manufacturer may be required to furnish a representative sample of material to be supplied in accordance with the project specifications

The manufacturer shall provide instructions for the proper installation of the joint system.

Any patching materials must be approved prior to use from the expansion joint seal manufacturer. Expansion joint seal shall be installed at locations shown on the contract plans.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 Section Includes: All labor, materials, tools and other equipment, services and supervision required to complete all exterior and interior painting and decorating work as indicated on Finish Schedules and to the full extent of the drawings and specifications.

.2 The Work shall also include, but not necessarily be limited to surface preparation of substrates as required for acceptance of painting, including cleaning, small crack repair, patching, caulking, making good surfaces and areas, pre-treatment, priming and back-priming to the extent / limits defined under ***MPI*** preparation requirements.

1.2 QUALITY ASSURANCE:

.1 This Contractor shall have a minimum of five (5) years proven satisfactory experience and shall maintain a qualified crew of painters throughout the duration of the work.

.2 Only qualified journeypersons, as defined by local jurisdiction shall be engaged in painting and decorating work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyperson in accordance with trade regulations.

.3 All materials, preparation and workmanship shall conform to requirements of the latest edition of the Architectural Painting Specification Manual by the Master Painters Institute (***MPI***) (hereafter referred to as the ***MPI*** Painting Manual) as issued by the local **MPI** Accredited Quality Assurance Association having jurisdiction.

.4 All paint manufacturers and products used shall be as listed under the Approved Product List section of the ***MPI*** Painting Manual.

.5 All painting and decorating work shall be inspected by a Paint Inspection Agency (inspector) acceptable to the specifying authority and the local ***MPI*** Accredited Quality Assurance Association. The painting contractor shall notify the Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of the project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.

.6 **All surfaces requiring painting shall be inspected** by the Paint Inspection Agency who shall notify the Departmental Representative in writing of any defects or problems, prior to commencing painting work, or after the prime coat shows defects in the substrate.

.7 The painting contractor shall receive written confirmation of the specific surface preparation procedures and primers used for all fabricated steel items from the fabricator / supplier to ascertain appropriate and manufacturer compatible finish coat materials to be used before painting any such work.

1.3 REGULATORY REQUIREMENTS:

.1 Conform to work place safety regulations and requirements of those authorities having jurisdiction for storage, mixing, application and disposal of all paint and related hazardous materials.

1.4 SUBMITTALS / MOCK-UP:

.1 Submit consent of surety with Bid Submission as proof of ability to supply a 100% two (2) year Maintenance Bond, if an ***MPI*** Accredited Quality Assurance Association's guarantee option is not used.

.2 If requested, submit an invoice list of all painting materials ordered for project work to Paint Inspection Agency indicating manufacturer, types and quantities for verification and compliance with specification and design requirements.

.3 Submit two sets of Material Safety Data Sheets (MSDS)/ Safety Data Sheets (SDS) per Globally Harmonized System from Q2 of 2017 prior to commencement of work for review and for posting at job site as required.

.4 At project completion provide an itemized list complete with manufacturer, paint type and color-coding for all colors used for Owner's later use in maintenance.

.5 When requested by the Consultant or Paint Inspection Agency, prepare and paint a designated surface, area, room or item (in each color scheme) to requirements specified herein, with specified paint or coating showing selected colors, gloss/sheen, textures and workmanship to ***MPI*** Painting Specification Manual standards for review and approval. When approved, surface, area, room and/or items shall become acceptable standard of finish quality and workmanship for similar on-site work.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING:

.1 Deliver and store all painting materials in sealed, original labeled containers bearing manufacturer's name, brand name, type of paint or coating and color designation, standard compliance, materials content as well as mixing and/or reducing and application requirements in strict accordance with manufacturer and ***MPI*** requirements.

1.6 ENVIRONMENTAL, WASTE MANAGEMENT AND DISPOSAL REQUIREMENTS:

.1 Perform no painting or decorating work when the ambient air and substrate temperatures, relative humidity and dew point and substrate moisture content is below or above requirements for both interior and exterior work.

.2 Apply paint only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.

.3 Ensure adequate continuous ventilation and sufficient heating and lighting is in place.

.4 Paint, stain and wood preservative finishes and related materials (thinners, solvents, caulking, empty paint cans, cleaning rags, etc.) shall be regarded as hazardous products. Recycle and dispose of same subject to regulations of applicable authorities having jurisdiction.

.5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground retain cleaning water and filter out and properly dispose of sediments.

.6 Set aside and protect surplus and uncontaminated finish materials not required by the Owner and deliver or arrange collection for verifiable re-use or re-manufacturing.

1.7 GUARANTEE:

.1 Provide and pay for either the local ***MPI*** Accredited Quality Assurance Association's two (2) year guarantee, or, alternatively, a 100% two (2) year Maintenance Bond - both in accordance with ***MPI*** Painting Manual requirements. The Maintenance Bond shall warrant that all painting work has been performed in accordance with ***MPI*** Painting Manual requirements.

.2 **All surfaces requiring painting shall be inspected** by the Paint Inspection Agency who shall notify the Departmental Representative in writing of any defects or problems, prior to commencing painting work, or after the prime coat shows defects in the substrate.

Part 2 Products

2.1 MATERIALS:

.1 Only materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, etc.) listed in the latest edition of the ***MPI*** Approved Product List (APL) are acceptable for use on this project. All such material shall be from a single manufacturer for each system used.

.2 Other materials such as linseed oil, shellac, thinners, solvents, etc. shall be the highest quality product of an ***MPI*** listed manufacturer and shall be compatible with paint materials being used as required.

.3 Where required, use only materials having a minimum ***MPI*** "Environmentally Friendly" rating based on VOC (EPA Method 24) content levels.

2.2 MIXING AND TINTING:

.1 Unless otherwise specified herein or pre-approved, all paint shall be ready-mixed and pre-tinted. Re-mix all paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and color and gloss uniformity. Where thinner is used, addition shall not exceed paint manufacturer's recommendations.

2.3 FINISH, COLOUR, GLOSS / SHEEN:

.1 Unless otherwise noted, all painting work shall be in accordance with ***MPI*** Grade finish requirements.

.2 Colours shall be as selected by the Departmental Representative from a manufacturer's full range of colours. The colour for this project is a silver colour, subject to approval from the Departmental Representative.

.3 The Departmental representative will select one colour for use on the entire project.

.4 Gloss level ratings of all painted surfaces shall be approved by the Departmental Representative. Refer to ***MPI*** Painting Manual for gloss level definitions and requirements.

Part 3 Execution

3.1 CONDITION AND PREPARATION OF SURFACES:

.1 The condition and preparation requirements for all surfaces shall be in accordance with ***MPI*** Painting Manual requirements.

3.2 APPLICATION:

.1 Do not paint unless substrates are acceptable and/or until all environmental conditions (heating, ventilation, lighting and completion of other subtrade work) are acceptable for applications of products.

.2 Apply paint or stain in accordance with noted ***MPI*** finish Grade requirements

.3 Painting coats specified are intended to cover surfaces satisfactorily when applied at proper consistency and in accordance with manufacturer's recommendations. Apply a minimum of four coats of paint where deep or bright colors are used to achieve satisfactory results.

3.3 EXTERIOR FINISH / COATING SYSTEMS:

.1 Paint exterior surfaces in accordance with the following ***MPI*** Painting Manual requirements:

.1 **Galvanized Metal:**(not chromate passivated)

.1 EXT 5.3D Polyurethane, pigmented finish for high traffic areas

.1 First layer: vinyl wash primer

.2 Second layer: epoxy

.3 Third layer: Polyeurathane

3.4 MECHANICAL / ELECTRICAL EQUIPMENT AND RELATED SURFACES:

.1 Unless otherwise specified or noted, paint all “unfinished” conduits, piping, hangers, ductwork and other mechanical and electrical equipment with color and texture to match adjacent surfaces, in the following areas:

.1 Where exposed-to-view in all exterior areas.

.2 In unfinished areas leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks. Do not paint over nameplates.

.3 Refer to Mechanical and Electrical specifications for painting, banding, stenciling of other surfaces / equipment.

3.5 FIELD QUALITY CONTROL:

.1 Painted surfaces shall be considered to lack uniformity and soundness in accordance with defects noted in the ***MPI*** Painting Manual. Refer to long form specification item 3.7 - Field Quality Control / Standard of Acceptance.

.2 Painted surfaces rejected by the inspector shall be made good at the expense of the Contractor in accordance with ***MPI*** Painting Manual requirements.

3.6 PROTECTION AND CLEAN-UP:

.1 Protect all newly painted exterior surfaces from elements condensation and contamination until paint coatings are completely dry. Erect barriers or screens and post signs to warn of or limit or direct traffic.

.2 Remove all spilled, splashed, splattered or over sprayed paint as work progresses, remove waste materials and keep area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.

END OF SECTION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Supply and installation of new LED light fixtures, drivers and complete dimming system.

.2 Supply and installation of conduit and wiring for LED lighting.

.3 Supply and installation of junction boxes.

.4 New Electrical Panel to carry the new lighting loads.

.5 Provision of temporary power.

.6 All permanent Electrical work as depicted within contract documents.

.7 All temporary Electrical work to facilitate permanent work.

1.2 GENERAL REQUIREMENTS

.1 General Clean-up.

.2 All inspection and other permits, licenses required by various Inspection Agencies and local regulations related to Electrical Trade.

.3 Shop Drawings.

.4 Project Record Documents (As-Built Drawings).

.5 Operating and Maintenance Data.

1.3 MATERIALS

.1 Conduit, wire and junction boxes as indicated on the drawings. All required connectors and couplings

.2 Conductors, including all types of wires, conductors, cables, which form an integral part of the electrical power system.

.3 Support systems which are intended to enclose or support all forms of electrical conductors used for any purpose covered by this scope. This includes all forms of rigid, flexible, metallic and non-metallic conduit.

.4 Control panels associated with any electrical equipment covered under this section of Work.

.5 Electrical panel and circuit breakers of all types, and for all applications associated with electrical equipment which receives its power supply from the main.

.6 Dimmer systems.

.7 Grounding systems, as required by the Electrical Code, or as otherwise specified in the bid documents.

.8 Lighting - all forms of electric lighting devices, both individual and packaged types, including complete modular and integrated ceiling together with all associated, deflectors, diffusers, drivers, lens and mounting devices, and which are used for all purposes, such as floodlighting exterior parking areas, landscaping lighting, etc.

.9 All material required or implied to provide a fully functional system.

Part 2 Units of Measurement

2.1 GENERAL

.1 The Contract Documents have been prepared using the modified International System (SI) units of metric measurement. Whenever appropriate, available metric products shall be used unless otherwise specified herein.

.2 Only metres (m) and millimeters (mm) are used. Generally, metres are used for measurements of 10 metres or more, and millimeters for measurements below 10 m.

.3 All measurements on drawings are in millimeters unless otherwise indicated.

Part 3 Definitions

3.1 GENERAL

.1 All terminologies, abbreviations and acronyms used in this document are as listed in the various Standards, Codes, Rules and Bulletins used herein.

3.2 REFERENCE

.1 Imperative tense has been used throughout this Document for work intended for the successful Contractor. There shall be no work exclusions unless they have been clearly identified as such herein.

.2 Any reference to "Design Authority" shall mean Stantec Consulting Ltd.

.3 The word "provide" shall mean "supply, install, connect" unless otherwise indicated.

Part 4 Codes

4.1 GENERAL

.1 All Codes, Standards, Rules, Regulations, Bulletins, By-laws etc., shall be those that are currently enforced in the locality of job site, unless otherwise specified herein.

END OF SECTION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Complete and operational electrical lighting and dimming system as required by the drawings and as herein specified.

1.2 DESIGNATION OF PARTIES AND DEFINITION

.1 The following defines various items used within the Electrical Specification Division 26:

- .1 'Engineer or Electrical Engineer': This refers to Departmental representative.
- .2 'Electrical Trade of Contractor': The Contractor undertaking to do the electrical work described in the Electrical Specification and on the electrical drawings.
- .3 'General Contractor or General Construction Trade': The Contractor that has the agreement with the Owner for the construction of the project.
- .4 'Mechanical Trade or Mechanical Contractor': Sub-contractors undertaking to do the work described in the mechanical specifications and/or on the mechanical drawings.
- .5 'Provide': Means supply and install or supply labour and materials required for the installation of.
- .6 'Concealed': Where used in connection with the installation of electrical raceways and wiring, means that they are hidden from sight as in furred out spaces, ceiling spaces, etc.
- .7 'Exposed': Where used in connection with the installation of electrical raceways and wiring and electrical equipment, means that they are visible to persons within the building.

1.3 DRAWINGS AND SPECIFICATIONS

.1 The General Conditions, Supplementary Conditions and Division 01 are a part of this specification and shall apply to this Division.

.2 The intent of the drawings and specifications is to include all labour, products and services necessary for complete work, tested and ready for operation. Drawings and specifications are complementary each to the other and what is called for by one shall be binding as if called for by both.

.3 Symbols used to represent various electrical devices often occupy more space on the drawing than the actual device does when installed. In such instances, do not scale locations of devices from electrical symbols. Install these devices with primary regard for usage of wall space, convenience of operation and grouping of devices.

.4 These specifications and the drawings and specifications of all other divisions shall be considered as an integral part of the accompanying drawings. Any item or subject omitted from either the specifications or the drawings but which is mentioned or reasonably specified in and by the others, shall be considered as properly and sufficiently specified and shall be provided.

.5 Provide all minor items and work not shown or specified but which are reasonably necessary to complete the Work. Electrical drawings indicate general location and route to be followed by conduit and/or wire and do not show all structural and mechanical details. In some cases, conduit or wiring is not as shown on the plans or shown diagrammatically on schematic or riser diagrams. Conduit and wire to be installed to

provide a complete operating job and to be installed physically to conserve headroom, furring spaces, etc.

.6 If discrepancies or omissions in the drawings or specifications are found, or if the intent or meaning is not clear, advise the Consultant for clarification before submitting tender.

.7 Responsibility to determine which Division provides various products and work rests with the Contractor. Additional compensation will not be considered because of differences in interpretation of specifications.

1.4 QUALITY ASSURANCES

.1 Codes, Rules, Permits & Fees

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

.2 Comply with all rules of the Canadian Electrical Code (latest at time of permit), CSA Standard C22.1 and the applicable building codes.

.3 Quality of work specified and/or shown on the drawings shall not be reduced by the foregoing requirements.

.4 Give all required notices, submit drawings, obtain all permits, licenses and certificates and pay all fees required for this work.

.5 Furnish a Certificate of Final Inspection and approvals from inspection authority to the Consultant.

.2 Standards of Workmanship

.1 Execute all work in a competent manner and to present an acceptable appearance when completed.

.2 Employ a competent supervisor (consistency is essential) and a sufficient number of licensed tradesmen to complete the Work in the required time.

.3 Arrange and install products to fit properly into designated building spaces.

.4 Unless otherwise specified or shown, install products in accordance with recommendations and ratings of manufacturers.

1.5 SUBMITTALS

.1 Within 30 days of award of contract, the contractor shall submit a completed equipment procurement schedule which lists the manufacturer and model of equipment, indicating the projected ordering, shop drawing submittal date and delivery dates of all products to meet the required construction schedule.

.2 Submit samples as required where specified in Division 26.

.3 Prior to delivery of any products to job site and sufficiently in advance of requirements to allow ample time for checking, submit shop drawings for review as specified in Division 01. Submit shop drawings for all equipment as required in each section of this specification.

.4 Prior to submitting the shop drawings, the Contractor shall review the shop drawings to determine that the equipment complies with the requirements of the specifications and drawings.

.5 The term “shop drawing” means drawings, diagrams, illustrations, schedules, performance characteristics, brochures and other data which are to be provided by the Contractor to illustrate details of a portion of the Work.

Indicate materials, methods of construction and attachment of support wiring, diagrams, connections, recommended installation details, explanatory notes and other information necessary for completion of Work. Where equipment is connected to other equipment, indicate that such items have been coordinated, regardless of the section under which the adjacent items will be supplied and installed. Indicate cross-references to design drawings and specifications.

Adjustments made on shop drawings by the Consultant are not intended to change the contract price. If adjustments affect the value of the work state such in writing to the Consultant prior to proceeding with the Work.

.6 Manufacture of products shall conform to revised shop drawings.

.7 Keep one complete set of shop drawings at job site during construction.

.8 See Luminaire Schedule and Luminaire schedule notes on E001 for further direction regarding performance specification.

1.6 RECORD DRAWINGS

.1 The Contractor shall keep one complete set of white prints at the site office, including all addendums, change orders, site instructions, clarifications and revisions for the purpose of record drawings. As the work on site proceeds, the Contractor shall clearly record in Red Pencil all as-built conditions which deviate from the original contract documents. Record drawings to include circuiting of all devices, conduit and feeder runs (complete with conductor size and number) and locations of all electrical equipment. Include actual room names and numbers on these drawings.

.2 Contractor to forward letter of certification. Contractor is to forward the hard copy red-lined as-built drawing to the consultant.

.3 The contractor may borrow copies of the electrical contract drawings on disc from the Consultant.

