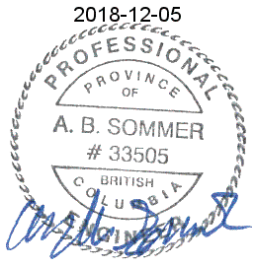
F1737-181015A

Depot Lighting Upgrade

Institute of Ocean Sciences
Sidney, B.C.

FISHERIES AND OCEANS CANADA

Pêches et Océans Canada
Fisheries and Oceans Canada



Seal #1

Andrea Sommer, P.Eng.
PBX Engineering Ltd.
Division 1, Division 7, 26,
and 31 Specifications

NOTES:

Each Engineer that has applied a seal above shall indicate which sections of the specifications he or she is certifying and the engineering company they work for. Alternatively, the Engineer may indicate which engineering discipline he or she is certifying as long as the name of the engineering company they work for (the source) is shown on the applicable technical specifications.

DRAWINGS

DWG #	Description	Rev	Date
E000	Cover Sheet & Drawing Index	0	2018-11-30
E001	Symbol Legend, Key Plan & General Notes	0	2018-11-30
E002	Site Plan	0	2018-11-30
E100	Area Enlargement – Winch Shop - Demolition	0	2018-11-30
E101	Area Enlargement – Winch Shop – Proposed	0	2018-11-30
E102	Area Enlargement – Depot	0	2018-11-30
E120	Workshop/Hangar Lower Level	0	2018-11-30
E121	Workshop/Hangar Upper Level	0	2018-11-30
E500	Details	0	2018-11-30
E510	Lighting Relay Schedules	0	2018-11-30
E600	Luminaire Schedule	0	2018-11-30
S01	General Notes	0	2018-11-30
S02	Site Plan	0	2018-11-30
S03	Sections and Details	0	2018-11-30

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Not Used.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises exterior lighting upgrades at the Institute of Ocean Sciences, located at 9860, West Saanich Road in Sidney, BC.

.2 Work includes but is not limited to:

.1 Provision of new luminaires and Davit arms on the exterior of existing buildings.

.2 Provision of new luminaires, poles, and Davit arms on new in-ground bases.

.3 Provision of new luminaires, poles, and Davit arms on existing in-ground bases.

.4 Structural evaluation of in-ground bases to confirm suitability for re-use.

.5 Provision of new lighting controllers.

.6 Provision of new wiring and conduit to accommodate all new luminaires.

.7 Provision of new indoor electrical distribution equipment in multiple buildings on site.

.8 Provision of all Civil works required to facilitate the installation of new electrical equipment and re-instate excavated areas.

.9 Coordinate and pay for First Nations Cultural Observers to be present during all excavation work.

.3 Contractor shall obtain and pay for all permits required to perform the work outlined in the Contract Documents including but not limited to electrical and building permits.

1.4 SCHEDULE

.1 Work must be completed by March 31, 2019.

.2 Due to funding restrictions, work must be completed by the date listed.

1.5 WORK ENVIRONMENT

.1 The Institute of Ocean Sciences is a federal facility with restricted access. All contractors' personnel must hold reliability clearance or be escorted by IOS staff members.

1.6 CONTRACT METHOD

.1 Relations and responsibilities between Contractor and subcontractors and suppliers assigned by Departmental Representative are as defined in Conditions of Contract. Assigned Subcontractors must, in addition:

.1 Furnish to Contractor, bonds covering faithful performance of subcontracted work and payment of obligations thereunder.

.2 Purchase and maintain general liability insurance to protect Contractor from claims for not less than limits of liability which Contractor is required to provide to Departmental Representative.

.2 WorkSafeBC

.1 Within five (5) working days of execution of the Contract, provide written confirmation from the WorkSafeBC that the prime contractor and all subcontractors are registered in good standing with WorkSafeBC. No invoice will be payable until such confirmation has been received.

.3 Performance Assurance:

.1 Accepted Bidder must provide Performance and Labour and Materials Payment Bonds each in the amount of fifty percent (50%) of the Contract Price.

.2 Include cost of bonds in Bid Price.

.3 Obligee on bonds shall be the Departmental Representative.

.4 Provide these bonds within ten (10) Working Days of contract award. Maintain bonds in good standing until Contract fulfillment. Ensure requirements of contract are met and payment obligations arising under the Contract are made while bonds are still in place.

.5 Ensure the Performance Bond is issued on CCDC-221 Performance Bond form, and Labour and Material Bond is issued on CCDC-222 Labour and Material Performance Bond form or other forms approved by the Surety Association of Canada and issued by a Surety acceptable to the Departmental Representative.

1.7 CASH ALLOWANCES

.1 Contractor shall carry a cash allowance of $15,000 for replacement of existing MMCD Type C pole bases. Bases shall be evaluated during construction and any bases deemed unsuitable for re-use by the Departmental Representative will be replaced.

1.8 FUTURE WORK

.1 Not Required.

1.9 WORK SEQUENCE

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

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

.3 Maintain fire access/control.

1.10 CONTRACTOR USE OF PREMISES

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

.1 Tenant occupancy.

.2 Work by other contractors.

.2 Co-ordinate use of premises under direction of Departmental Representative.

.3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

.4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.

.5 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.

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

1.11 TENANT OCCUPANCY

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

.2 Co-operate with all tenants in scheduling operations to minimize conflict and to facilitate Tenant usage.

1.12 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

.2 Use only elevators existing in building for moving workers and material.

.1 Protect walls of passenger elevators, to approval of Departmental Representative prior to use.

.2 Accept liability for damage, safety of equipment and overloading of existing equipment.

1.13 EXISTING SERVICES

.1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to tenant operations.

.3 Provide alternative routes for pedestrian and vehicular traffic.

.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 when directed by Departmental Representative 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 WorkSafeBC requirements.

1.14 DOCUMENTS REQUIRED

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

- .1 Contract Drawings.
- .2 Specifications.
- .3 Addenda.
- .4 Reviewed Shop Drawings.
- .5 List of Outstanding Shop Drawings.
- .6 Change Orders.
- .7 Other Modifications to Contract.
- .8 Field Test Reports.
- .9 Copy of Approved Work Schedule.
- .10 Health and Safety Plan and Other Safety Related Documents.
- .11 Other documents as specified.

PART 2 PRODUCTS

.1 Not used.

PART 3 EXECUTION

.1 Not used.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results.

1.3 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.4 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Project Manager and 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 Departmental Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.

.5 Use only assigned elevators, stairwells, or paths of travel in existing in building for moving workers and material.

.1 Protect walls of passenger elevators, to approval of Project Manager and Departmental Representative prior to use.

.2 Accept liability for damage, safety of equipment and overloading of existing equipment.

.6 Protect work temporarily until permanent enclosures are completed.

.7 Workers shall refrain from use of loud and vulgar language. Non- compliance to this policy will result in the specific worker(s) involved being required to immediately leave the site and to be permanently removed from any subsequent involvement on this project by the Contractor.

.8 Use of loud radios shall be prohibited.

.9 Pets are not allowed on site.

.10 Vehicles must be parked in designated areas.

.11 The Departmental Representative will designate storage areas for tools and equipment. The Contractor shall assign and coordinate storage facilities for sub-Contractors within these designated areas.

1.5 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

1.6 EXISTING SERVICES

.1 Notify Project Manager, Departmental Representative, and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Project Manager, and Departmental Representative a minimum of 5 working days of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

.3 Provide for personnel and vehicular traffic.

.4 Construct barriers in accordance with WorkSafeBC, safety authority, Authority Having Jurisdiction, and Project Manager.

1.7 SPECIAL REQUIREMENTS

.1 Submit schedule in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart.

.2 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

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

.4 Carry out noise generating work outside of normal working hours or as specifically coordinated with the Project Manager and Departmental Representative.

1.8 TRENCHING AND EXCAVATION

.1 Two First Nations Cultural Observers must be present during all excavation within the IOS property. Coordinate attendance of observers with the First Nation.

.1 Costs for observers shall be paid directly to the local first nation.

.2 Costs for Cultural Observers are $30/hr for each observer.

.2 Perform work during normal working hours, Monday to Friday.

1.9 SECURITY

.1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.

.2 The Institute of Ocean Sciences (IOS) is a federal facility. Contractors must hold reliability clearance or be escorted by IOS personnel.

1.10 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is permitted only in approved areas as designated by the Departmental Representative.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Not Used.

1.1 ADMINISTRATIVE

.1 Departmental Representative shall schedule and chair meetings and record the meeting minutes.

.2 Departmental Representative shall prepare agenda for meetings.