1.7 OPERATION AND MAINTENANCE MANUALS

.1 Provide hard copy and electronic copies of both Operating & Maintenance Manuals and Record Drawings.

.2 Within 30 days prior to substantial performance, the Contractor shall submit a draft copy of the proposed contents of each maintenance manual to the Consultant for review. Once the draft copy is approved, the Contractor will supply 4 copies in suitably labelled, hard back, D-Ring type commercial binders, each complete with an index and tabbed title sheets for each section. Final copies of manuals to be received by Consultant not less than 7 days prior to substantial performance.

.3 All maintenance manual data shall be printed on 8 1/2” x 11” heavy bond, indexed, tabbed, punched and bound in the binders. each manual shall have a title sheet which is labelled “Operation & Maintenance Manual”, and lists the Project name, Contractor’s & Consultant’s names, date submitted, and a Table of Contents for each volume. If a manual exceeds 75 mm in thickness, provide additional manuals as required.

.4 Provide an electronic version of complete manual.

.5 Each section of the manual shall contain the following information:

.1 Systems Descriptions. A brief synopsis of each system typed and inserted at the beginning of each section. Include sketches and diagrams where appropriate.

.2 Descriptive and technical data.

.3 Maintenance and operating instructions for all electrical equipment and controls. (These operating instructions need not be manufacturer's data but may be typewritten instructions in simple language to guide the Owner in the proper operation and maintenance of his installation.)

.4 A copy of all wiring diagrams complete with wire coding.

.5 List of spare parts of all electrical equipment complete with names and addresses of sales, service representatives and suppliers.

.6 Copy of test data

.7 Include type and accuracy of instruments used to obtain test data.

.8 Copy of final inspection certificate.

.9 Copy of the purchase order, showing equipment make and model numbers issued to the manufacturer complete with all addendums. All cost details may be hidden.

.10 Copy of all warranty certificates.

.11 Set of final reviewed Shop Drawings.

.12 Names, addresses, phone numbers and facsimile numbers of Contractor, Consultants, sub-contractors and suppliers used on the Work together with a specification reference of the portion of the Work they undertook.

1.8 PRODUCT HANDLING

.1 Use all means necessary to protect the products of this Division before, during and after installation and to protect products and installed work of all other trades.

.2 Immediately make good any damage by repair or replacement at no additional cost to the Owner and to the approval of the Consultant.

.3 Remove advertising labels from all electrical equipment. Do not remove identification of certification labels.

.4 Remove dirt, rubbish, grease, etc. resulting from this work from all surfaces, including the inside of all cabinets, equipment enclosures, panelboard tubs, etc.

1.9 GUARANTEE

.1 Furnish a written guarantee to the Owner prior to final contract payment, which will be in effect for one year from the date of final acceptance of the complete work. Replace or repair at no cost to the Owner any defective material or workmanship except where, in the opinion of the Consultant, such defects are due to the misuse or neglect by the Owner.

.2 This general guarantee shall not act as a waiver of any specified or special equipment guarantees, which cover a greater length of time.

.3 The warranty period shall not begin until the date of substantial performance of the work.

.4 Note: Certain sections of this Electrical Specification are subject to the following warranty clause:

In the event of an emergency failure during the warranty period of any product(s), material(s) or system(s) installed under this Section, and the issuer of the warranty is unable to or chooses not to respond to a request by the owner for immediate emergency repair/replacement of the affected product, material or system, then the owner reserves the right to recover, from the issuer of the warranty, all costs incurred by the owner or owner engaged forces in effecting the immediate repair/replacement.

1.10 PROGRESS CLAIMS

.1 Within thirty (30) days after award of contract a breakdown of material and equipment items including labour and expense components shall be compiled on the Consultant format. Subsequent requests for payment shall be documented accordingly.

1.11 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with the Waste Management Plan.

.3 Fold up metal banding, flatten and place in designated area for recycling.

.4 Ensure emptied containers are sealed and stored safely for disposal away from children.

.5 Place materials defined as hazardous or toxic waste in designated containers.

.6 Collect, package and store any salvaged or remaining materials such as wire, conduit, and other associated components for recycling and reuse.

Part 2 Products

2.1 PRODUCTS & EQUIVALENTS

.1 Products and materials provided shall be new and free from all defects. Defective products or materials will be rejected, regardless of previous inspections. The Contractor shall be responsible to remove and replace defective products at their expense, and shall be responsible for any resulting delays and associated expenses, which result from defective products being rejected. Related materials shall be of the same manufacturer throughout the project.

2.2 PERFORMANCE SPECIFICATION PRODUCTS

.1 All Lighting products must be approved by the Engineer and Departmental Representative.

.2 The Contractor shall assume full responsibility for ensuring that when providing products or materials, all space, weight, connections, power and wiring requirements etc. are considered. Any costs incurred for additional components, changes to services, structural or space requirements, layouts and plans, etc. that may be necessary will be borne by the contractor.

.3 All submissions to be provided with technical data and whatever pertinent information that may be required to evaluate equivalency to the specified product. The responsibility to provide sufficient technical data with respect to submissions will remain solely with those making the submission.

2.3 QUALITY OF PRODUCTS

.1 All products provided shall be CSA Approved, Canadian Underwriters' Laboratory approved where applicable, and new.

.2 If products specified are not CSA approved, obtain special approval from the local regulatory authority. Pay all applicable charges levied and make all modifications required for approval.

.3 Products provided, if not specified, shall be new, of a quality best suited to the purpose required and their use subject to approval by the Consultant.

2.4 UNIFORMITY OF MANUFACTURE

.1 Unless otherwise specifically called for in the Specifications, uniformity of manufacture shall be maintained for similar products throughout the work.

2.5 PRODUCT FINISHES

.1 Touch up all damaged painted finishes with matching lacquer, or, if required by the Consultant, completely repaint damaged surface.

Part 3 Execution

3.1 SITE EXAMINATION

.1 Examine the site of work and become familiar with all features and characteristics affecting this work before submitting tender.

.2 No additional compensation will be given for extra work due to existing conditions, which such examination should have disclosed.

.3 Report to the Consultant any unsatisfactory conditions, which may adversely affect the proper completion of this work.

3.2 CO-ORDINATION WITH OTHER DIVISIONS

.1 Examine the drawings and specifications of all divisions and become fully familiar with their work. Before commencing work, obtain a ruling from the Consultant if any conflict exists, otherwise no additional compensation will be made for any necessary adjustments.

.2 Lay out the work and equipment with due regard to architectural, structural and mechanical features. Architectural and structural drawings take precedence over electrical drawings regarding locations of walls, doors and equipment.

.3 Do not cut structural members without approval of the Consultant.

.4 Coordinate with all Division installing equipment and services, and ensure that there are no conflicts.

.5 Install anchors, bolts, pipe sleeves, hanger inserts, etc. in ample time to prevent delays.

.6 Examine previously constructed work and notify the Consultant of any conditions, which prejudice the proper completion of this work. Commencement of this work without such notification shall constitute acceptance of other work.

3.3 LOCATION OF LIGHTS AND JUNCTION BOXES

.1 Electrical drawings are, unless otherwise indicated, drawn to scale and approximate distances and dimensions may be obtained by scaling. Figured dimensions shall govern over scaled dimensions.

.2 Equipment locations shown on the drawings are approximate. Locations may be revised up to 3 meters to suit construction and equipment arrangements without additional cost to the Owner, provided that the Contractor is notified prior to the installation of the outlets, or equipment.

.3 Unless otherwise specified or shown, install products in accordance with recommendations and ratings of manufacturers.

3.4 SEPARATION OF SERVICES

.1 Maintain separation between electrical wiring system and building piping, ductwork, etc. so that wiring system is isolated (except at approved connections to such systems) to prevent galvanic corrosion.

.2 In particular, contact between dissimilar metals, such as copper and aluminium, in damp or wet locations is not permitted.

.3 Do not support wiring from pipes, ductwork, etc. Hangers for suspended ceilings may be used for the support of wiring only when approval is obtained from the Consultant and the ceiling installer, and approved clips or hangers are used.

3.5 EQUIPMENT IDENTIFICATION

.1 3 mm thick plastic lamacoid name plates, coloured face to match system colour, white core, mechanically attached with self tapping screws, 6 mm high lettering, to be attached to the front face of the following equipment:

.1 Junction Boxes, new dimming panel, new electrical panel

.2 Provide neatly typed circuit directories in panelboards to indicate the area or equipment controlled by each branch circuit.

.3 All conductors shall be identifiable by coloured insulation and permanent markers at every terminal and accessible points throughout its entire run.

.4 Install yellow plastic warning tape, 300 mm below grade, above all underground ducts.

3.6 WIRING TO EQUIPMENT SUPPLIED BY OTHERS

.1 Equipment supplied by the Owner or under other Division will be moved to the installation site by others. However, the electrical connection to the equipment shall be done by this Division.

3.7 ACCESS PANELS

.1 Where electrical equipment, junction boxes, remote Drivers or the like are concealed, access panels shall be supplied. Panels shall be of adequate size for servicing of the electrical work and complete with necessary frames and hinged doors held closed with captive fasteners. Coordinate type and size of panels with the Consultant.

3.8 SEALING OF WALL AND FLOOR OPENINGS

.1 All conduit and cable entries through outside walls of buildings, through partition walls separating electrical rooms from other areas, through fire separations, and through floors above grade shall be sealed to prevent passage of moisture, dust, gasses, flame, or to maintain pressurization.

.2 Openings shall be sealed when all wiring entries shown on the drawings have been completed.

.3 Sealing material shall be fire resistant and shall not contain any compounds, which will chemically affect the wiring jacket or insulating material. Cable penetrations through fire separations to be sealed.

3.9 ELECTRICAL CONDUIT IN SLABS

.1 Locate conduit to be cast into a structural slab within the centre third of the slab thickness only; arrange crossovers to ensure that all conduits are contained within the centre third

of the slab thickness. Maximum outside diameter of conduit is to be one quarter of the slab thickness.

.2 Do not displace reinforcing steel to place conduit; do not secure conduit in place by tying parallel to reinforcing bar.

.3 Place conduit with minimum spacing between parallel conduits equal to four (4) conduit diameters.

3.10 TEMPORARY POWER

.1 Provide grounded extension cords and temporary lights required for electrical work.

.2 Co-ordinate with General Contractor for obtaining temporary power service.

.3 If Owner's operations will be affected by any power outage required for this work, give adequate notice to the Owner and do not interrupt power until approval has been obtained.

.4 Give adequate notice to other Contractors of any power outage required for this work. Schedule outages to provide least interference with other work.

3.11 INSULATION RESISTANCE TESTING

.1 Megger circuits and feeders with a 500 V instrument.

.2 Check resistance to ground before energizing.

.3 Submit test results for Consultant's review.

3.12 LOAD BALANCE

.1 Measure phase current to panelboards with normal loads operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Submit, at completion of work, report listing phase and neutral currents on panelboards operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

3.13 NEUTRAL WIRING

.1 Provide a separate white neutral conductor for each lighting circuit.

3.14 GROUND WIRING

.1 Provide a separate green ground conductor in each conduit run.

END OF SECTION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Provide a complete system of wiring, making all connections necessary for the installation shown on drawings.

1.2 REFERENCES, CODES AND STANDARDS

.1 CSA C22.2 No. 0.3, Test Methods for Electrical Wires and Cables.

.2 Install and rate power cables in accordance with the Canadian Electrical Code requirements.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Refer to Section 26 05 11 – Electrical General Requirements.

1.4 PRODUCT DATA

.1 Submit product data in accordance with Section 26 05 11 - Electrical General Requirements.

1.5 WARRANTY

.1 In the event of an emergency failure during the warranty period of any product(s), material(s) or system(s) installed under this Section, and the issuer of the warranty is unable or chooses not to respond to a request by the Owner for immediate emergency repair/replacement of the affected product, material or system, then the Owner reserves the right to recover, from the issuer of the warranty, all costs incurred by the Owner engaged forces in effecting the immediate repair/replacement.

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG copper and larger. Minimum size: 10 AWG copper.

.2 Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene (XLPE) material rated RW90.

.3 All grounding and bonding conductors to be stranded insulated copper. Sheath color green exposed and FT-4 if in a raceway. If located in a plenum space the sheath is to be FT-6 rated.

.4 Dedicated Neutral required for each circuit.

2.2 DIMMING CONTROL WIRING

.1 Control wiring for 0-10V dimming to be copper - minimum size #10awg copper.

Part 3 Execution

3.1 GENERAL

.1 Minimum conductor size #10 AWG copper.

3.2 INSTALLATION OF BUILDING WIRES

.1 Install wiring in conduit systems in accordance with Section 26 05 33.

3.3 WORKMANSHIP

.1 Before pulling wire, ensure conduit is dry and clean. If moisture is present, thoroughly dry out conduits; vacuum if necessary. To facilitate pulling, recognized specially manufactured wire pulling lubricants may be used as long as they are rated for cold temperatures. Do not use grease. Employ suitable techniques to prevent damage to wire when ambient temperature is below the minimum permitted for each insulation type. Do not pull wires into incomplete conduit runs.

.2 Installation to be free of opens and grounds. Before energization, measure insulation resistance and comply with the Canadian Electrical Code. Submit data sheet with values measured.

.3 Provide sizes of conductors as shown on drawings. Voltage drop from lighting panels to farthest load must not exceed 3% at full load in any case. Advise Consultant if problem is foreseen.

.4 Exercise care in stripping insulation from wire. Do not nick conductors.

.5 Conductor length for parallel feeders to be identical.

.6 All grounding and bonding conductors to be stranded insulated copper. Sheath color green exposed and FT-4 if in a raceway. If located in a plenum space the sheath is to be FT-6 rated.

3.4 IDENTIFICATION, CODING AND BALANCING

.1 Connect single-phase equipment to minimize imbalance on feeders. Adjust branch circuiting shown as required for optimum balancing. Record all changes on "record" drawings.

.2 Conductors sized No. 10 and smaller are required to be factory colored, not taped on site.

.3 All wire color to match that of the Canadian Electrical Code.

3.5 TESTING

.1 All power and control wiring shall be tested for insulation resistance value with a 1000-volt megger. Resistance values shall be as recommended by the cable manufacturer.

.2 All wire test results shall be properly tabulated, signed, dated, and submitted to the Consultant.

END OF SECTION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Provide a complete system of wiring, making all connections necessary for the installation shown on drawings.

1.2 REFERENCES, CODES AND STANDARDS

.1 CSA C22.2 No. 65 Wire Connectors.

.2 Install and rate power cables in accordance with the Canadian Electrical Code requirements.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Refer to section 26 05 11 – Electrical General Requirements.

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors: with current carrying parts same material as conductors sized to fit the conductors as required.

.2 Fixture type splicing connectors: with current carrying parts same material as conductors sized to fit the conductors 10 AWG or less.

2.2 WIRE CONNECTORS

.1 Use Approved self-insulated connectors for hand twist wire joints for lighting and power.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Install fixture type connectors, tighten and waterproof. Replace insulating cap.

END OF SECTION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Supply and install all hangers and supports for the installation shown on the drawings and specified herein, as necessary to fasten electrical equipment securely.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Refer to Section 26 05 11 – Electrical General Requirements.

Part 2 ProductS

2.1 CONCRETE AND MASONRY ANCHORS

.1 Materials: Hardened steel inserts, zinc plated for corrosion resistance. All anchor bolts must be galvanized.

.2 Components: non-drilling anchors for use in predrilled holes, sized to safely support the applied load with a minimum safety factor of four.

.3 Manufacturer: Hilti (Canada) Limited or equal.

2.2 NON-METALLIC ANCHORS

.1 Material: Plastic anchors for sheet metal screws.

2.3 CONDUIT SUPPORTS

.1 General: Malleable iron one-hole conduit straps where exposed to weather. Stamped steel two-hole straps indoors.

.2 Masonry, concrete, stone, etc.: Anchors.

.3 Metal studs, ceiling hangers, etc.: “Caddy-Clips” or equal

.4 Strut: strut conduit clamps.

2.4 CABLE SUPPORTS AND CLAMPS

.1 General: As per conduit supports, except that for single conductor cables, suitable non-ferrous, or approved stainless steel or aluminum clamps shall be used.

Part 3 Execution

3.1 GENERAL

.1 Do not cut or drill beams, joists or structural steel unless written permission of the Consultants is obtained.

.2 Distance between conduit or cable supports not to exceed code requirements.

.3 Supports to be suitable for the real loads imposed by equipment.

.4 Supports to be securely fastened, free from vibration and excessive deflection or rotation. Maximum deflections are 4 mm over a 1-meter span and 8 mm over a 2 meter span.

.5 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

.6 Provide conduit rack with 25% spare capacity for multiple runs.

.7 Provide channel support with fittings for vertical runs of conduit and cables.

3.2 INSTALLATION

.1 Secure equipment to solid masonry, tile and plaster surfaces with approved anchors.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls with toggle bolts.

.4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.5 Fasten exposed conduit or cables to building construction or support system using straps.

.1 One-hole malleable iron or 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.

.6 Use plastic anchors for light loads only. Use metal anchors for all other loads.

.7 Shot driven pins may only be used with written approval of the structural engineer.

.8 Use round or pan head screws for fastening straps, boxes, etc.