.3 Distribute written notice of each meeting to subcontractors four days in advance of meeting date.

.4 Provide physical space and make arrangements for meetings.

.5 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

.1 Within 10 business days after award of Contract, Departmental Representative will request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

- .1 Attendance by Contractor and major Subcontractors is mandatory.
- .2 Departmental Representative, Contractor, and major Subcontractors, will be in attendance.
- .3 Parties shall be notified a minimum of 5 days prior to meeting.
  - .1 Contractor shall be responsible for notifying and coordinating attendance of Subcontractors.

.2 Contractor shall prepare preliminary Schedule of Work for review at preconstruction meeting.

.3 Agenda will include but not be limited to:

- .1 Appointment of official representative of participants in the Work.
- .2 Schedule of Work.
- .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 Delivery schedule of major equipment.
- .6 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
- .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
- .8 Owner provided products.

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

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

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

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

.13 Appointment of inspection and testing agencies or firms.

1.3 PROGRESS MEETINGS

.1 During course of Work schedule progress meetings every two weeks.

.2 Contractor, major Subcontractors involved in Work Departmental Representative are to be in attendance.

.3 Notify parties minimum one week prior to meetings as to who is required to attend from Departmental Representative Team.

.4 Departmental Representative shall perform the following duties:

.1 Prepare agenda for meetings.

.2 Preside at meetings.

.3 Record meeting minutes including significant proceedings and decisions.

.4 Reproduce and distribute copies of minutes within two days of meeting:

.1 To all participants at meeting.

.2 To all parties affected by decisions made at meeting.

.5 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems, conflicts.

.4 Problems which impede construction schedule.

.5 Review of off-site fabrication delivery schedules.

.6 Corrective measures and procedures to regain projected schedule.

.7 Revision to construction schedule.

.8 Progress schedule, during succeeding work period.

.9 Review submittal schedules: expedite as required.

.10 Maintenance of quality standards.

.11 Review proposed changes for affect on construction schedule and on completion date.

.12 Other business.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results

1.2 ADMINISTRATIVE

.1 Submit to Project Manager and 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 Project Manager and 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 Project Manager and 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 Project Manager or Departmental Representative's review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Project Manager or Departmental Representative's review.

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

1.3 SHOP DRAWINGS AND PRODUCT DATA

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

.2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Canada where applicable.

.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 5 business 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 Project Manager and 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 Project Manager and 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 Project Manager and Departmental Representative's review, distribute copies.

.10 Submit electronic copy in pdf format shop drawings for each requirement requested in specification and as Project Manager or Departmental Representative may reasonably request.

.11 Submit electronic copy in pdf format of product data sheets or brochures for requirements requested in specification Sections and as requested by Project Manager or Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.1 Indicate exact model number and all options to be supplied on data sheet.

.12 Submit electronic copy in pdf format of test reports for requirements requested in specification Sections and as requested by Project Manager or 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 copy in pdf format of certificates for requirements requested in specification Sections and as requested by Project Manager or 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 copy in pdf format of manufacturer’s instructions for requirements requested in specification Sections and as requested by Project Manager or 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 copy in pdf format of Manufacturer's Field Reports for requirements requested in specification Sections and as requested Project Manager or Departmental Representative.

.16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.17 Submit electronic copy in pdf format of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Project Manager or Departmental Representative.

.18 Delete information not applicable to project.

.19 Supplement standard information to provide details applicable to project.

.20 Indicate equipment numbers(s) or descriptions(s) on each submittal.

.21 If upon review by Project Manager and 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.

.22 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.

1.4 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic of colour digital photography in jpg or tif format, standard resolution as directed by Project Manager and Departmental Representative.

.2 Project identification: name and number of project and date of exposure indicated.

.3 Number of viewpoints: to adequately capture the stages of existing equipment, equipment removal, equipment during construction, and final equipment replacement.

.4 Frequency of photographic documentation: as directed by Departmental Representative.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Results

1.2 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 Province of British Columbia

.1 Workers Compensation Act, RSBC latest version.

1.3 ACTION AND INFORMATIONAL 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

.3 Submit copies of Contractor's authorized representative's work site health and safety inspection reports as required by the authority having jurisdiction and provide a weekly update for the Departmental Representative.

.4 Submit copies of reports or directions issued by health and safety inspectors.

.5 Submit copies of incident and accident reports.

.6 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with authority having jurisdiction

.7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 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.

1.4 FILING OF NOTICE

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

1.5 SAFETY ASSESSMENT

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

1.6 MEETINGS

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

1.7 REGULATORY REQUIREMENTS

.1 Do Work in accordance with Authority having jurisdiction.

1.8 PROJECT/SITE CONDITIONS

.1 Refer to hazardous materials report for facility appended to the specification for additional information.

1.9 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.

1.10 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.

1.11 COMPLIANCE REQUIREMENTS

.1 Comply with Workers Compensation Act, B.C. Reg.

.2 Comply with requirements of Authority Having Jurisdiction

1.12 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.

1.13 HEALTH AND SAFETY CO-ORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:

.1 Have site-related working experience specific to activities associated with renovation and replacement of electrical distribution in existing buildings with the potential to have hazardous materials.

.2 Have working knowledge of occupational safety and health regulations.

.3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.

.4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

.5 Be on site during execution of Work and report directly to and be under direction of site supervisor

1.14 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.

1.15 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.

1.16 BLASTING

.1 Blasting or other use of explosives is not permitted

1.17 POWDER ACTUATED DEVICES

.1 Not Permitted.

1.18 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.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

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

1.1 INSPECTION

.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 Contract Documents, or law of Place of Work.

.1 Provide a minimum of 2 business days' notice to Departmental Representative and Project Manager.

.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.

1.2 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.

1.3 PROCEDURES

.1 Notify appropriate agency Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. 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.

1.4 REJECTED WORK

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

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

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

1.5 REPORTS

.1 Submit inspection and test reports in digital PDF format to Departmental Representative.

.2 Provide copies to subcontractor of work being inspected or tested.

1.6 CONCRETE 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.

1.7 MOCK-UPS

.1 Not Required.

1.8 MILL TESTS

.1 Not Required.

1.9 EQUIPMENT AND SYSTEMS

.1 Refer to Division 26 for electrical system requirements.

Part 2 Products

1.10 NOT USED

.1 Not Used.

Part 3 Execution

1.11 NOT USED

.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.

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

.2 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance. Cost for such testing will be borne 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 All products, materials, equipment, and articles incorporated in Work shall bear CSA, cUL, or equivalent approval. Notify Departmental Representative if specified products are not available with certification for use in Canada.

.3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.

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

.6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 AVAILABILITY

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

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

1.4 STORAGE, HANDLING AND PROTECTION

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

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

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

.4 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 Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 TRANSPORTATION

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

.2 Transportation cost of products supplied by Departmental Representative will be paid for Contractor. Unload, handle and store such products.

1.6 MANUFACTURER'S INSTRUCTIONS

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

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

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

1.7 QUALITY OF WORK

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

.2 Do not employ anyone unskilled in their required duties. Departmental Representative and Project Manager reserve right to require dismissal from site, workers deemed incompetent or careless.

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

1.8 CO-ORDINATION

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

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

1.9 CONCEALMENT

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

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

1.10 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.

1.11 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.

1.12 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.

1.13 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.

1.14 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 Departmental Representative.

1.15 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 building occupants.

.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

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Not Used.

1.1 REFERENCES

.1 Not Required.

1.2 SURVEY REQUIREMENTS

.1 Not Required.

1.3 EXISTING SERVICES

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

.2 No documentation is available showing location of existing underground services. Buried services on the site include but are not limited to water, sewer, high voltage (25kV) distribution, low voltage (600 and 208V) distribution, and communications systems.

.3 Perform Ground Penetrating Radar scans of all areas to be excavated and/or where equipment is to be installed outdoors prior to commencing Work.

.1 Use survey paint to mark location of all services in areas to be excavated.

1.4 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.

1.5 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.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit name and address of Contractor performing Ground Penetrating Radar scans to Departmental Representative.

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

1.7 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.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Departmental Representative.

.2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative or Project Manager. Do not burn waste materials on site.

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

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

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

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

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

.8 Debris and waste will be managed and disposed of in a proper manner as approved by the Departmental Representative. Permits for waste handling and disposal will be obtained by the contractor.

1.3 FINAL CLEANING

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

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

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

.4 Remove waste products and debris other than that caused by Departmental Representative or other Contractors.

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

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

.7 Remove stains, spots, dust, marks and dirt from electrical equipment, walls, and floors.

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

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

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling as required by the waste management service and in accordance with project documents

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Not Used.