.9 Do not support heavy loads from the bottom chord of open web steel joists.

.10 Support outlet boxes, junction boxes, panel tubs, etc., independent of conduits running to them. Support conduits within 600 mm of outlet boxes. Support surface mounted panel tubs with a minimum of four 6 mm fasteners.

.11 For surface mounting of two or more conduits use channels at 1.5 m oc spacing.

.12 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.13 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.14 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.15 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of the Consultant.

END OF SECTION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Supply and install all hangers and supports for the installation shown on the drawings and specified herein, as necessary to fasten electrical equipment securely.

Part 2 General

2.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Provide a complete system of boxes and cabinets for the installation of wiring and equipment.

2.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data for cabinets in accordance with Section 26 05 11 Electrical General Requirements.

2.3 WARRANTY

.1 In the event of an emergency failure during the warranty period of any product(s), material(s) or system(s) installed under this Section, and the issuer of the warranty is unable or chooses not to respond to a request by the Owner for immediate emergency repair/replacement of the affected product, material or system, then the Owner reserves the right to recover, from the issuer of the warranty, all costs incurred by the Owner or Owner engaged forces in effecting the immediate repair/replacement.

2.4 WASTE MANAGEMENT AND DISPOSAL

.1 Refer to Section 26 05 11 – Electrical General Requirements.

Part 3 Products

3.1 PEDESTALS, WEATHERPROOF

.1 Minimum acceptable standard is AC Dandy model #6A-DPP single sided. Painted brown and without decals except CSA logo and rating.

.2 Minimum acceptable standard is Killark or equal breather drain on top of pedestal

3.2 JUNCTION BOXES AND CABINETS, WEATHERPROOF

.1 Materials:

- .1 Code gauge sheet steel, welded construction, phosphatized and factory paint finish, suitable for field painting, door gasket.
- .2 Locks: to match panelboards.
- .3 Backplates: 1.5 mm steel backplate, one piece per cabinet, covering entire cabinet interior
- .4 Minimum acceptable standard is Killark breather drain on top of junction box and one on bottom side.

3.3 JUNCTION BOXES AND PULL BOXES, INDOOR DRY LOCATIONS

.1 Materials:

.1 Code gauge sheet steel, welded construction, phosphatized and factory paint finish, suitable for field painting.

.2 Locks: to match panelboards.

.3 Backplates: 1.5 mm steel backplate, one piece per cabinet, covering entire cabinet interior

3.4 CABINETS – INDOOR DRY LOCATIONS

.1 Materials:

.1 Cabinets: Code gauge sheet steel, welded construction, phosphatized and factory paint finish, suitable for field painting.

.2 Locks: to match panelboards.

.3 Backplates: 1.5 mm steel backplate, one piece per cabinet, covering entire cabinet interior.

.2 Components:

.1 With hinged door and return flange overlapping sides, with handle, lock and catch for surface mounting, size as indicated or to suit.

.2 Surface or flush with trim and hinged door, latch and lock and two keys, size as indicated or to suit. Keyed to match panelboard keys.

Part 4 Execution

4.1 INSTALLATION

.1 Junction Boxes and Pull Boxes:

.1 Supply all pull boxes and junction boxes shown on the drawings or required for the installation. Maximum 30 m (100 feet) spacing.

.2 Install in inconspicuous but accessible location.

.3 Identify with system name and circuit designation as applicable.

.4 Size in accordance with the Canadian Electrical Code, as a minimum.

4.2 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 11- Electrical General Requirements**.**

END OF SECTION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Provide a complete system of boxes for the installation of wiring and equipment.

1.2 REFERENCES

.1 CSA C22.1-Canadian Electrical Codes, Part 1.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Refer to Section 26 05 11 – Electrical General Requirements.

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 Size boxes to accommodate drivers where required.

2.2 OUTLET BOXES FOR METAL CONDUIT

.1 Materials:

.1 Surface or recessed concealed type: Die formed steel, hot dip galvanized, 1.25 oz/sq. ft. minimum zinc coating.

.2 Surface mounting exposed: Cast ferrous for threaded conduit, with attached lugs, corrosion resistant two coats finish.

2.3 OUTLET BOXES FOR RIGID PVC CONDUIT

.1 Materials:

.1 Rigid PVC boxes and fittings: Unplasticized PVC.

.2 Size boxes to accommodate drivers where required.

2.4 CONCRETE BOXES

.1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

.2 Size boxes to accommodate drivers where required.

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 32 mm and pull boxes for larger conduits.

.4 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 material to prevent entry of debris during construction. Remove upon completion of work.

.3 Provide correct size of openings in boxes for conduit. Reducing washers are not allowed.

.4 Do not distort boxes during installation. If boxes are distorted, replace with new boxes.

.5 Do not use sectional boxes.

.6 Provide boxes sized as required by the Canadian Electrical Code, allow for size of drivers where required.

.7 Install vapour barrier material to surround and seal all outlet boxes located on exterior walls of building. Maintain wall insulation.

.8 Where outlet boxes penetrate throughout a fire or smoke separation, ensure that they are tightly fitted with non-combustible material to prevent passage of smoke or flame.

.9 No sectional or handy boxes to be installed.

END OF SECTION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Provide a complete system of boxes for the installation of wiring and equipment.

Part 2 General

2.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Provide a complete system of conduit and fittings for installation of wiring.

2.2 WASTE MANAGEMENT AND DISPOSAL

.1 Refer to Section 26 05 11 – Electrical General Requirements.

Part 3 Products

3.1 E.M.T. CONDUIT

.1 Fittings in dry locations: Steel or zinc set screw connectors with insulated throat. Steel or zinc set screw couplings.

.2 Fittings in wet locations: steel rain tite connectors with insulated throat. Steel rain tite couplings.

.3 Where exposed to public view EMT conduit to be lightly sanded and primed with Stixs (or equal) primer and painted to match background it is installed to.

.4 Minimum size to be 21 mm.

3.2 RIGID P.V.C. CONDUIT

.1 Conduit: rigid non-metallic conduit of unplasticized polyvinyl chloride as manufactured C.G.E. "Sceptre" Schedule 40 or equal.

.2 Fittings: threaded male or female solvent weld connectors and solvent weld couplings, as supplied by conduit manufacturer.

Part 4 Execution

4.1 E.M.T. CONDUIT

.1 Use as raceways for following applications:

.1 Surface mounted.

.2 It may not be used in corrosive atmosphere or underground.

4.2 RIGID P.V.C. CONDUIT

.1 Use as raceways for following applications

.1 In poured concrete and on underground runs exterior to the buildings unless otherwise noted.

.2 Wiring installed in areas subject to intermittent or continuous moisture.

.2 Provide insulated ground wire in all rigid PVC conduits in accordance with the Canadian Electrical Code.

.3 Where rigid PVC conduit is set in poured concrete, solvent joints must be completed and allowed to set as per manufacturer's instructions.

.4 Bend rigid conduit in strict accordance with manufacturer's directions. Distorted bends will not be accepted.

4.3 WORKMANSHIP

.1 Install all conduit and wiring concealed, unless otherwise shown on the drawings. Do not recess conduit in columns, except as noted, without permission.

.2 Where conduit is run exposed, run parallel to building lines. Where conduits are grouped (two or more), space evenly, make bends concentric.

.3 Lay out conduit to avoid interference with other work. Maintain a minimum clearance of 150 mm from steam or hot water piping, vents, etc.

.4 Conduits to have minimum 25 mm concrete cover.

.5 Organize conduit in slabs to minimize crossovers.

.6 Provide underground warning tapes 300 mm below grade above all underground conduits. Tape shall be yellow warning tape, 150 mm wide.

.7 Where steel conduit is required to be bent, do not heat, and do not bend conduit in such a way as to reduce pipe cross section area at any point. Radii of bends shall be as per Canadian Electrical Code.

.8 For all runs of conduits, do not include more than equivalent of 4 - quarter bends. Provide conduit fittings, pullboxes and junction boxes where necessary. Pulling elbows shall not be used except by special permission.

.9 Where possible, install conduits so that they are not trapped, cap turned up conduits to prevent the entrance of dirt of moisture during construction. Swab out conduit and thoroughly clean internally before wires and cables are pulled.

.10 Take extreme care in reaming ends of all conduit to ensure a smooth interior finish that will not damage the insulation of the wires.

.11 Use insulated non-metallic bushings on all conduit terminations.

.12 Ensure electrical continuity in all conduit systems.

.13 All conduits shown exposed in finished areas is to be free of unnecessary labels and trade marks.

.14 Install a 90 lb. test line in all conduits left empty by this contractor including those which others will pull cables, wires, etc.

.15 Conduits and ducts crossing building expansion joints shall have conduit expansion fittings to suit the type of conduit used, and shall be Crouse-Hinds, Sceptre, or equal fitting.

.16 Seal conduits with duct seal where conduits are run between heated and unheated areas. Where conduits, cables, or cable trays pierce fire separations, seal openings with Dow Corning 3-6548 sealant or equal.

.17 Where conduits pass through walls, they shall be grouped and installed through openings. After all conduits shown on the drawings are installed, wall openings shall be closed with material compatible with the wall construction.

.18 Where conduit finish is damaged, repair or replace.

.19 Where conduits pass through fire separations, seal with approved fire sealing compound.

.20 Maximum run of conduit shall not exceed 30 m. Provide pull boxes at a minimum of every 30 m.

.21 All conduit bends shall be sweep type bends with the inside radius not less than six (6) times the diameter for conduits 50 m and smaller and ten (10) times the diameter for conduits 65 mm and larger.

.22 Provide a separate ground conductor in each conduit

END OF SECTION

TESTING, ADJUSTING AND COMMISIONING OF ELECTRICAL EQUIPMENT AND SYSTEMS

Part 1 General

1.1 INTENT

.1 Except where otherwise specified, arrange and pay for testing, adjusting, balancing and of dimming system by system supplier or agency representative.

.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. Confirm with agency representative or manufacturer how many days are required to commission the system.

.4 Care Systems of Vernon BC is responsible for the BMS system at Radium Hot Springs. Electrical contractor to engage the services of Care Systems for the termination of required wiring from the dimming system and integration of dimming system control with existing Automated Logic system.

.5 All tests shall be witnessed by persons designated by the Owner, who shall also sign the test documentation.

.6 Submit procedures proposed in writing for approval two (2) weeks prior to test.

1.2 RELATED WORK

.1 Electrical General RequirementsSection 26 05 11

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 Consultant 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 Consultant 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 for 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 before 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 NEW DIMMING EQUIPMENT

.1 Enclosure:

.1 Visually inspect.

.2 Torque all connections to manufacturer’s specifications.

.2 Dimming modules:

.1 Visually inspect.

.2 Mechanical function test.

3.2 LIGHTING

.1 Function test all light switches, luminaires, dimmers and lighting control equipment such as photo-cells and time clock settings.

.2 Prior to energizing lighting control system, ensure all equipment and wiring for proper installation and termination. Check that all pre-set levels are set and operate as specified.

.3 Record all settings for all lighting control devices such as time clock, sensors, etc.

3.3 COMMUNICATIONS CABLING

.1 Check installation of all equipment.

.2 Ensure all cables are properly identified at each end and correctly terminated prior to testing.

3.4 TESTING OF WIRING AND WIRING DEVICES

.1 Test conductors at distribution centers 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.

.4 Test voltage at all lights.

3.5 LOAD BALANCE TESTING

.1 Perform load tests with as many building loads on as possible prior to Interim Acceptance and three months after Practical Completion.

.2 Test load balance on all feeders at panel boards, distribution centers, motor control centers and lighting panelboards.

.3 If load unbalance exceeds 15%, reconnect circuits to balance loads. Revise panelboard directories and wiring identification accordingly.

SYSTEM COMPLETION AND COMMISSIONING

SYSTEM: _____

The above system is installed as per the drawings and specifications, is complete and has been commissioned.

Electrical Contractor

Signed by: _____Dated: _____

General Contractor

Signed by: _____Dated: _____

Deficiencies Attached

This system has been reviewed by:

The Consultant

Signed by: _____Dated _____

The Owner's personnel have been instructed in the operation and maintenance of the above system:

The Owner

Signed by: _____Dated _____

The above does not constitute a waiver of any of the requirements of the Contract Documents.

	ELECTRICAL CONTRACTOR	GENERAL CONTRACTOR
	_____	_____
Address:	_____	_____
	_____	_____
Phone:	_____	_____

END OF SECTION

ELECTRICAL EQUIPMENT SYSTEM DEMONSTRATION AND INSTRUCTION

Part 1 General

1.1 INTENT

.1 Provide demonstration and instruction sessions to familiarize Owner's operation and maintenance personnel with the new lighting, the new dimming system and their operation and maintenance.

.2 Submit system sign off sheets for each system listed prior to substantial completion.

.3 All sign off and survey sheets shall be typewritten.

1.2 MANUFACTURER'S SITE SERVICES

.1 Arrange and pay for appropriately qualified manufacturers' representatives to provide or assist in providing electrical equipment and system demonstration and instruction as specified herein.

1.3 CONTRACTOR/OWNER COORDINATION

.1 Owner will chair demonstration and instruction sessions.

.2 Establish agendas for demonstration and instruction sessions in conjunction with Owner. Coordinate scheduling of sessions with Owner.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 SYSTEMS DEMONSTRATION AND INSTRUCTION SEMINARS

.1 Provide demonstration and instruction seminars for the following equipment and systems identified. Include in demonstrations and instruction seminars, the information specified for each piece of equipment and system.

.1 New Dimming control system

.1 Disconnect switch operation.
.2 Protective features.
.3 Protective relaying - calibration and operation.
.4 Metering - calibration and operation.
.5 Safety procedures.
.6 Troubleshooting procedures.
.7 Visual maintenance inspections.
.8 Maintenance procedures.
.9 Testing requirements and procedures.
.1 Dimmers.
.2 Time clock operation.

.3 Master control unit programming and interface with Automated Logic System.

.10 Spare parts.

.2 Lighting:

.1 Description of each luminaire with respect to lamp, driver and ballast or any other special features:

.1 Troubleshooting procedures.

.2 Maintenance procedures.

.3 Spare parts.

3.2 SITE TOURS

.1 Provide a “walk through” Contractor guided tour of new lighting and dimming system to allow operators to familiarize themselves with it.

.2 Coordinate timing of tour with the Owner.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section covers the providing and installation of distribution panelboards.

1.2 RELATED DOCUMENTS

.1 All sections of the Bidding Requirements, contract Conditions and Division 1 are part of this section.

Part 2 Products

2.1 PANELBOARDS, CIRCUIT BREAKER TYPE, 208/120 VOLT, 3 PHASE 4 WIRE

.1 Manufacturers: Square D, Siemens, General Electric, or Cutler-Hammer are all minimum acceptable standard.

.2 Shall be dead front type with surface mounted steel cabinet as required and an internal assembly of circuit breakers. Trims shall have hinged and locked doors with heavy plastic covered circuit directories. All locks shall be keyed alike. Boxes shall be galvanized, and front assembly shall be painted with a prime and a finish coat of manufacturer=s standard finish. Panels shall have 3 phase, 4 Wire, solid neutral mains of capacities indicated on the Drawings with main lugs or main circuit breaker as required.

.3 Panelboards shall have suitable gutter space to accommodate separate neutrals conductors for all branch circuits.

.4 Circuit breakers shall be molded plastic case type, quick-make, quick-break, with trip free common operating handle, position indication and common trip from thermal-magnetic trip device. Trip ratings shall be as indicated on the Drawings and minimum interrupting capacity shall be 22,000 RMS symmetrical amperes at 240 volts.

.5 Bus

.1 All bus bars shall be silver-plated copper. Main horizontal bus bars shall be mounted with all three phases arranged in the same vertical plane. Bus sizing shall be based on NEMA standard temperature rise criteria of 65 degrees C over a 40 degrees C ambient (outside the enclosure).

.2 A copper ground bus (minimum 1/4 x 2 inch), shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the switchboard.

.3 All hardware used on conductors shall be high-tensile strength and zinc-plated. All bus joints shall be provided with conical spring-type washers.

.6 Wiring/Terminations

.1 Mechanical-type terminals shall be provided for all line and load terminations suitable for copper or aluminum cable rated for 75 degrees C of the size as indicated on the drawings.

.2 Lugs shall be provided in the incoming line section for connection of the main grounding conductor. Additional lugs for connection of other grounding conductors shall be provided as indicated on the drawings.

.3 Each switchboard shall have a neutral bar with incoming terminations equal to the phase terminations and load side terminations equal to the terminations of the switchboard load switches.

.7 Circuit Breakers

.1 Circuit breakers shall be molded plastic case type, quick-make, quick-break, with trip free common operating handle, position indication and common trip from thermal-magnetic trip device. Trip ratings shall be as indicated on the Drawings and minimum interrupting capacity shall be 22,000 RMS symmetrical amperes at 240 volts. Circuit breakers to be of the “bolt on” type.

.8 Enclosures

.1 NEMA 1 Enclosure

.9 Nameplates

.1 Engraved nameplates, mounted on the face of the assembly, shall be furnished for all main and feeder circuits as indicated on the drawings. Nameplates shall be laminated plastic, black characters on white background. Characters shall be 3/16-inch high, minimum. Nameplates shall give item designation and circuit number as well as frame ampere size and appropriate trip rating. Furnish master nameplate giving switchboard designation, voltage ampere rating, short-circuit rating, manufacturer's name, general order number, and item number.

.10 Finish

.1 All exterior and interior steel surfaces of the panelboard shall be properly cleaned and provided with a rust-inhibiting phosphatized coating.

Part 3 Execution

3.1 INSTALLATION

.1 Panelboards shall be surface mounted in electrical rooms or flush mounted where indicated on plan drawings.

.2 Mount panelboard directly to painted plywood covering wall.

.3 Install panelboards plumb and level.

3.2 GROUNDING

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

3.3 IDENTIFICATION

.1 Provide name plates.

.2 Paint panelboards.

END OF SECTION

Part 1 General

1.1 DOCUMENTS

.1 Refer to contract drawings for lighting specification.

.2 This section of the specifications forms part of the Contract Document and is to be read, interpreted, and co-ordinated with all other parts.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

.1 Supply and installation of luminaires complete with drivers supports and accessories

.2 Supply and installation of and back boxes.

.3 Supply and installation of integral parts not specified, but otherwise required to form a fully functional system

1.3 GENERAL REQUIREMENTS

.1 All Luminaires will be purchased by the Contractor. Include in the tender price administration of all shop drawings, purchase of all lights, receiving Luminaires on site, uncrating of all the Luminaires and clean up.

.2 Install lighting as indicated in Contract Documents and as per manufacturer recommendations.

.3 Provide and install all materials, components, and services necessary for a complete and functional power and communication wiring distribution system for lighting.

.4 Equipment submitted in compliance with performance specification shall be subject to review and approval.

.5 Contractor shall submit a complete list of lighting products intended to be furnished with manufacturer and catalogue designations, along with currently quoted lead times for delivery of same. Products deemed non-compliant with performance specification by the Engineer shall be revised and resubmitted at no cost to Owner. Should the Contractor anticipate that the delivery schedule of any specified product may adversely impact the construction schedule, he shall bring it to the attention of the Owner at this time.

1.4 RELATED DOCUMENTS

.1 Section 26 05 11: General Electrical Requirements

.2 Section 26 05 33: Conduits, Conduit Fastenings, and Conduit Fittings

.3 Section 26 05 19: Wires and Cables

.4 Section 26 05 32: Outlet Boxes, Conduit Boxes, and Fittings

.5 Section 29 05 29 Fastenings and Supports

1.5 REFERENCES

.1 Underwriters' Laboratories Canada (ULC).

.2 Illuminating Engineering Society of North America (IES).

.3 Canadian Standards Association (CSA).

.4 CGSB 31-GP-103Ma, heavy Phosphate conversion coatings for Iron and Steel (for Corrosion Resistance).

.5 CGSB 31-GP-105Ma, Zinc Phosphate Conversion Coatings for Paint Base.

.6 CGSB 31-GP-106M, coating, Conversion, Iron Phosphate, for Paint Base.

.7 Installation of lighting equipment to conform to the current edition of the Canadian Electrical Code as amended and supplemented by provincial, municipal or other regulatory agencies having jurisdiction.

1.6 SUBMITTALS, SHOP DRAWINGS, AND PRODUCT DATA

.1 Submittals

.1 Submit shop drawings, samples and product data in accordance with Section 26 05 11 General.

.2 Provide the required number of submittals promptly and deliver through appropriate channels, leaving sufficient time for adequate review and possible resubmittals without jeopardizing Project Schedule.

.3 Contractor is responsible for all verification and actual field dimensions, quantities, co-ordination, and compliance with Contractor Documents.

.4 Submit shop drawings of all components associated with each applicable luminaire shop drawing. If required by the Consultant, submit certified thermal test data for each type of driver mounting.

.2 Contractor shall provide fully dimensioned shop drawings for all fixture types and all custom mounting hardware.

.1 No release of orders for lighting equipment shall be made until review of submittals is complete and approval is given.

.2 Submit shop drawings for all products as follows:

.1 Provide photometric analysis of all luminaire submissions.

.2 Provide complete, fully dimensioned detail drawings including all major components and details of fabrication.

.3 Provide requisite schematics and plans indicating assembly and installation of components.

.4 Provide inventory of all equipment to be supplied including types, quantities, and reference to applicable drawings and schematics.

.5 Submit a list of luminaire types and quantities and catalogue cuts for all product data. Such data shall show both technical and pictorial detail, marked specifically to show the optional components required, the exact catalogue number, and type designation corresponding to the type indicated in the luminaire Schedule. Include this data also with Maintenance Manual with the Consultant's review stamp.

.6 Manufacturer's product data shall be marked clearly to indicate all technical information that indicates conformance to all specified requirements in Contract Documents. Include the following information for all fixtures not listed as pre-approved in the light fixture schedule:

.1 Manufacturer's catalogue sheets of standard fixtures, indicating materials, gauges, dimensions, standard finishes available, weights, CSA (or approved equivalent) approval of fixture.

.2 Photometrics from an independent testing laboratory calculated according to IES standards. Photometrics shall include the following:

.1 For lighting fixtures used for general illumination:

.1 Candlepower distribution curve and table. Data in table shall have vertical angles no greater than 10º increments, (5º, 15º, 25º, etc.,). All asymmetric distributions shall have quadrants represented in 22.5º increments, (parallel, 22.5º, 45º… normal), or sufficient increments to fully describe asymmetric light distribution.

.2 Coefficient of Utilization (CU) tables.

.3 Visual Comfort Probability (VCP) table (fluorescent fixtures only) for 100 foot candle room with reflectance of 80% ceiling, 50% wall, and 20% floor with task height of 2.5'.

.4 Zonal lumens stated numerically in 10º increments, (5º, 15º, etc.,) or smaller increments for narrow beam fixtures.

1.7 DELIVERY & STORAGE

.1 Equipment shall be individually wrapped and sealed and substantially crated for shipment. All handling and shipping shall be performed in accordance with Manufacturer's recommendations. Store products in unopened cartons in a protected location.

1.8 WARRANTY

.1 Provide Contractor warranties as well as factory warranties. All equipment and labour in this Contract shall be free from defects in products or workmanship for 12 months after date of acceptance by the Owner, unless otherwise noted or approved by Owner.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Refer to section 26 05 11 – Electrical General Requirements.

Part 2 Products

2.1 GENERAL

.1 All fixtures and drivers to be rated for -20 degrees celcius.

.2 Provide all products with CSA labels or appropriate approvals for all mounting conditions.

.3 Provide lighting fixtures new and complete with mounting accessories, junction boxes, trims, and drivers.

.4 Fixture type catalogue number does not necessarily denote required mounting equipment or accessories. Provide all appropriate mounting accessories for all mounting conditions.

.5 Provide only luminaires, which are structurally, well designed and constructed and which use new materials of the highest commercial grade available. Unless specifically noted otherwise, luminaires to be of the quality stated in the manufacturers catalogues and data sheets. Luminaires shall be designed for adequate dissipation of driver and lamp heat.

.6 . Hinges, latches and other exposed hardware to be non-metallic or 316 stainless steel for corrosion-resistant luminaires.

2.2 LUMINAIRE CONSTRUCTION

.1 General

.1 No metal clips, screws, angles, etc. shall be visible when the fixture is viewed from below.

.2 Extruded fixture housings shall have a minimum thickness of 2.3 (3/32") mm and be smooth and free of tooling lines. Die cast end plates and joiner sections shall have a minimum thickness of 2 (3/32") mm thickness and concealed fasteners.

.3 Die casts shall be smooth, free of pits, grooves, and imperfections.

.4 Spinning shall be smooth and clean with finished edges, and free of spinning lines.

.5 Sheet metal fixture housings shall be of welded construction with seams filled and ground smooth. Any exceptions shall be noted under individual fixture types.

.6 Material shall be light-stable 100% virgin acrylic with minimum 98% transmittance unless otherwise indicated. Acrylic shall conform to minimum standards of IES-NEMA-SPI, and have a minimum thickness of 3mm. Material shall perform as applied for a period of 20 years with no greater than 5% transmission loss.

2.3 STANDARD LEDS LUMINAIRES

.1 Consider LED sources based on durability, energy efficiency, and reduced maintenance.

.2 LED luminaires are to be provided by manufacturers with a minimum (10) years' experience and provide minimum (5) years warranty on all electrical parts.

.3 LED components and LED luminaires shall comply with ANSI chromaticity standards, IES-TM-21 Projecting Long Term Lumen Maintenance of LED Light Sources Standard, LM79 and IES LM80 lumen maintenance testing standards.

.4 Dimmable LEDs will utilize common control philosophy based upon system head end. Contractor shall be responsible for all dimming control systems.

.5 LED lighting systems with unmatched drivers and power supplies will not be considered.

.6 They must respond cUL recognized and CSA compliant.

.7 They should comply with CSA-C866-12 Performance for LED luminaires.

.8 Intensity:

.1 Fixture LED design will provide long-life operation in accordance with the technical spec designed for each fixture and they will considerer heat dissipation and other degradation factors in order to offer the guarantees established.

.9 Operating Life:

.1 They must be designed to operate upwards of 50.000 hours at 25°C ambient temperature. LEDs fixtures must resist shock, vibration and can be cycled on and off without degradation.

.10 LED Power Supplies:

.1 . LED fixture power supplies must be dimmable utilizing single control philosophy to attain 5% increments in luminaire output, IP-65 minimum and rated to -20 degrees celsius. The wide range of input voltage must be 120 use on single-phase AC power lines. They must be protected against open circuit, short circuit, overload and overheating. Minimum acceptable standard is Mean Well HLG series.

.11 They must respond cUL recognized and CSA compliant.

.12 They must comply with CAN/CSA-C22.2 NO. 250.13-12 – LED equipment for lighting applications.

Part 3 Execution

3.1 INSTALLATION - GENERAL

.1 Lighting fixtures shall be installed as indicated on Electrical Drawings and per approved shop drawings.

.2 Lighting fixtures are indicated in the Luminaire Schedule.

.3 Lighting fixtures shall be installed in accordance with fixture manufacturer's written instructions, applicable requirements of CED, applicable authorities, and with recognized industry practices.

.4 Work shall be co-ordinated with other trades.

.5 Install lighting fixtures true to the surface in or to which they are mounted, and except where otherwise indicated on the Drawings, align correctly with building or room walls as the case directs.

.6 All parts of all lighting fixtures shall be securely fastened.

3.2 WORKMANSHIP

.1 Hang and mount luminaires to prevent distorting frame, housing, sides or lens frame and permit correct alignment of several luminaires in a row.

.2 Support luminaires level and plumb, and turn with structure and other equipment in horizontal or vertical position as intended. Install wall or side bracket mounted luminaire housings rigidly, and adjust to neat flush fit with mounting surface.

.3 Install ceiling canopies to cover suspension attachments and fit tightly to ceiling without restricting alignment of hanger.

3.3 FIELD QUALITY CONTROL

.1 Operate each fixture after installation and connection. Each fixture shall be Inspected for proper connection and operation.

.2 Verify that all lenses, louvres, baffles, fixture trim cones, diffusers and other parts are thoroughly cleaned in a manner recommended by the manufacturer.

3.4 BRANCH CIRCUIT WIRING

.1 Conductors shall be a minimum size of #10 R90 copper XLPE.

.2 Provide a neutral for each circuit (phase conductor).

.3 Conduits shall be sized in accordance with code requirements and the drawings. Run visible conduit parallel to major building lines.

3.5 ADJUSTMENTS

.1 All adjustable fixtures shall be aimed and dimmed as instructed by the Engineer or Lighting Designer. The contractor shall be available for all luminaire adjustments. All tools, labor and equipment shall be provided by Electrical Contractor to facilitate the adjustments.

3.6 CLEANING

.1 All necessary equipment, materials, wiring, and fixtures shall be removed from those areas affected by the construction. Materials that are not part of the lighting or electrical distribution system shall be removed from the Site.

.2 All lighting fixtures shall be cleaned in a manner approved by the manufacturer and shall be free of dirt and debris upon completion of installation.

3.7 PROTECTION

.1 Lighting fixtures, once installed, shall be protected from damage during the remainder of the construction period.

END OF SECTION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Supply and installation of 0-10V dimming control system.

.2 Supply and installation of controllable head unit.

.3 Supply and installation of junction boxes for the head unit.

.4 Coordination and incidental work to be completed by Care Systems for connection to the Existing Automated Logic BMS system.

1.2 RELATED SECTIONS

.1 Section 26 50 00 Lighting Equipment

1.3 REGULATORY REQUIREMENTS

.1 The lighting control system shall be CSA or ULC labelled. Programmable panelboards shall be CSA or ULC labelled.

1.4 GENERAL REQUIREMENTS

.1 General Clean-up.

.2 All inspection and other permits, licenses required by various Inspection Agencies and local regulations related to Electrical Trade.

.3 Shop Drawings.

.4 Project Record Documents (As-Built Drawings).

.5 Operating and Maintenance Data.

1.5 MATERIALS

.1 Contractor to provide BOM required to fully achieve dimming system described in 1.1.

1.6 SUBMITTALS

.1 Component list.

.2 Assembly ratings including short circuit rating, voltage and continuous current.

.3 Cable terminal sizes.

.4 Product data sheets. Submit original manufacturers data sheets on system submitted and components supplied, with complete descriptions of hardware and soft wear.

.5 Shop drawings.

.6 Wiring diagrams. Typical for all components.

.7 One-line diagram.

1.7 QUALIFICATIONS

.1 The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

.2 The manufacturer should be ISO 9001 or 9002 certified.

.3 The manufacturer shall have a minimum of 5 years manufacturing experience.

Part 2 Products

Lighting control system shall include control unit hardware and soft wear, control devices, sensors, operator input/output devices, all miscellaneous devices required for complete operation, and that will provide maximum benefit to the end user. It shall interface with the existing Automated Logic BMS system.

2.1 PERFORMANCE REQUIREMENTS

.1 The Lighting Control System shall have web-based software management program that enables remote system control, status monitoring, and creating of lighting control profiles.

.2 Lighting Control Systems shall support external control using external industry standard protocol preferably BAC net.

.3 The system shall be capable of monitoring and controlling a string of lights connected to a single circuit breaker or multiple strings of lights connected to a group of circuit breakers locally and remotely.

.4 The system shall be capable of monitoring and controlling a specific lighting zone.

.5 Individual lighting zones shall be capable of being segmented into several channels of occupancy, photocell, and switch functionality for sequences of operation.

.6 The system shall be capable of operating a lighting control zone based on:

.1 Time-of-day scheduling.

.2 Sunrise/sunset times using an astronomical clock.

.3 Daylight savings time adjustments.

.7 All lamps, LEDs, ballasts, drivers, sensors, and controls must be fully compatible, providing full operability of all components.

.1 The control system shall achieve 0-10V dimming at each specified lighting zone. Alternate control systems shall be considered provided it is demonstrated by the proponent that the system can integrate with the current proposed luminaires and drivers.

.2 The control system shall be controllable through the BMS by means of software interface to allow users to remotely access, alter, and operate the system.

.3 The control system shall have capacity for the current dimming zones as depicted within the contract documents with the ability to handle a 25% increase in lighting zones for future growth. See E001 Lighting control zone table.

.4 Contractor to ensure even dimming across all luminaires within a dimming zone at increments no less than 10% of delivered lighting values. All luminaires within a dimming zone shall dim uniformly; non-uniform dimming shall not be permitted.

.5 All equipment located outdoors to be minimum rated -20-degree Celsius operation with IP66 certification, bearing CSA or ULC approvals regardless of whether devices will be installed within enclosures.

.6 Design information as depicted on the drawings is for illustration of typical system requirements. The contractor shall be responsible for the supply and install of all system requirements including but not limited to equipment, cabling, conduits, and junction boxes for a complete and operational system.

.7 Contractor shall make provisions for commissioning of the system, maintenance and operations binders, and provide training to the owner for the operation of the system. Contractor shall demonstrate full operation of the system including incremental dimming capabilities both locally and remotely to the owner and the consultant.

2.2 LIGHTING CONTROL SYSTEM REQUIREMENTS – HARDWARE

.1 NODES – an electronic device that is to be installed in junction boxes remote from the light point. It must be able to receive ON/OFF and dimming commands and to execute them with the ballast and or driver. It must be able to perform the other features listed in the sections below. It must communicate over the existing powerline cables using ISO 14908 communication standard. The node shall be capable of:

.1 Nodes must be installed in junction boxes remote from the light point. Supplier shall detail the possible types of installation and associated technical constraints or need for additional accessories.

.2 The nodes must preferably consume less than 2 watts. It shall operate on 120 to 277Volts, 60HZ.

.3 The solution must be capable of step less dimming from 10% to 100% light level with the possibility to set the dimming level at any percent between these two values.

.4 The nodes must communicate over powerline or RF using the ISO 14908 protocol that is standardized by the International Standard Organization (ISO/IEC), also called LONWORKS on power line or wireless

.5 The nodes must be able to repeat the powerline signal for another node on the segment, in the case when the segment controller cannot reach the final node.

.6 The nodes must have IP 65 or higher rating.

.7 The nodes must be compliant with open LonMark Luminaire Controller profile.