1.3 WASTE MANAGEMENT GOALS

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

.2 Waste Management Goal is to divert all materials considered recyclable from landfill sites.

.3 Accomplish maximum control of solid construction waste.

.4 Preserve environment and prevent pollution and environment damage.

1.4 DEFINITIONS

.1 Class III: non-hazardous waste - construction renovation waste.

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

.3 Recycled: ability of product or material to be recovered at end of its life cycle and reused.

1.5 DISPOSAL OF WASTES

.1 Debris and waste will be managed and disposed of in a proper manner as approved by the Departmental Representative. Permits for waste handling and disposal will be obtained by the contractor.

.2 Do not bury rubbish or waste materials.

.3 Burning of any materials on site is prohibited.

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

.5 Keep records of construction waste including:

.1 Number and size of bins.

.2 Waste type of each bin.

.3 Reused or recycled waste destination.

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

.7 Dispose of Hazardous wastes at an approved facility only. Provide proof of proper disposal to Departmental Representative.

1.6 USE OF SITE AND FACILITIES

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

.2 Provide temporary security measures approved by Departmental Representative.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 APPLICATION

.1 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 in specific sort areas.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Not Used.

1.3 REFERENCES

.1 Canadian Environmental Protection Act (CEPA)

.1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:

.1 Contractor's Inspection: Contractor: 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 submit verification that corrections have been made.

.2 Request Departmental Representative's inspection.

.2 Departmental Representative's Inspection:

.1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.

.2 Contractor to correct Work as directed.

.3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:

.1 Work: completed and inspected for compliance with Contract Documents.

.2 Defects: corrected and deficiencies completed.

.3 Equipment and systems: tested, adjusted, balanced, and fully operational.

.4 Certificates required by Utility companies: submitted.

.5 Operation of systems: demonstrated to Departmental Representative's personnel.

.6 Work: complete and ready for final inspection.

.4 Final Inspection:

.1 When completion tasks are done, request final inspection of Work by Departmental Representative, and Contractor.

.2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.

.5 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract

substantially performed, make application for Certificate of Substantial Performance.

.6 Commencement of Lien and Warranty Periods: date of Departmental Representative's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.

.7 Final Payment:

.1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.

.2 When Work deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

.8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

1.5 FINAL CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Two weeks prior to Substantial Performance of the Work, submit to the Project Manager, two final hard copies and one electronic copy of operating and maintenance manuals in English.

.3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.

.4 Provide evidence, if requested, for type, source and quality of products supplied.

1.4 O&M MANUAL FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, 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.

.1 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, 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.

.1 Bind in with text; fold larger drawings to size of text pages.

.9 Provide to scale CAD files in dwg format on CD.

1.5 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of Contents for Each Volume: 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.

.1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

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

.7 Refer to attached Commissioning Oversight Operation & Maintenance Manual Review Checklist for additional requirements for O&M manual submission.

1.6 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, at site for Project Manager and 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 in secure location.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.

.4 Maintain record documents in clean, dry and legible condition.

.1 Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Departmental Representative.

1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of drawings, and in copy of Project Manual, provided by Project Manager.

.2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress.

.1 Do not conceal Work until required information is recorded.

.4 Contract Drawings and shop drawings: mark each item to record actual construction, including:

.1 Changes made by change orders.

.2 Details not on original Contract Drawings.

.3 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, as required by individual specifications sections.

.7 Provide digital photos, if requested, for site records.

1.8 EQUIPMENT AND SYSTEMS

.1 For each item of equipment and each system include description of unit or system, and component parts.

.1 Give function, normal operation characteristics and limiting conditions.

.2 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 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

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

.6 Include sequence of operation by controls manufacturer.

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

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

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

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

1.9 MAINTENANCE MATERIALS

.1 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; place and store.

.4 Receive and catalogue items.

.1 Submit inventory listing to Project Manager

.2 Include approved listings in Maintenance Manual.

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

.2 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; place and store.

.4 Receive and catalogue items.

.1 Submit inventory listing to Project Manager.

.2 Include approved listings in Maintenance Manual.

1.10 DELIVERY, STORAGE AND HANDLING

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

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

.3 Store components subject to damage from weather, or temperature extremes in suitable weatherproof, heated or conditioned areas.

.4 Remove and replace damaged products at own expense and for review by Project Manager or Departmental Representative.