.8 The nodes must measure voltage, current, power, power factor.

.9 The nodes must measure and store the cumulated energy consumption.

.10 The nodes must measure and store the number of lamp burning hours.

2.3 SEGMENT CONTROLLER

.1 An electronic programmable device that is to be installed in a cabinet or feeder pillar. It must provide an astronomical clock to control the main segment and each light point, individually or by group, by communicating using ISO14908 communication standard over the existing powerline cables. It must send ON/OFF and dimming commands. It must collect data including alarms from each light point and send them to the monitoring software. It must be able to perform the other features listed in the sections below.

.2 The segment controller shall be capable of:

.1 The segment controller must be installed on a rail DIN so that it can fit in new or existing cabinets. The controller is to be located for convenient servicing. Provide enclosure as required to house the segment controller and other components.

.2 The segment controller shall comply with EMC FCC Part 15 Class B, EN55024, CISPR 22 Class B, VCCI Class B.

.3 The segment controller must support 120 to 277Volts, 60 HZ.

.4 The segment controller must be able to communicate using TCP/IP over Ethernet or GPRS. No proprietary protocol shall be accepted. The segment

controller must have a RJ45 Ethernet port (for ADSL, fiber optic, Wi-Fi or 3G) and a RS232 port for a GPRS modem.

.5 The segment controller must be remotely configurable, through the CMS.

.6 The segment controller must consume less than 20 watts.

.7 The segment controller must support temperature from -20 degrees Celsius to +60 degrees Celsius without requiring any additional ventilation or heating devices.

.8 The segment controller must provide at least one digital ON/OFF output to control the mains. It must provide 2 digital inputs for applications such as door-open detection.

.9 The segment controller must provide a way to add digital and/or analog inputs to identify other signals, events, or failures.

.10 The segment controller shall provide a fail-safe lighting operation in case of power outage, and failure of the segment controller.

.11 The segment controller must provide an integrated astronomical clock that can be configured remotely based upon (GPS position of the segment controller). ON/OFF and dimming commands shall be programmed based on the signals provided by this astronomical clock, + or – a time shift.

.12 The segment controller must communicate, manages, and control lights on wireless and power line networks.

.13 The segment controller must be able to support at least 250 nodes.

.14 The segment controller must provide automatic mechanism to manage the repeating of the power line signal. The supplier shall describe such mechanism that optimizes the communication with the nodes. The solution must continue to work 100% correctly even when a node is out of order.

.15 The segment controller must control the node autonomously, without any connection to any central server or central service.

.16 The segment controller must communicate with the CMS using standardized methods such as XML, SOAP, http, POP3, CSV file exchange, or FTP.

.17 The segment controller shall provide ways to control group of light points to switch them ON/OFF and dim them.

.18 The segment controller shall send data to the CMS on its own, without the CMS polling for data, either every day or on alarm. This is to ensure scalability. Supplier shall describe the strategy to send data to the CMS.

.19 The segment controller shall keep up to one month of data on its local flash disk if no communication towards the CMS.

.20 The segment controller shall be able to control/monitor MODBUS devices on a RS485 or RS232 serial interface.

.21 The segment controller shall provide means to program specific application that would run locally.

.22 The segment controller shall provide a dynamic DNS client to enable remote control even on a TCP/IP network where TCP/IP addresses are changed on a periodic basis.

.23 The segment controller shall automatically (without manual operation) update its real-time clock when summer/winter time shift.

.24 The segment controller shall provide a way to automatically synchronize its internal real-time clock with a SNTP server. This action shall not require any manual operation but shall be automatically performed by the segment controller at periodic interval.

.25 Each segment controller shall have a local switch for maintenance functions such as bypass all loads ON and OFF.

.26 The segment controller shall be able to collect data from at least 3 different models of energy meters.

.27 Software that communicates to the segment controller(s) via TCP/IP over Ethernet or GPRS, using standardized methods such as XML, SOAR, http, POP3, CSV file exchange or FTP.

2.4 LIGHTING CONTROL SYSTEM REQUIREMENTS – SOFTWARE

.1 System software shall be fully licensed to the owner for the number of PC's/laptops furnished.

.2 System software shall, at a minimum provide:

.1 Monitor and supervise all control points.

.2 Add new points and edit system database.

.3 Change control set points, timing parameters, and loop-tuning of PID coefficients in all control loops in all control units.

.4 Enter programmed start/stop which must have capability of annual, weekly and temporary schedules.

.5 View alarm and messages.

.6 Modify existing control logic (or sequence of operation) in all control units.

.7 Upload/Download programs, databases, control parameters, etc.

.8 Modify graphic screens.

.9 All troubleshooting software necessary

.3 Software Compatibility

.1 Third Party Software Packages – The Host software shall provide the capacity to run third party software packages for word processing, spreadsheets, or data management programs. The use of third party software shall not suspend operation of background tasks of multi-tasking operating system, such as alarm, logging, and report generation.

Part 3 Execution

3.1 FACTORY TESTING

.1 The factory service shall provide adequate testing of the supplied equipment and software to ensure that the system performs as intended by the specification. Radium Hot Springs engineering and maintenance personnel shall be trained on all aspects of operating and maintaining the system. Care shall be taken to ensure that the system load connections are to the electrical drawing and that the control scenarios re operating properly.

3.2 FIELD QUALITY CONTROL

.1 Provide the services of a qualified factory-trained manufacturer's representative to assist the Contractor in starting-up and programming the system for a period of two (2) working days.

.1 The manufacturer's representative shall be factory-trained and shall have a thorough knowledge of the software, hardware and system programming.

.2 The Contractor shall provide three (3) copies of the manufacturer's field startup.

.3 The following system programming shall be provided by the factory trained manufacturer's representative:

.1 Assist the owner in developing a practical control scenario for each application

.2 Explain the operation of the control programs to the owner and walk through their operation

3.3 MANUFACTURER'S CERTIFICATION

.1 A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.

.2 The Contractor shall provide three (3) copies of the manufacturer's representative's certification.

3.4 TRAINING

.1 The Contractor shall provide a training session for up to five (5) Radium Hot Springs representatives for normal three (3) workdays at a jobsite location determined by the Radium Hot Springs representatives.

.2 The training session shall be conducted by a manufacturer's qualified representative. Training program shall include instructions on the control system, programming, and other major components.

.3 The training program shall include:

.1 System review of all system components and their function

.2 System review of all management software and its function

.3 Operator training to develop experience with control applications.

3.5 DOCUMENTATION

.1 Documentation shall be provided in electronic and hard copy form as indicated below:

.1 System 1 - Line Diagram: Show system components and quantities including programmable panelboards, expansion cabinets, switches, light sensors, data line, and central operator's station network connection

.2 Panelboard Load Schedule: Show load placement and sizing

.3 Panelboard Wiring Schedule: Show load terminations

.4 Wiring Diagrams: Show typical interconnect wiring diagram for each system component supplied

.5 Installation Guide: Provide instructions on how to install system components

.6 Manual: Provide System User's Guide and Programmer's Guide in loose leaf three-ring binders

.7 Training Video: The contractor shall provide a complete training video for installation of software, basic operation of software, and common components of system

.8 Riser Diagram: Provide single line drawing showing control connections for each system component

3.6 INSTALLATION

.1 The Contractor shall furnish, install and terminate all conductors and associated conduits external to any factory supplied equipment.

.2 All conductors, wiring and routing shall be per the manufacturer's recommendations and as shown on the contract drawings.

3.7 FIELD TESTING

.1 Verify complete system operation including all hardware, software, and communication devices.

.2 Verify networking performance with all interfacing systems by other manufacturers.

.3 Contractor shall make provision for commissioning of the system, maintenance and operations binders, and provide training to the owner for the operation of the system. Contractor shall demonstrate full operation of the system including incremental dimming capabilities both locally and remotely to the owner and consultant

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Department of Fisheries and Oceans (DFO)

.1 Land Development Guidelines for the Protection of Aquatic Habitat.

1.2 DEFINITIONS

.1 Clearing and grubbing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.

.2 Clearing and grubbing of isolated trees consists of cutting off trees to not more than specified height above ground and disposing of felled trees, and stumps, and surface debris.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for tree wound paint, include product characteristics and limitations.

.3 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 and are to include details related to the Work of this Section.

1.4 QUALITY ASSURANCE

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.2 Safety Requirements: worker protection.

.1 Clean up spills of preservative materials immediately with absorbent material and safely discard to landfill.

1.5 STORAGE AND PROTECTION

.1 Prevent damage to fencing, landscaping, natural features, existing buildings, existing pavement, site appurtenances, water courses, and root systems of trees which are to remain.

.1 Repair damaged items to approval of Departmental Representative.

.2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

Part 2 Products

2.1 MATERIALS

.1 Bituminous based paint of standard manufacture specially formulated for tree wounds.

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 PREPARATION

.1 Inspect site and verify with Departmental Representative, items designated to remain.

.2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.

.1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.

.2 When utility lines which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.

.3 Notify utility authorities before starting clearing and grubbing.

.4 Keep roads and walks free of dirt and debris.

3.3 APPLICATION

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

3.4 CLEARING

.1 Clearing includes cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within cleared areas.

.2 Clear as indicated on project drawings, by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.

.3 Cut off branches overhanging area cleared as directed by Departmental Representative.

.4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.5 ISOLATED TREES

.1 Cut off isolated trees as indicated by Departmental Representative at height of not more than 300 mm above ground surface. Trees to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.

.2 Grub out isolated tree stumps.

.3 Prune individual trees as indicated.

.4 Trim trees designated to be left standing within cleared areas of dead branches 4 cm or more in diameter; and trim branches to heights as indicated.

.5 Cut limbs and branches to be trimmed close to bole of tree or main branches.

.6 Paint cuts more than 3 cm in diameter with approved tree wound paint.

3.6 GRUBBING

.1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.

.2 Grub out stumps and roots to not less than 200 mm below ground surface.

.3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 1.5 m^3.

.4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

3.7 REMOVAL AND DISPOSAL

.1 Dispose of waste materials and debris outside of Kootenay National Park.

.2 Remove cleared and grubbed materials to disposal area as indicated by Departmental Representative.

.3 Cut timber greater than 125 mm diameter to 300 mm lengths and stockpile as indicated by Departmental Representative. Stockpiled timber becomes property of Owner.

.4 Dispose of cleared and grubbed materials, not mentioned above, as directed by Departmental Representative.

.5 Bury to approval of Departmental Representative by:

.1 Consolidating.

.2 Covering with minimum 500 mm of mineral soil.

.3 Finishing surface.

.6 Remove diseased trees identified by Departmental Representative and dispose of this material to approval of Departmental Representative.

3.8 FINISHED SURFACE

.1 Leave ground surface in condition suitable for stripping of topsoil to approval of Departmental Representative.

3.9 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 REFERENCES

.1 Department of Fisheries and Oceans (DFO)

.1 Land Development Guidelines for the Protection of Aquatic Habitat.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 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 and are to include details related to the Work of this Section.

Part 2 Products

2.1 NOT USED

.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 STRIPPING OF TOPSOIL

.1 Ensure that procedures are conducted in accordance with applicable Provincial requirements.

.2 Commence topsoil stripping of areas as indicated after area has been cleared and grubbed.

.3 Remove topsoil before construction procedures commence to avoid compaction of topsoil.

.4 Protect stockpiles from contamination and compaction.

.5 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by Departmental Representative.

.6 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by composting.

.7 Remove brush from targeted area by non-chemical means and dispose of through mulching.

.8 Strip topsoil to depths as indicated. Avoid mixing topsoil with subsoil.

.9 Stockpile in locations as directed by Departmental Representative. Stockpile height not to exceed 2 m.

.10 Dispose of unused topsoil as directed by Departmental Representative.

3.3 PREPARATION OF GRADE

.1 Verify that grades are correct and notify Departmental Representative if discrepancies occur. Do not begin work until instructed by Departmental Representative.

.1 Grade area only when soil is dry to lessen soil compaction.

.2 Grade soil to establish natural contours and eliminate uneven areas and low spots, ensuring positive drainage.

3.4 PLACING OF TOPSOIL

.1 Place topsoil only after Departmental Representative has accepted subgrade.

.2 Spread topsoil during dry conditions by mechanical hoe in uniform layers not exceeding 150 mm, over unfrozen subgrade free of standing water.

.3 Establish traffic patterns for equipment to prevent driving on topsoil after it has been spread to avoid compaction.

.4 Cultivate soil following spreading procedures.

3.5 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 REFERENCES

.1 ASTM International

.1 ASTM D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).

.2 Underwriters' Laboratories of Canada (ULC)

1.2 EXISTING CONDITIONS

.1 Examine geotechnical reports which are bound in Appendix B of this project manual.

.2 Known underground and surface utility lines and buried objects are as indicated on site plan.

.3 Refer to dewatering in Section 31 23 33.01 - Excavating, Trenching and Backfilling.

Part 2 Products

2.1 MATERIALS

.1 Fill material: In accordance with of Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Excavated or graded material existing on site is suitable to use as fill for grading work if approved by Departmental Representative.

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 rough grading 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 GRADING

.1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.

.2 Slope rough grade away from building as indicated.

.3 Grade ditches to depth as indicated.

.4 Prior to placing fill over existing ground, scarify surface to depth of 150 mm minimum before placing fill over existing ground. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

.5 Compact filled and disturbed areas to Standard Proctor maximum dry density to ASTM D698, as follows:

.1 98% under paved areas, walk areas, and embankment fills.

.6 Do not disturb soil within branch spread of trees or shrubs to remain.

3.3 TESTING

.1 Inspection and testing of soil compaction shall be in accordance with Sections 01 29 83 - Payment Procedures for Testing Laboratory Services and 01 45 00 - Quality Control.

.2 Submit testing procedure, frequency of tests, and test results to Departmental Representative for review.

3.4 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.

3.5 PROTECTION

.1 Protect existing fencing, trees, landscaping, natural features, bench marks, buildings, and pavement, which are to remain as directed by Departmental Representative. If damaged, restore to original or better condition unless directed otherwise.

.2 Maintain access roads to prevent accumulation of construction related debris on roads.

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/ft^3) (600 kN-m/m^3).

.5 ASTM D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (2,700 kN-m/m^3).

.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.

.3 Canadian Standards Association (CSA International)

.1 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.1 CSA-A3001, Cementitious Materials for Use in Concrete.

.2 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.4 Department of Fisheries and Oceans (DFO)

.1 Land Development Guidelines for the Protection of Aquatic Habitat.

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 m^3 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, and compressible materials.

.2 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 or ASTM C136: Sieve sizes to CAN/CGSB-8.2.

.2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

.3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

.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 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 1.7 - 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 at least 7 days prior to excavation work, to ensure cross sections are taken.

.4 Submit to Departmental Representative written notice when bottom of excavation is reached.

.5 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 and are to include details related to the Work of this Section.

1.4 QUALITY ASSURANCE

.1 Qualification Statement: submit proof of insurance coverage for professional liability.

.2 Where Departmental Representative is employee of Contractor, submit proof that Work by Departmental Representative is included in Contractor's insurance coverage.

.3 Submit design and supporting data at least 2 weeks prior to beginning Work.

.4 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Canada.

.5 Keep design and supporting data on site.

.6 Engage services of qualified professional Engineer who is registered or licensed in Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.

.7 Do not use soil material until written report of soil test results are reviewed by Departmental Representative.

.8 Health and Safety Requirements:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 EXISTING CONDITIONS

.1 Examine geotechnical reports which are bound in Appendix B of this project manual.

.2 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 to be paid by Departmental Representative.

.9 Record location of maintained, re-routed and abandoned underground lines.

.10 Confirm locations of recent excavations adjacent to area of excavation.

.3 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 MATERIALS

.1 Type 1 and Type 2 fill: properties to Section 31 05 16 - Aggregate Materials and the following requirements:

.1 Crushed, pit run or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C136 or ASTM C117. Sieve sizes to CAN/CGSB-8.2.

.3 Table:

Sieve Designation	% Passing	% Passing
	Type 1	Type 2
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
0.075 mm	3-8	0-10

.2 Type 3 fill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

.3 Unshrinkable fill: proportioned and mixed to provide:

.1 Maximum compressive strength of 0.4 MPa at 28 days.

.2 Maximum cement content of 25 kg/: to CSA-A3001, Type GU.

.3 Minimum strength of 0.07MPa at 24 h.

.4 Concrete aggregates: to CSA-A23.1/A23.2.

.5 Cement: Type GU.

.6 Slump: 160 to 200 mm.

.4 Shearmat: honeycomb type bio-degradable cardboard 100 mm thick, treated to provide sufficient structural support for poured concrete until concrete cured.

.5 Geotextiles: to Section 31 32 19.01 - Geotextiles.

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 and cleanly in accordance with Section 02 41 13 - Selective Site Demolition.

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 29.06 - Health and Safety Requirements.

.1 Where conditions are unstable, Departmental Representative to verify and advise methods.

.2 Obtain permit from authority having jurisdiction for temporary diversion of water course.

.3 Construct temporary Works to depths, heights and locations as approved by Departmental Representative.

.4 During backfill operation:

.1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.

.2 Do not remove bracing until backfilling has reached respective levels of such bracing.

.3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.

.5 When sheeting is required to remain in place, cut off tops at elevations as indicated.

.6 Upon completion of substructure construction:

.1 Remove cofferdams, shoring and bracing.

.2 Remove excess materials from site and restore watercourses as directed by Departmental Representative.

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.

.6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

3.7 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 Remove concrete, paving, walks, and other obstructions encountered during excavation in accordance with Section 02 41 13 - Selective Site Demolition and Section 02 41 13.14 - Asphalt Pavement Removal.

.4 Excavation must not interfere with bearing capacity of adjacent foundations.

.5 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.

.6 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.

.7 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.

.8 Restrict vehicle operations directly adjacent to open trenches.

.9 Dispose of surplus and unsuitable excavated material outside of Kooteney National Park.

.10 Do not obstruct flow of surface drainage or natural watercourses.

.11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.12 Notify Departmental Representative when bottom of excavation is reached.

.13 Obtain Departmental Representative approval of completed excavation.

.14 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.

.15 Correct unauthorized over-excavation as follows:

.1 Fill under bearing surfaces and footings with concrete specified for footings Type 2 fill compacted to not less than 98% of Standard Proctor maximum dry density.

.2 Fill under other areas with Type 2 fill compacted to not less than 98 % of Standard Proctor maximum dry density.

.16 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.

.17 Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.

3.8 FILL TYPES AND COMPACTION

.1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum dry densities.

.1 Exterior side of perimeter walls: use Type 1 fill to subgrade level. Compact to 98% of maximum dry density.

.2 Within building area: use Type 2 to underside of base course for floor slabs. Compact to 98% of maximum dry density.

.3 Under concrete slabs: provide 150mm compacted thickness base course of Type 1 fill to underside of slab. Compact base course to 98%.

.4 Retaining walls: use Type 2 fill to subgrade level on high side for minimum 500 mm from wall and compact to 98 %. For remaining portion, use Type 3 fill compacted to 98 %.

.5 Place unshrinkable fill in areas as indicated.

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 concrete formwork.

.5 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 150 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.

.2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.

.3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 500 mm.

.4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:

.1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative.

.2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.

.7 Place unshrinkable and recycled fill in areas as indicated.

.8 Consolidate and level unshrinkable fill with internal vibrators.

.9 Install drainage system in backfill as indicated.

3.10 RESTORATION

.1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 11 - Cleaning, 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 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 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.

.7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

Part 1 General

1.1 MEASUREMENT AND PAYMENT

.1 Measure geotextiles in square metres of surface covered by material. No allowance will be made for seams and overlaps.

1.2 REFERENCES

.1 ASTM International

- .1 ASTM A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .2 ASTM D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
- .3 ASTM D4595, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
- .4 ASTM D4716, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
- .5 ASTM D4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-4.2 No. 11.2, Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
- .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
  - .1 No.2, Methods of Testing Geosynthetics - Mass per Unit Area.
  - .2 No.3, Methods of Testing Geosynthetics - Thickness of Geotextiles.
  - .3 No.6.1, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
  - .4 No.7.3, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
  - .5 No. 10, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.

.3 CSA International

- .1 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

1.3 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 geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Test and Evaluation Reports:

.1 Submit copies of mill test data and certificate at least 4 weeks prior to start of Work.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.

.2 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect geotextiles from direct sunlight and UV rays.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIAL

.1 Products: Refer to drawings.

.2 Securing pins and washers: to CSA G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m^{2}to ASTM A123/A123M.

.3 Factory seams: sewn in accordance with manufacturer's recommendations.

.4 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

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 geotextile material 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 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position.

.2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.

.3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.

.4 Overlap each successive strip of geotextile 600 mm over previously laid strip.

.5 Join and pin successive strips of geotextile as recommended by manufacturer.

.6 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.

.7 After installation, cover with overlying layer within 4 hours of placement.

.8 Replace damaged or deteriorated geotextile to approval of Departmental Representative.

.9 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

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.

3.4 PROTECTION

.1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION

Part 1 General

1.1 MEASUREMENT AND PAYMENT

.1 Measure geogrid in square metres of surface covered by material. No allowance will be made for seams and overlaps.

1.2 REFERENCES

.1 ASTM International

.1 ASTM D1248, Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable.

.2 ASTM D4101, Standard Specification for Polypropylene Injection and Extrusion Materials.

.3 ASTM D4218, Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds By the Muffle-Furnace Technique.

.4 ASTM D5262, Standard Test Method for Evaluating the Unconfined Tension Creep Behaviour of Geosynthetics.

.5 ASTM D6637, Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method.

.2 Drexel University - Geosynthetic Research Institute (GRI)

.1 GRI GG2, Geogrid Junction Strength.

.3 Department of Fisheries and Oceans (DFO)

.1 Land Development Guidelines for the Protection of Aquatic Habitat.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Certificates:

.1 Submit copies of mill test data and certificate 4 weeks prior to start of Work.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.

.2 During delivery and storage, protect geogrids from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

Part 2 Products

2.1 MATERIAL

.1 Products: Refer to drawings.

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 soil stabilization 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 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.

3.3 INSTALLATION

.1 Place geogrid material by unrolling onto graded surface in manner and locations indicated and retain in position in accordance with manufacturer's written recommendations.

.2 Place geogrid on sloping surfaces in one continuous length from toe of slope to upper extent of geogrid.

.3 Overlap each successive strip of geogrid 600 mm over previously laid strip.

.4 Join successive strips of geogrid as recommended by manufacturer.

.5 Protect geogrid from displacement, damage or deterioration before and during placement of overlay soil layers.

.6 After installation, cover with overlay layer within 10 days of placement.

.7 Replace damaged or deteriorated geogrid to approval of Departmental Representative.

.8 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling and Section 31 24 13 - Roadway Embankments.

3.4 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.

3.5 PROTECTION

.1 Vehicular traffic not permitted directly on geogrid.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM International

.1 ASTM C117, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.

.2 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.3 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.

.5 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 600kN-m/m^3.

.6 ASTM D1557, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort 2,700kN-m/m^3.

.7 ASTM D1883 Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.

.8 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.

.3 Department of Fisheries and Oceans (DFO)

.1 Land Development Guidelines for the Protection of Aquatic Habitat.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 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 and are to include details related to the Work of this Section.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section manufacturer's written instructions.

.2 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations and erosion and sedimentation control plan.

.2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Granular sub-base material and engineered fill material: in accordance with Section 31 05 16 - Aggregate Materials and following requirements:

.1 Crushed, pit run or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CGSB 8-GP-2M µm.

.3 Table

Sieve Designation	% Passing
80 000	100
50 000	55-100
25 000	38-100
20 000	-
16 000	32-85
10 000	-
5 000	20-65
1 250	-
630	-
315	6-30
160	-
80	2-10

.4 Other properties as follows:

.1 Liquid Limit: to ASTM D4318, Maximum 25.

.2 Plasticity Index: to ASTM D4318, Maximum 6.

.3 Los Angeles degradation: to ASTM C131.

.1 Maximum loss by mass: 50 %.

.4 Soaked CBR: to ASTM D1883, Minimum 40 when compacted to 100% of ASTM D1557.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for granular sub-base 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 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.

3.3 PLACING

.1 Place granular sub-base after subgrade is inspected and approved by Departmental Representative.

.2 Construct granular sub-base to depth and grade in areas indicated.

.3 Ensure no frozen material is placed.

.4 Place material only on clean unfrozen surface, free from snow or ice.

.5 Begin spreading sub-base material on crown line or high side of one-way slope.

.6 Place granular sub-base materials using methods which do not lead to segregation or degradation.

.7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.

.8 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.

.1 Departmental Representative may authorize thicker lifts if specified compaction can be achieved.

.9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.10 Remove and replace portion of layer in which material has become segregated during spreading.

3.4 COMPACTION

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Departmental Representative before use.

.3 Equipped with device that records hours of actual work, not motor running hours.

.4 Compact to density of not less than 98% Standard Proctor maximum dry density in accordance with ASTM D698 or ASTM D1557.

.5 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

.6 Apply water as necessary during compaction to obtain specified density.

.7 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.

.8 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.5 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: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures

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

.2 Dispose of waste materials and debris outside of Kooteney National Park.

3.6 SITE TOLERANCES

.1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.7 PROTECTION

.1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1	Clearing and Grubbing	Section 31 11 00
.2	Soil Stripping and Stockpiling	Section 31 14 13
.3	Rough Grading	Section 31 22 13

1.2 REFERENCES

.1 Definitions:

.1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

.2 Reference Standards:

.1 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.2 Fertilizers Act (R.S. 1985, c. F-10).

.3 Fertilizers Regulations (C.R.C., c. 666).

.4 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

.2 Health Canada - Pest Management Regulatory Agency (PMRA)

.1 National Standard for Pesticide Education, Training and Certification in Canada (1995).

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.2 Safety Data Sheets (SDS) from Q2 of 2017 per Globally Harmonized System.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:

.1 Obtain approval from Departmental Representative of schedule indicating beginning of Work.

1.4 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 tree and shrub preservation materials and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit monthly written reports on maintenance during warranty period, to Departmental Representative identifying:

.1 Maintenance work carried out.

.2 Development and condition of plant material.

.3 Preventative or corrective measures required which are outside Contractor's responsibility.

.3 Submit [2] copies of WHMIS MSDS/ SDS-Safety Data Sheets in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Reduction Workplan highlighting recycling and salvage requirements.

.2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50% of construction wastes were recycled or salvaged.

.2 Recycled Content:

.1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer content, and total cost of materials for project.

.3 Regional Materials: submit evidence that project incorporates required percentage 75% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

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 off ground and in a dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect[tree and shrub preservation materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Develop Waste Reduction Workplan related to Work of this Section.

1.6 MAINTENANCE DURING WARRANTY PERIOD

.1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.

.1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.

.2 Apply pesticides in accordance with National Standard for Pesticide Education, Training and Certification in Canada, Federal, Provincial and Municipal regulations as and when required to control insects, fungus and disease. Obtain product approval from Departmental Representative prior to application.

.3 Apply fertilizer in early spring at rate of 0.025 kg of nitrogen/m^2.

.4 Remove dead, broken or hazardous branches from plant material. Dispose of debris through mulching.

Part 2 Products

2.1 MATERIALS

.1 Fill:

.1 Type (A): clean, natural river sand and gravel material, free from silt, clay, loam, friable or soluble materials and organic matter.

.2 Type (B): excavated soil, free from roots, rocks larger than 75 mm, building debris, and toxic ingredients (salt, oil, etc). Excavated material shall be approved by Departmental Representative before use as fill.

.2 Coarse washed stones: 40 mm diameter clean round hard stone.

.3 Draintile: 100 mm diameter corrugated recycled content 100% plastic perforated tubing complete with snap couplings. Fill vents with [20] mm clear stone.

.4 Peatmoss:

.1 Derived from partially decomposed species of Sphagnum Mosses.

.2 Elastic and homogeneous.

.3 Free of wood and deleterious material which could prohibit growth.

.4 Shredded minimum particle size: 5mm.

.5 Fertilizer:

.1 To Canada Fertilizer Act and Fertilizers Regulations.

.2 Complete, commercial, slow release with 35% of nitrogen content in water-insoluble form.

.6 Anti-desiccant: commercial, wax-like emulsion.

.7 Filter Cloth:

.1 Type 1: 100 % non-woven needle punched polyester, 2.75 mm thick, 240 g/m^2 mass.

.2 Type 2: biodegradable burlap.

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 tree and shrub preservation 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 IDENTIFICATION AND PROTECTION

.1 Identify plants and limits of root systems to be preserved as approved by Departmental Representative.

.2 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by Departmental Representative.

.3 Ensure no pruning is done inside drip line. If pruning inside drip line is required consult an arborist or Canadian Certified Horticultural Technician (CCHT) as approved by Departmental Representative.

3.3 TRENCHING AND TUNNELING FOR UNDERGROUND SERVICES

.1 Centre line location and limits of trench/tunnel excavation to be approved by Departmental Representative prior to excavation. Tunnel excavation to extend 2000 mm from edge of trunk on either side.

.2 Excavate manually within zone of root system. Do not sever roots greater than 40 mm diameter except at greater than 500 mm below existing grade. Protect roots, and cut roots cleanly with sharp disinfected tools.

.3 Excavate tunnel under centre of tree trunk using methods and equipment approved by Departmental Representative.

.4 Minimum acceptable depth to top of tunnel: 1000 mm.

.5 Backfill for tunnel and trench to 85% Standard Proctor Density. Avoid damage to trunk and roots of tree.

.6 Complete tunnelling and backfilling at tree within 2 weeks of beginning Work.

3.4 LOWERING GRADE AROUND EXISTING TREE

.1 Begin Work in accordance with schedule approved by Departmental Representative.

.2 Cut slope not less than 500 mm from tree trunk to new grade level.

.3 Excavate to depths as indicated. Protect from damage root zone which is to remain.

.4 When severing roots at excavation level, cut roots with sharp tools.

.5 Cultivate excavated surface manually to 15 mm depth.

.6 Prepare homogeneous soil mixture consisting by volume of:

.1 60% excavated soil cleaned of roots, plant matter, stones, debris.

.2 25% coarse, clean sterile sand.

.3 15% organic matter.

.4 Grade 2:12:8 fertilizer at rate of 1.5 kg/m^3.

.7 Place soil mixture over area of excavation to finished grade level. Compact to 85% Standard Proctor Density.

.8 Water entire root zone to optimum soil moisture level.

.9 Install surface cover of seeding or sodding in accordance with Section 32 92 19.13 - Mechanical Seeding, Section 32 92 19.16 - Hydraulic Seeding or 32 92 23 - Sodding.

3.5 PRUNING

.1 Prune in accordance with Section 32 93 43.01 - Tree Pruning.

.2 Prune crown to compensate for root loss while maintaining general form and character of plant. Dispose of debris through mulching.

3.6 ANTI-DESICCANT

.1 Apply anti-desiccant to foliage where applicable and as directed by Departmental Representative.

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.

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

.2 Dispose of waste materials and debris outside of Kooteney National Park.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM International

.1 ASTM C117, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.3 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft^3) (600kN-m/m^3).

.5 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft^3) (2,700kN-m/m^3).

.6 ASTM D1883, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.

.7 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.

.3 Department of Fisheries and Oceans (DFO)

.1 Land Development Guidelines for the Protection of Aquatic Habitat.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 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 and are to include details related to the Work of this Section.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with 31 05 16 - Aggregate Materials.

.2 Storage and Handling Requirements:

.1 Stockpile minimum 50% of total aggregate required prior to beginning operation.

.2 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.3 Replace defective or damaged materials with new.

.4 Store cement in weathertight bins or silos that provide protection from dampness and easy access for inspection and identification of each shipment.

Part 2 Products

2.1 MATERIALS

.1 Granular base: material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:

.1 Crushed stone or gravel.

.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CGSB 8-GP-2M µm.

.3 Table

Sieve Designation	% Passing
80 000	-
50 000	-
25 000	100
20 000	82-97
16 000	70-94
10 000	52-79
5 000	35-64
1 250	18-43
630	12-34
315	8-26
160	5-18
80	2-10

.1 Other properties as follows:

.1 Liquid limit: to ASTM D4318, maximum 25

.2 Plasticity index: to ASTM D4318, maximum 6.

.3 Los Angeles degradation: to ASTM C131. Max. % loss by weight: 45

.4 Crushed particles: at least 60% of particles by mass within each of following sieve designation ranges to have at least 1 freshly fractured face. Material to be divided into ranges using methods of ASTM C136.

Passing	Retained on	
25 000	to	20 000
20 000	to	5 000

.5 Soaked CBR: to ASTM D1883, minimum 100, when compacted to 100% of ASTM D1557.

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 PLACEMENT AND INSTALLATION

.1 Place granular base after sub-base surface is inspected and approved in writing by Departmental Representative.

.2 Placing:

.1 Construct granular base to depth and grade in areas indicated.

.2 Ensure no frozen material is placed.

.3 Place material only on clean unfrozen surface, free from snow and ice.

.4 Begin spreading base material on crown line or on high side of one-way slope.

.5 Place material using methods which do not lead to segregation or degradation of aggregate.

.6 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.

.7 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.

.1 Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.

.8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.9 Remove and replace that portion of layer in which material becomes segregated during spreading.

.3 Compaction Equipment:

.1 Ensure compaction equipment is capable of obtaining required material densities.

.2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Departmental Representative before use.

.3 Equipped with device that records hours of actual work, not motor running hours.

.4 Compacting:

.1 Compact to density not less than 98% Standard Proctor maximum dry density in accordance with ASTM D698 or ASTM D1557.

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.3 Apply water as necessary during compacting to obtain specified density.

.4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved in writing by Departmental Representative.

.5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.3 SITE TOLERANCES

.1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3.4 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: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures

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

.2 Dispose of waste materials and debris outside of Kooteney National Park.

3.5 PROTECTION

.1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Departmental Representative.

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 Materials 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 D260, Standard Specification for Boiled Linseed Oil.
- .4 ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft^3) (600 kN-m/m^3).

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-3.3, Kerosene, Amend. No. 1, National Standard of Canada.
- .2 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.