1.11 WARRANTIES AND BONDS

.1 Develop warranty management plan to contain information relevant to Warranties.

.2 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.

.3 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

.4 Submit, warranty information made available during construction phase, to Project Manager for approval prior to each monthly pay estimate.

.5 Assemble approved information in binder, submit upon acceptance of work and 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.

.6 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

.7 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 extended warranty items, to include electrical equipment.

.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 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

.8 Respond in timely manner to oral or written notification of required construction warranty repair work.

.9 Written verification to follow oral instructions.

.1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

END OF SECTION

PART 1 GENERAL

.1 All design has been completed in accordance with the 2012 edition of the British Columbia building code, including all addenda.

.2 All construction must be in accordance with the British Columbia building code, including all addenda, all referenced codes and all federal and municipal regulations and by-laws.

.3 All referenced codes and standards shall be as referenced in the governing edition of the British Columbia building code

.4 Design criteria: kPa (psf)

<table>
<tr><td colspan="8">Sidney</td></tr>
<tr><td colspan="2">Snow Loads</td><td colspan="6">Spectral Acceleration</td></tr>
<tr><td>Ss</td><td>1.1 kPa (23.00psf)</td><td>Sa (0.2)</td><td>Sa (0.5)</td><td>Sa (1.0)</td><td>Sa (2.0)</td><td>PGA</td></tr>
<tr><td>Sr</td><td>0.2 kPa (4.20psf)</td><td>1.2</td><td>0.8</td><td>0.37</td><td>0.19</td><td>0.6</td></tr>
<tr><td>Is</td><td>ULS 1.0/SLS 0.75</td><td colspan="5"></td></tr>
<tr><td colspan="2">Wind Loads</td><td colspan="5">Site Class</td></tr>
<tr><td>q10</td><td>0.33 kPa (6.89 psf)</td><td rowspan="3">D</td><td colspan="4" rowspan="3">Assumed
See geotechnical report</td></tr>
<tr><td>q50</td><td>0.42 kPa (8.77pse</td></tr>
<tr><td>Iw</td><td>ULS 2.0 /SLS 0.9</td></tr>
<tr><td colspan="3">Deflection Criteria</td><td colspan="5">Deflection Criteria</td></tr>
<tr><td colspan="3">Live Load = L/360</td><td colspan="5">Live Load = L/360</td></tr>
<tr><td colspan="3">Total Load = L/240</td><td colspan="5">Total Load = L/240</td></tr>
</table>

.5 These drawings including dimensions shall be read in conjunction with all other project drawings and specifications. Contractor shall report any discrepancies to the structural engineer for clarification prior to commencing construction. Contractor shall be familiar with all project drawings including those of other disciplines and shall make allowances for all items shown on other drawings that affect this contractor's work.

.6 These drawings show the completed structure only. Provide temporary bracing and shoring for the construction loading conditions and stability of the structure during construction. Construction loads shall not exceed design loads.

.7 The contractor shall retain a professional engineer registered in the province of British Columbia to design and take responsibility for any temporary shoring, bracing or other designs required to complete construction.

.8 The contractor shall submit written recommendations for flatwork performed during cold (below +5°c) and hot (above +25°c) weather. The recommendations shall be prepared, sealed and signed by a professional engineer registered in the province of British Columbia. A schedule's' shall also be submitted upon request. Flatwork includes slabs on grade, suspended slabs, tilt-up panels, masonry and concrete topping.

.9 Under no circumstances shall drawings be scaled.

.10 Contractor and all sub-trades shall verify all dimensions on site prior to commencing fabrication.

PART 2 SUBMITTALS

.1 Where shop drawings are requested in the general notes the contractor shall provide them in either hard copy or digital format to the following requirements for the engineer's review prior to fabrication. The shop drawings shall indicate details, dimensions, materials and design loads.

.2 If hard copy format is used five paper copies shall be submitted. Unless noted otherwise they shall be signed and sealed by a specialty engineer registered in the province of British Columbia.

.3 Drawings not sealed by the specialty engineer shall be accompanied by a letter with a drawing list identifying all drawing numbers, titles, most recent revision numbers and dates. The letter and drawing list are to be signed and sealed by the specialty engineer.

.4 If a digital submission is made the files shall be in pdf format on a disc or transmitted via e-mail. The submission shall contain a letter with a drawing list as described above signed and sealed by the specialty engineer. The final submission shall be made as a hard copy bearing the original seal and signature of the specialty engineer registered in the province of British Columbia.