.3 Canadian Standards Association (CSA International)

- .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data: submit WHMIS MSDS/ SDS -Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.

.3 If materials have been tested by independent testing laboratory within previous 2 months and have passed tests equal to requirements of this specification, submit test certificates from testing laboratory showing suitability of materials for this project.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

- .1 Separate waste materials for reuse or recycling in accordance with Waste Reduction Workplan.

Part 2 Products

2.1 MATERIALS

.1 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.2 Reinforcing steel: in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 Joint filler: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.4 Curing Compound: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.5 Granular base: material to Section 31 11 23 – Aggregate Base Courses

.6 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water-soluble soap.

.1 Fill material: to Section 31 23 33.01 – Excavation, Trenching and Backfilling.

.2 Boiled linseed oil: to ASTM D260.

.3 Kerosene: to CAN/CGSB-3.3.

Part 3 Execution

3.1 GRADE PREPARATION

.1 Do grade preparation work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Construct embankments using excavated material free from organic matter or other objectionable materials.

.1 Dispose of surplus and unsuitable excavated material in approved location off site.

.3 When constructing embankment provide for minimum 2 m shoulders, where applicable, outside of neat lines of concrete.

.4 Place fill in maximum 150 mm layers and compact to at least 98% of Standard Proctor maximum dry density to ASTM D698.

3.2 GRANULAR BASE

.1 Obtain Departmental Representative's approval of subgrade before placing granular base.

.2 Place granular base material to lines, widths, and depths as indicated.

.3 Compact granular base in maximum 150 mm layers to at least 98% of maximum density to ASTM D698.

3.3 CONCRETE

.1 Obtain Departmental Representative approval of granular base and reinforcing steel prior to placing concrete.

.2 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.3 Immediately after floating, give sidewalk surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to centre line.

.4 Provide edging as indicated with 10 mm radius edging tool.

.5 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work acceptable to Departmental Representative can be demonstrated. Hand finish surfaces when directed by Departmental Representative.

3.4 TOLERANCES

.1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

3.5 EXPANSION AND CONTRACTION JOINTS

.1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals as directed by Departmental Representative.

.2 Install expansion joints as indicated and as directed by Departmental Representative.

.3 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

3.6 ISOLATION JOINTS

.1 Install isolation joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.

.2 Install joint filler in isolation joints in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.3 Seal isolation joints with sealant approved by Departmental Representative.

3.7 CURING

.1 Cure concrete by adding moisture continuously in accordance with CSA-A23.1/A23.2 to exposed finished surfaces for at least 1 day after placing, or sealing moisture in by curing compound as directed by Departmental Representative.

.2 Where burlap is used for moist curing, place two pre-wetted layers on concrete surface and keep continuously wet during curing period.

.3 Apply curing compound evenly to form continuous film, in accordance with manufacturer's requirements.

3.8 BACKFILL

.1 Allow concrete to cure for 7 days prior to backfilling.

.2 Backfill to designated elevations with material as directed by Departmental Representative.

.1 Compact and shape to required contours as indicated.

3.9 LINSEED OIL TREATMENT

.1 Apply two coats of linseed oil mixture uniformly to surfaces of curbs, walks and gutters, after concrete has cured for specified curing time and when surface of concrete is clean and dry.

.2 Linseed oil mixture to consist of 50% boiled linseed oil and 50% mineral spirits by volume.

.3 Apply treatment when air temperature above 10 degrees C.

.4 Apply first coat at 135 mL/m^2.

.5 Apply second coat at 90 mL/m^2 when first coat has dried.

3.10 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 REFERENCES

.1 Agriculture and Agri-Food Canada

.1 The Canadian System of Soil Classification, Third Edition, 1998.

.2 Canadian Council of Ministers of the Environment

.1 PN1340, Guidelines for Compost Quality.

.3 Department of Fisheries and Oceans (DFO)

.1 Land Development Guidelines for the Protection of Aquatic Habitat.

1.2 DEFINITIONS

.1 Compost:

.1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.

.2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.

.3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth, and contain no toxic or growth inhibiting contaminates.

.4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Quality control submittals:

.1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.

.2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 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 and are to include details related to the Work of this Section.

1.4 PRE-INSTALLATION MEETING

.1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 32 16 - Construction Progress Schedule.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused soil amendments from landfill to official hazardous material collections site approved by Departmental Representative.

.2 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

.3 Separate waste materials for reuse or recycle in accordance with Waste Reduction Workplan.

Part 2 Products

2.1 ORIGINAL TOPSOIL

.1 Original material stockpiled on site.

.2 Material subject to analysis by testing laboratory before use.

2.1 TOPSOIL

.1 Friable, fertile, natural loam, neither heavy clay or of very light sandy nature containing minimum of 4% organic matter of clay loams and not less than 2% organic matter for sandy loams to a maximum of 15%, and capable of sustaining vigorous plant growth, free of rocks of 50 mm in diameter and over, subsoil contamination, roots, weeds, toxic materials, foreign objects and with an acidity range of 7.0 to 8.5 topsoil, or noxious weeds will be rejected.

.2 Topsoil containing non-native plant species or weed seeds will be rejected.

.3 Material subject to analysis by testing laboratory prior to use.

2.2 SOIL AMENDMENTS

.1 Peatmoss: Decomposed plant material, fairly elastic and homogeneous; free of decomposed colloidal residue, wood, sulphur and iron containing minimum 60% organic matter by weight and moisture content, not exceeding 15%, Shredded particles may not exceed 6 mm (¼") in size. Minimum pH value of part 4.5 maximum 6. Supply peatmoss in bags unless approved otherwise by the Engineer.

.2 Sand: washed coarse silica sand, medium to course textured.

.3 Organic matter: compost Category A, in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.

.4 Limestone:

.1 Ground agricultural limestone.

.2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

.5 Sulphur: Finely crushed agricultural elemental sulphur, free of impurities

2.3 SOURCE QUALITY CONTROL

.1 Advise Departmental Representative of sources of topsoil to be utilized with sufficient lead time for testing.

.2 Contractor is responsible for amendments to supply topsoil as specified.

.3 Soil testing by recognized testing facility for PH, P and K, and organic matter.

.4 Testing of topsoil will be carried out by testing laboratory designated by the Contractor.

.1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

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 STRIPPING OF TOPSOIL

.1 Perform stripping of topsoil in accordance with Section 31 14 13 – Soil Stripping and Stockpiling.

3.3 PREPARATION OF EXISTING GRADE

.1 Verify that grades are correct.

.1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.

.2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.

.3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.

.1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.

.2 Remove debris which protrudes more than 75 mm above surface.

.3 Dispose of removed material off site.

.4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.

.1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

.1 Place topsoil after Departmental Representative has accepted subgrade.

.2 Spread topsoil in uniform layers not exceeding 150 mm.

.3 For sodded areas keep topsoil 15 mm below finished grade.

.4 Spread topsoil as indicated to following minimum depths after settlement.

.1 150 mm for seeded areas.

.2 135 mm for sodded areas.

.3 300 mm for flower beds.

.4 600 mm for shrub beds.

.5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.5 SOIL AMENDMENTS

.1 For planting beds: apply and thoroughly mix soil amendments indicated on drawings

3.6 FINISH GRADING

.1 Grade to eliminate rough spots and low areas and ensure positive drainage.

.1 Prepare loose friable bed by means of cultivation and subsequent raking.

.2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative.

.1 Leave surfaces smooth, uniform and firm against deep foot-printing.

3.7 ACCEPTANCE

.1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.8 SURPLUS MATERIAL

.1 Dispose of materials except topsoil not required.

3.9 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.2 Dispose of waste materials and debris outside of Kooteney National Park.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 31 19 - Project Meetings.

.2 Scheduling:

.1 Schedule hydraulic seeding to coincide with preparation of soil surface.

.2 Schedule hydraulic seeding using grass mixtures and mixtures containing Crownvetch or Trefoil between dates recommended by Regional Agricultural Department.

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 seed, mulch, tackifier, fertilizer, liquid soil amendments and micronutrients.

.2 Submit 2 copies of WHMIS MSDS/SDS -Safety Data Sheets in accordance with Section 01 35 29.06 - Health and Safety Requirement and 01 35 43 - Environmental Procedures.

.3 Submit in writing 4 days prior to commencing work:

.1 Volume capacity of hydraulic seeder in litres.

.2 Amount of material to be used per tank based on volume.

.3 Number of tank loads required per hectare to apply specified slurry mixture per hectare.

.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 and are to include details related to the Work of this Section.

.5 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.6 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

1.3 QUALITY ASSURANCE

.1 Qualifications: The contractor must have experience at performing this type and scale of work and must be willing to provide proof of this experience.

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:

.1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.

.2 Inoculant containers to be tagged with expiry date.

.3 Storage and Handling Requirements:

.1 Store fertilizer in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

.4 Develop Waste Reduction Workplan related to Work of this Section and in accordance with Section 01 35 43 - Environmental Procedures.

Part 2 Products

2.1 MATERIALS

.1 Seed: "Canada pedigreed grade" in accordance with Government of Canada Seeds Act and Regulations.

.1 Grass mixture: As indicated on drawings.

.2 Mulch: specially manufactured for use in hydraulic seeding equipment, non-toxic, water activated, green colouring, free of germination and growth inhibiting factors with following properties:

.1 Type I mulch:

.1 Made from wood cellulose fibre.

.2 Organic matter content: 95% plus or minus 0.5%.

.3 Value of pH: 6.0.

.4 Potential water absorption: 900%.

.2 Type II mulch:

.1 Made from newsprint, raw cotton fibre and straw, processed to produce fibre lengths of 15 mm minimum and 25 mm maximum. Greater proportions of ingredients to be straw.

.3 Tackifier: water dilutable, liquid dispersion.

.4 Water: free of impurities that would inhibit germination and growth.

.5 Fertilizer:

.1 To Canada "Fertilizers Act" and Regulations.

.2 Complete synthetic, slow release with 35% of nitrogen content in water-insoluble form.

.3 Supply and deliver in bags clearly marked with name of manufacturer, contents, weights and analysis. Type and application rate to be determined by a soil test.

.6 Inoculants: inoculant containers to be tagged with expiry date.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for hydraulic seeding 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 PROTECTION OF EXISTING CONDITIONS

.1 Protect structures, signs, guide rails, fences, plant material, utilities and other surfaces not intended for spray.

.2 Immediately remove any material sprayed where not intended as directed by Departmental Representative.

3.3 PREPARATION OF SURFACES

.1 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water.

.2 Fine grade areas to be seeded free of humps and hollows.

.1 Ensure areas are free of deleterious and refuse materials.

.3 Cultivated areas identified as requiring cultivation to depth of 25 mm.

.4 Ensure areas to be seeded are moist to depth of 150 mm before seeding.

.5 Obtain Departmental Representative's approval of grade and topsoil depth before starting to seed.

3.4 PREPARATION OF SLURRY

.1 Measure quantities of materials by weight or weight-calibrated volume measurement satisfactory to Departmental Representative. Supply equipment required for this work.

.2 Charge required water into seeder. Add material into hydraulic seeder under agitation. Pulverize mulch and charge slowly into seeder.

.3 After materials are in seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete slurry.

3.5 SLURRY APPLICATION

.1 Ensure seed is placed under supervision of certified Landscape Planting Supervisor.

.2 Hydraulic seeding equipment:

.1 Slurry tank.

.2 Agitation system for slurry to be capable of operating during charging of tank and during seeding, consisting of recirculation of slurry and/or mechanical agitation method.

.3 Capable of seeding by 50 m hand operated hoses and appropriate nozzles.

.4 Tank volume to be certified by certifying authority and identified by authorities "Volume Certification Plate".

.3 Slurry mixture applied per hectare.

.1 Apply seed mix, as indicated on drawings, as per manufacturer's specifications.

.4 Apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed.

.1 Using correct nozzle for application.

.2 Using hoses for surfaces difficult to reach and to control application.

.5 Blend application 300 mm into adjacent grass areas, sodded areas, and previous applications to form uniform surfaces.

.6 Re-apply where application is not uniform.

.7 Remove slurry from items and areas not designated to be sprayed.

3.6 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: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures

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

.2 Dispose of waste materials and debris outside of Kooteney National Park.

3.7 PROTECTION

.1 Protect seeded areas from trespass until plants are established.

.2 Remove protection devices as directed by Departmental Representative.

3.8 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Ensure maintenance is curried out under supervision of certified Landscape Maintenance Supervisor.

.2 Perform following operations from time of seed application until acceptance by Departmental Representative.

.3 Grass Mixture:

.1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.

.2 Mow grass to 50 mm whenever it reaches height of 70 mm. Remove clippings which will smother grass.

.3 Fertilize seeded areas after first cutting in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles.

.4 Control weeds by mechanical means utilizing acceptable integrated pest management practices.

.5 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.

3.9 ACCEPTANCE AND WARRANTY

.1 Seeded areas will be accepted by Departmental Representative provided that:

.1 Plants are uniformly established.

.2 Seeded areas are free of rutted, eroded, bare or dead spots.

.3 Areas have been mown at least twice.

.4 Areas have been fertilized.

.2 Contractor hereby warrants that seeded areas will remain free of defects until the Final Warranty Inspection.

.3 Areas seeded will have a final acceptance inspection on the date of the Final Warranty Inspection.

.4 End-of-warranty inspection will be conducted by Departmental Representative.

.5 Departmental Representative reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, area seeded do not meet the above acceptance requirements (Article 3.9.1).

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1	Topsoil Placement and Grading	Section 32 91 19 13
.2	Hydraulic Seeding	Section 32 92 19 16

1.2 REFERENCES

.1 Definitions:

- .1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

.2 Reference Standards:

- .1 Agriculture and Agri-Food Canada (AAFC).
  - .1 Plant Hardiness Zones in Canada.
- .2 Parks Canada – Kooteney National Park
  - .1 Environmental Management Plan
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
  - .2 Safety Data Sheets (SDS) per Globally Harmonized System effective from Q2 of 2017.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling: obtain approval from Vegetation Ecologist and Departmental Representative of schedule seven 7 days in advance of shipment of plant material.

.2 Schedule to include:

- .1 Quantity and type of plant material.
- .2 Shipping dates.
- .3 Arrival dates on site.
- .4 Planting Dates.

1.4 QUALITY ASSURANCE

.1 Qualifications: The work shall be installed in accordance with Parks Canada Environmental Management Plan.

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.

.1 Protect plant material from frost, excessive heat, wind and sun during delivery.

.2 Protect plant material from damage during transportation:

.1 Delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.

.2 Delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.

.3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.

.3 Storage and Handling Requirements:

.1 Immediately store and protect plant material which will not be installed within 1 hour in accordance with supplier's written recommendations and after arrival at site in storage location approved by Vegetation Ecologist and Departmental Representative

.2 Protect stored plant material from frost, wind and sun and as follows:

.1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in topsoil and watering to full depth of root zone.

.2 For pots and containers, maintain moisture level in containers.

.3 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.

.3 Store and manage hazardous materials in accordance with manufacturer's written instructions.

1.6 WARRANTY

.1 Contractor hereby warrants that plant material as itemized on plant list will remain free of defects until the Final Warranty Inspection.

.2 End-of-warranty inspection will be conducted by Departmental Representative.

.3 Departmental Representative reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

Part 2 Products

2.1 PLANT MATERIAL

.1 Type of root preparation, sizing, grading and quality: comply to Parks Canada Environmental Management Plan.

.1 Source of plant material: grown in Zone 3a in accordance with Plant Hardiness Zones in Canada.

.2 Plant material must be planted in zone specified as appropriate for its species.

.3 Plant material in location appropriate for its species.

.2 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.

.3 Trees: with straight trunks, well and characteristically branched for species.

.4 Bare root stock: nursery grown, in dormant stage, not balled and burlapped or container grown.

.5 Collected stock: maximum 40 mm in caliper, with well-developed crowns and characteristically branched; no more than 40% of overall height may be free of branches.

.1 During collection, ensure 10% maximum seed crop (or plants) are collected from healthy population of many individuals, and from several plants of same species.

.2 Leave remainder for natural dispersal and as food for dependent organisms.

2.2 WATER

.1 Free of impurities that would inhibit plant growth.

2.3 TRUNK PROTECTION

.1 Wire mesh: galvanized, electrically welded 1.4 mm wire with 25 x 25 mm mesh and fasteners.

2.4 FERTILIZER

.1 Synthetic commercial type and use as recommended by soil test report.

.1 Ensure new root growth is in contact with mycorrhiza.

.2 Use mycorrhiza as recommended by manufacturer's written recommendations.

2.5 SOURCE QUALITY CONTROL

.1 Obtain approval from Vegetation Ecologist and Departmental Representative of plant material prior to planting.

.2 Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal, Provincial or Territorial regulations.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for planting installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Vegetation Ecologist and Departmental Representative

.2 Inform Vegetation Ecologist and Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied Vegetation Ecologist and Departmental Representative

3.2 PRE-PLANTING PREPARATION

.1 Proceed only after receipt of written acceptability of plant material from Vegetation Ecologist and Departmental Representative.

.2 Remove damaged roots and branches from plant material.

.3 Locate and protect utility lines.

.4 Notify and acquire written acknowledgment from utility authorities before beginning excavation of planting pits for trees and shrubs.

3.3 EXCAVATION AND PREPARATION OF PLANTING BEDS

.1 Establishment of sub-grade for planting beds in accordance with Section 31 22 13 - Rough Grading.

.2 Preparation of planting beds in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.

.3 For individual planting holes:

.1 Stake out location and obtain approval Vegetation Ecologist and Departmental Representative prior to excavating.

.2 Excavate to depth and width as indicated.

.3 Remove subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.

.4 Scarify sides of planting hole.

.5 Remove water which enters excavations prior to planting. Notify Vegetation Ecologist and Departmental Representative if water source is ground water.

3.4 PLANTING

.1 For bare root stock, place 50 mm backfill soil in bottom of hole.

.1 Plant trees and shrubs with roots placed straight out in hole.

.2 For jute burlapped root balls, cut away top one third of wrapping and wire basket without damaging root ball.

.1 Do not pull burlap or rope from under root ball.

.3 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.

.4 Plant vertically in locations as indicated.

.1 Orient plant material to give best appearance in relation to structure, roads and walks.

.5 For trees and shrubs:

.1 Backfill soil in 150 mm lifts.

.1 Tamp each lift to eliminate air pockets.

.2 When two thirds of depth of planting pit has been backfilled, fill remaining space with water.

.3 After water has penetrated into soil, backfill to finish grade.

.2 Form watering saucer as indicated.

.6 For ground covers, backfill soil evenly to finish grade and tamp to eliminate air pockets.

.7 Water plant material thoroughly.

.8 After soil settlement has occurred, fill with soil to finish grade.

3.5 TRUNK PROTECTION

.1 Install trunk protection on deciduous trees as indicated.

.1 Install flagging tape to guys as indicated.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.2 Dispose of waste materials and debris outside of Kooteney National Park.

END OF SECTION

Part 1 General

.1 The heat trace system shall be an independently controlled, constant wattage type system, controlled by two temperature sensors (low temperature of the pipe and high temperature of the heat trace wire)

.2 The minimum acceptable product for this application is the Thermocable heat trace cable (C10-240-COJ), power lead (PSK1) and Controller (UTC-2030-01), complete with high and low temperature controllers (URTD-06-R and URTD-06-G, respectively), as supplied by Urecon Canada.

1.2 MEASUREMENT AND PAYMENT

.1 Heat trace wire: Measurement and payment shall be in liner meters of product supplied, installed and accepted.

.2 Heat trace controller: Measurement and payment shall be as a lump sum, for the supply and installation, connection and commissioning of the heat trace system. This price shall include the cost of supplying and installing the temperature sensors (including any required conduit).

.3 The price shall include any splicing, fittings and appurtenances required to accommodate fittings, joints, bends and connections.

1.3 REFERENCES

.1 CSA Canadian

.1 CAN/CSA-C22.2 NO. 130-03 (R2013) - Requirements for Electrical Resistance Heating Cables and Heating Device Sets

1.4 ACTION AND INFORMATION SUBMISSION

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

.2 Submit manufacturer's instructions, printed product literature and data sheets for proposed insulation system, including product characteristics, performance criteria, physical size, finish and limitations.

1.5 DELIVERY, STORAGE, and HANDLING

.1 Care must be taken to not damage the product during the installation process. Any damages to the system must be reported to the engineer to inspect prior to use.

Part 2 Products

2.1 General

.1 All tracing cables and related accessories to be CSA approved and comply with CSA heat tracing standard C22.2 No. 130-03.

2.2 Controller Thermostat

.1 Operation:

.1 The controller thermostat shall at a minimum monitor and alarm at low temperature, ground fault current, open / shorted temperature sensor(s) and high cable temperature.

.2 Low temperature alarm (heat trace on) at 2°C

.3 High temperature alarm (heat trace off) at a maximum of 65°C, based on the high temperature sensor located in contact with the thermocable, as shown on the drawings and as per Manufacture recommendations.

.2 System

.1 The controller shall be suitable for 120-240 vac, 50-60hz, single phase power (as required by the heat trace system). Not to draw more than 30Amps

.2 The controller must have the following alarm outputs: 1A max, 240VAC max, 50/60 Hz, SPDT (form C) relay output configured for "fail-safe" operation.

.3 The controller shall come in a secure enclosure, suitable for outdoor installation in a wet environment (ambient operating temperature -40 to +40°C)

.4 System shall be CSA approved

2.3 Heat trace cable

.1 Heat trace cable to be constant wattage, parallel resistance type system, delivering 10w/m heat and to be controlled by a suitable controller. The heat trace system shall be suitable for “cut-to-length” installation.

.2 Heat trace wire shall have a Fluoropolymer jacket and metallic braid exterior; and suitable for pulling through the heat trace channel of the insulated pipe.

.3 Bus wire gage to be #16 or larger

.4 System shall be CSA approved, certified for installation in to wet locations

.5 CSA approved termination and splice kits are to be used as per the manufacture recommendations. Alternatives splice systems must be reviewed and approved by the engineer, failure to do so could render the system not acceptable.

2.4 Temperature Sensors

.1 A minimum of two temperature sensors shall be used:

.1 Low temperature – to be located in the lowered temperature location, the heat trace system will be exposed to (as shown on the design drawings)

.2 High temperature - to be located in contact with the heat trace cable, in the anticipated highest temperature location the heat trace system will be exposed to (as shown on the design drawings)

Part 3 Execution

3.1 Heat Trace

.1 Heat trace cabling, controller and sensors are to be installed as per the manufactures recommendations and as shown on the drawings.

.2 Upon complete installation, heat trace system to be tested for ground fault and undergo a baseline Megger test to confirm insulation resistance

.3 The system is to be commissioned in the presence of the engineer, prior to acceptance.

END OF SECTION

Part 1 General

.1 All portions of the storm collection drainage system shall be heat traced and insulated to prevent freezing of storm water drainage conveyed.

.2 Pipe shall be insulated with rigid polyurethane complete with integral conduit(s) for electric heat trace cable (if required). The insulation of associated pipe joints, fittings and accessories shall be by a insulation system compatible with the piping insulation system and approved by the engineer.

.3 Insulation joint/fittings kits for fittings shall consist of rigid polyisocyanurate or polyurethane foam half shells with a heavy polymer protective coating on the outside surfaces, adhering to the specifications herein.

.4 An outer protective jacket shall complete the insulated piping system, consisting of black PE, UV inhibited, factory applied, adhering to the specifications herein.

.5 The minimum acceptable product for this application is the PE jacket cased standard U.I.P. system for above grade piping, as supplied by Urecon Canada.

1.2 MEASUREMENT AND PAYMENT

.1 Measurement and payment shall be in liner meters of product supplied, installed and accepted.

.2 The price shall include any joint kits required to accommodate fittings, joints, bends and provide insulation to the entire piping system, as shown on the drawings.

1.3 REFERENCES

.1 ASTM International

.1 ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics

.2 ASTM D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics

.3 ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics

.4 ASTM D3350-12 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

.5 ASTM D6226 - Standard Test Method for Open Cell Content of Rigid Cellular Plastics

.6 ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

.2 CSA Canadian

.1 CAN/CSA-C22.2 NO. 130-03 (R2013) - Requirements for Electrical Resistance Heating Cables and Heating Device Sets (if applicable)

1.4 ACTION AND INFORMATION SUBMISSION

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

.2 Submit manufacturer's instructions, printed product literature and data sheets for proposed insulation system, including product characteristics, performance criteria, physical size, finish and limitations.

1.5 DELIVERY, STORAGE, and HANDLING

.1 Care must be taken to not damage the product during the installation process. Any damages to the system must be reported to the engineer to inspect prior to use.

.2 The pipe may be unloaded from the trucks or containers by hand, or with the use of a lifting apparatus and 15 mm (6 in) wide fabric slings. (Cables, chains, etc. must not be used to lift the insulated pipe or damage will occur.

.3 Once removed, the pipes should be stored on a smooth surface such as sand, soil, or fine gravel. Care must be taken not to store pipes on sharp rocks or like bedding. The pipes should be laid flat on the surface not higher than 1,83 m (6 ft) high. If sleepers are laid, use several lengths of 50 mm x 250 mm (2 in x 10 in) or other wide planks to provide a broad bearing surface. When sleepers are used the stacking height should be reduced to 1,22 m (4 ft).

.4 The pre-insulated pipes should not be dragged from the storage area to the site but lifted with the fabric slings into position. On most jobs the pipes are strung out directly from the transport truck along the right of way to eliminate double handling. If this is the case, remember to prepare a smooth bed to lay the pipes on while they await joining.

Part 2 Products

2.1 System Properties

.1 System (outer jacket, insulation, and product pipe) compressive strength to be 690 to 1379 kPa

2.2 Insulation

.1 The Insulation shall be rigid polyurethane foam (density of 35 to 48 kg/m^3, thermal conductivity of 0.020 to 0.025 W/m°C), or approved equal

.2 Insulation system to have a water absorption: 4.0% by volume (or less).

.3 Insulation to be factory applied to the thickness specified on the drawings

.4 Heat tracing conduit(s) shall be installed prior to the application of the insulation on the pipe. The conduit(s) will be securely fastened to the pipe to prevent the ingress of foam therein during the insulation process.

2.3 Outer Jacket

.1 Outer jacket shall be extruded over the insulation, from polyethylene resin, confirming to ASTM D3350-12 (cell class 334360C)

.2 Polyethylene compound shall be of color and UV stabilizer Code C (black) as specified in ASTM D3350, with 2 to 2.8% well dispersed carbon black

.3 Jacket thickness shall be 3.81 mm (150 mils) unless otherwise specified on the drawings.

2.4 Insulated Pipe Joints and fittings

.1 Insulated pipe joints shall be consisting of preformed polyisocyanurate foam or polyurethane foam half shells, supplied complete with a joint cover sheet:

.1 Compressive, thermal and water absorption properties to match or exceed that of the insulation, or as shown on the drawings

.2 Thickness to match or exceed that of the of the insulation, or as shown on the drawings

.3 The joint cover sheet shall confirm to the same requirements outlined in the "Outer Jacket" section or approve equal. The joint cover sheet shall be compatible with joint insulation system and approved by the Engineer.

.2 The joint sections and cover sheets shall be installed as per the manufacture recommendations and instructions, with minimum requirements being stainless steel bands, stainless steel strews and gear clamps

.3 The preformed joint insulation sections shall be pre-grooved on the inside or slightly oversized to accommodate heat trace cable(s) if applicable.

.4 **Waterproofing**: Where waterproofing is required, a heat shrink sleeve, approved by the engineer, shall be applied as a primarily seal, under the standard outer jacket joint overlay

2.5 Insulated Pipe Fittings

.1 Insulated pipe joints shall be consisting of preformed polyisocyanurate foam or polyurethane foam half shells, supplied complete with heavy polymer coating:

.1 Compressive, thermal and water absorption properties to match or exceed that of the insulation, or as shown on the drawings

.2 Thickness to match or exceed that of the of the insulation, or as shown on the drawings

.3 The heavy polymer coating shall confirm to the following:

.1 Two component, high density polyurethane coating (tear strength of 26.5 N/m, thickness of 2.54mm (100mils) outside surface, 0.51mm (20mils) inside surface

.4 All fittings insulation sections shall be completed with silicone caulking

.2 The fittings sections and cover sheets shall be installed as per the manufacture recommendations and instructions, with minimum requirements being stainless steel bands, stainless steel strews and gear clamps

.3 The preformed joint insulation sections shall be pre-grooved on the inside or slightly oversized to accommodate heat trace cable(s) if applicable.

2.6 Electric Heat Tracing

.1 The electric tracing system and associated controls shall be as per the manufacturer's recommendations with particular attention being paid to the watt densities applied through conduits on plastic pipes.

.2 Heat trace systems must be confirmed as compatible with the associated piping system, particularly with plastic pipe systems. Heat trace systems must have suitable temperature control systems in place (which may be intrinsic or control system based). The engineer must confirm the compatibility of all proposed heat trace and piping systems, via the approval of shop drawings submitted by the contractor.

.3 All tracing cables and related accessories to be CSA approved and comply with CSA heat tracing standard C22.2 No. 130-03.

.4 The minimum acceptable product for this application is the ThermoCable heat trace and associated controller system, as supplied by Urecon Canada.

Part 3 Execution

3.1 Insulation and Outer Jacket

.1 Pipe shall be supplied to site completed with factory applied insulation and protective outer jacket.

.2 Pipe shall be assembled as per the drawings and following manufacture recommendations.

.3 Insulation joint and fitting kits shall be installed in accordance with manufacture recommendations to ensure the entire piping system is protected from freezing conditions

3.2 Heat Trace

.1 If pre-insulated pipe is used, completed with a heat trace conduit being installed, heat trace cabling to be installed in accordance with manufacture recommendations and as shown on the drawings

END OF SECTION

Part 1 General

.1 All pipe to be standard schedule 40 IPS PVC pipe complete with solvent weld type joints.

.2 The drain pipe system is to utilize a solvent weld type joining system. All joints are to be water tight and restrained to movement, once completed

.3 All portions of the storm collection drainage system shall be heat traced and insulated to prevent freezing.

.4 The minimum acceptable product for this application is the Xirtec140 PVC sch 40 pipe, as supplied by IPEX.

1.2 MEASUREMENT AND PAYMENT

.1 Measurement and payment shall be in liner meters of product supplied, installed and accepted.

.2 The price shall include any fittings, joints and related appurtenances required to accommodate bends as shown on the drawings.

1.3 REFERENCES

.1 ASTM International

.1 ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

.2 ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

.3 ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

.2 CSA Canadian

.1 CAN/CSA-B137 - Rigid polyvinylchloride (PVC) pipe and fittings for pressure applications

.2 CAN/CSA-C22.2 NO. 130-03 (R2013) - Requirements for Electrical Resistance Heating Cables and Heating Device Sets

.3 NSF

.1 NSF 14 - Plastics Piping System Components and Related Materials including the Uniform Plumbing Code (UPC)

1.4 ACTION AND INFORMATION SUBMISSION

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

.2 Submit manufacturer's instructions, printed product literature and data sheets for proposed insulation system, including product characteristics, performance criteria, physical size, finish and limitations.

1.5 DELIVERY, STORAGE, and HANDLING

.1 Care must be taken to not damage the product during the installation process. Any damages to the system must be reported to the engineer to inspect prior to use.

Part 2 Products

2.1 Pipe

.1 All pipe shall conform to ASTM D1785, NSF 14, and/or CSA B137.0/B137.3.

.2 All pipe, fittings and valves shall be compatible and produced by one manufacturer

2.2 Fittings

.1 Schedule 40 fittings shall conform to ASTM D2466

.2 Any heat trace system must adhere to CAN/CSA-C22.2 NO. 130-03.

Part 3 Execution

3.1 System

.1 The PVC piping system and related fittings, valves and appurtenances shall be installed as per the manufacture specifications

END OF SECTION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Area drains to be installed at the trap lows to convey the storm water into the drainage system per manufacturers specifications.

1.2 MEASUREMENT AND PAYMENT

.1 Floor drain: Measurement and payment shall be per area drain (each), supplied and installed.

.2 The price shall include any appurtenances and materials required by the manufacturer specifications.

1.3 REFERENCES

.1 ASME A112.6.1M

1.4 WORK BY OTHERS

.1 Co-operate with other Contractors in carrying out their respective works.

.2 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Consultant, in writing, any defects which may interfere with proper execution of Work.

1.5 WORK SEQUENCE

.1 Co-ordinate Progress Schedule and co-ordinate with Owner Occupancy during construction.

1.6 CONTRACTOR USE OF PREMISES

.1 Co-ordinate use of premises under direction of Parks Canada.

.2 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.7 OWNER OCCUPANCY

.1 Owner will occupy premises during entire construction period for execution of normal operations.

.2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.8 DOCUMENTS REQUIRED

.1 Manufacturers specifications for the floor area drains

Part 2 Products

2.1 Minimum acceptable product examples for area drains are as follows,

.1 Epoxy coated cast iron floor drain with anchor flange, trap primer tapping and round adjustable nickel bronze strainer with 4” threaded shank and vandal proof screws.

.2 Epoxy coated cast iron area drain with anchor flange, integral clamp collar, trap primer tapping and 8” round ductile iron or nickel bronze veneer grate.

.3 Epoxy coated cast iron area drain with anchor flange, trap primer tapping and 12” round adjustable ductile iron or nickel bronze veneer grate.

2.2 Minimum area drain outlet pipe sizes are all to be 100mm (4") to allow for ease of access and maintenance.

2.3 All floor area drains to include a seepage opening.

2.4 An 8 or 12 inch round area drain is recommended for WD 12, 13 and 14 drain locations to provide additional inlet capacity. All other drain locations may use a 5 or 6-inch diameter drain top.

2.5 Area drain inlets should be able to handle close to the estimated inlet flows provided on the tables shown on Civil Drawings C2 and C3 to reduce surface ponding time in the event of a large storm event.

2.6 Floor drains to have a galvanized body

2.7 Drain selection to meet **ASME A112.6.1M** ratings for light duty pedestrian traffic loading requirements or higher standard.

Part 3 Execution

3.1 Install to manufacturers specifications

END OF SECTION