.5 Shop drawings which are required to, but do not have the appropriate engineers seal and signature will not be reviewed.

.6 Shop drawings will be reviewed only for general conformity with the project drawings and specifications. Quantities and detailed dimensions are the contractor's responsibility. The review shall not relieve the contractor from complying with all the

requirements of the contract documents including coordination with other trades and disciplines. The contractor is responsible for errors and omissions on the shop drawings.

.7 Shop drawing submissions for the work of specialty engineers shall be as set out in this section.

.8 The quality assurance for materials, fabrication and installation is the responsibility of the contractor and his specialty engineer.

.9 The specialty engineer or his representative shall visit the site and review the completed work designed and detailed on his shop drawings to satisfy himself that the finished components and assemblies are in compliance with the engineered design. The specialty engineer shall then provide the project engineer of record with a completed schedule 's' for this work along with any sketches showing field modifications. These sketches shall bear the seal and signature of the specialty engineer.

PART 3 FIELD REVIEWS

.1 The contractor shall provide the engineer with a minimum of 24 hours (1 working day) advance notice for field reviews.

.2 Or if more than 100 km of travel is necessary use the following sentence; drafter to edit

.3 The contractor shall provide the engineer with a minimum of 48 hours (2 working days) advance notice for field reviews.

.4 The following field reviews are considered to be the minimum number of structural field reviews required for the project:

.1 Concrete: reinforcing steel shall be reviewed prior to placing concrete. Reinforcing in concrete walls shall be reviewed prior to "buttoning up" wall forms.

.2 Steel: structural steel shall be reviewed after the members have been fabricated and are in their final position with all connections complete and all bolts installed and tightened.

.5 If the engineer is not provided with the opportunity to perform the required field reviews, final certification of the project will not be issued.

PART 4 NON-STRUCTURAL ELEMENTS

.1 These drawings do not include non-structural elements which are to be designed, detailed and field reviewed by a specialty engineer registered in the province of British Columbia, who shall also provide letters required by the authority having jurisdiction. The specialty engineer shall coordinate his work with these documents and those of the other disciplines on the project.

Non-structural elements shall include but not be limited to the following:

.1 Masonry veneer and glass block and their attachment to the building structure,

.2 Non-loadbearing masonry,

.3 Architectural precast concrete and precast cladding,

.4 Exterior and interior stud walls, glazing systems, siding and cladding,

.5 Timber and steel stairs,

.6 Handrails and guardrails and other architectural components such as canopies, ceilings, millwork, skylights and flag poles,

.7 Non-structural concrete toppings,

.8 Fall restraint anchors and their attachment,

.9 Elevators, escalators and conveying systems,

.10 Window washing equipment,

.11 Mechanical and electrical equipment, their attachment to the building structure and seismic restraint,

.12 Landscaping elements such as light poles, benches and free-standing planters.

.2 Shop drawings for non-structural elements shall be submitted to the project engineer for review of the items impact on the building structure only.

.3 The following are the design wind loads to be used for exterior studs, cladding and glazing. Loads shown are unfactored (specified). Note that seismic forces may govern for masonry veneer designs. The Iw factors for ULS/SLS have not been applied in the table.

Height Above Finished Grade (m)	Inward Pressure (kN/m^2)	Outward Pressure (kN/m^2)
0 to 6.0	1.3	1.3

6.0 to 12.0	1.5	1.5

.4 The deflection of the exterior studs, cladding and glazing under the loading specified above shall meet the requirements of the project specifications, manufacturers specifications and relevant building codes but shall in no case exceed the following;

Elements Supporting	Max. Deflection
Wood Siding, Metal Cladding, Exterior Insulation, or Glazing	L/180 or 19mm
Precast Panels, Stucco, or Brick Veneer	L/360 or 19mm

.5 Interior partitions are to be designed for a wind load of 0.25 kN/m² (unfactored)

PART 5 FOUNDATIONS

.1 Assumed design values:

	Factored Bearing Resistance	Bearing Pressure For Settlement
Pad footings	100 kPa (2100 psf)	100 kPa (2100 psf)

Allowable bearing capacity to be confirmed by geotechnical engineer prior to construction.

.2 Centre all footings under columns and walls unless noted otherwise.

.3 Foundation bearing material shall be protected from rain, frost, snow and water infiltration.

.4 Footing elevations indicated on the drawings represent minimum values to be used. Variable site soil conditions, underground services and existing structures may require adjustment of footing elevations. The contractor shall make allowances for minor variations in footing elevations in his bid. Contact structural engineer for instructions regarding site conditions that differ from what is shown on drawings.

.5 Contractor shall coordinate construction of foundations with underground services as shown on civil, mechanical, electrical, and architectural drawings. Conflicts shall be reported to the architect for resolution.

.6 Unless noted otherwise, minimum assumed compaction under all footings and slabs for compacted granular fills is 98% standard corrected proctor density. Geotechnical engineer or testing agency to confirm prior to placing concrete.

PART 6 REINFORCING STEEL

.1 Reinforcing steel shall be deformed steel 400 grade and shall conform to CAN/CSA-G30.18-09

.2 Weldable low alloy deformed steel reinforcing bars, grade 400w, shall conform to CAN/CSA-G30.18-09. Mill certificates shall be supplied to the structural engineer for all weldable reinforcing steel used in the project.

.3 Welded wire fabric, deformed, shall conform ASTM A497-07.

.4 Welding of reinforcing steel shall conform to CSA W186-M1990 (R2012) "welding of reinforcing bars in reinforced concrete construction". Welding of reinforcing shall be allowed only as noted on plans. Where welding of reinforcing is required mill certificates for weldable reinforcing shall be provided prior to welding. Written permission from the structural engineer is required for any additional welding.

.5 All reinforcing bars shall be tied securely to prevent displacement.

.6 Unless noted otherwise on plans, lap lengths for reinforcing steel shall be as follows:

Concrete MPa	Bar size			
	10m	15m	20m	25m
25	380 (15")	560 (22")	760 (30")	1195 (47")
30	355 (14")	510 (20")	710 (28")	1065 (42")
35	330 (13")	480 (19")	660 (26")	990 (39")

Notes:

1. Multiply values by 1.3 for horizontal reinforcement placed in such a way that more than 12" of fresh concrete is cast in the member below the splice.
2. Multiply values by 1.5 for epoxy coated reinforcement with clear cover less than 3 bar diameters or bar spacing less than 7 bar diameters.

.7 No splices other than those noted on the drawings are permitted without written permission from the structural engineer.

.8 Where concrete surfaces are to be exposed only non-corrosive type reinforcing chairs shall be used to support the reinforcing steel.

.9 Dowels are to be tied in place prior to pouring concrete - "wet doweling" of any reinforcing steel is not permitted without the written approval of the structural engineer.

.10 Hooks on all ties shall be bent at least 135° and have a minimum leg of 6 times the tie bar diameter.

.11 Provide corner bars to match horizontal wall reinforcement.

.12 All vertical reinforcing to foundation walls and piers shall have a standard hook and be embedded in the footing.

.13 All bars shall be bent at temperatures greater than 10°c.

.14 No bars which are partially embedded in concrete shall be field bent except as shown on the drawings or approved in writing by the project structural engineer.

PART 7 CAST-IN-PLACE CONCRETE

.1 All concrete work shall conform to the requirements of CAN/CSA A23.1-09 and A23.2-09.

.2 Concrete mixes, aggregates and cementitious materials, including Portland cement and Portland limestone cement, shall conform to CAN/CSA A23.1-09 and A23.2-09 and CAN/CSA-A3000-08 and shall have the following properties based upon performance criteria proportioning:

Class	28 Day Strength	Exposure	Cement Type
Footings	25MPa (3500 psi)	N	GU
Foundation Walls & Piers	25MPa (3500 psi)	F-2	GU

.3 Portland limestone cement (PLC) shall meet the requirements of CSA A3000 for limestone cements.

.4 Concrete testing shall be carried out by the contractor and paid for by the owner and shall be in accordance with CAN/CSA A23.1-09 and A23.2-09. The minimum number of tests performed shall be as per CSA A23.2-09. Additional testing shall be performed at the direction of the structural engineer. Contractor shall provide testing agency with adequate notice to provide testing as required.

.5 Chamfer all exposed edges of concrete with a 19mm (3/4") chamfer unless noted otherwise.

.6 Concrete finishes shall be in accordance with CAN/CSA A23.1-09 and as follows unless noted otherwise:

.1 Interior slabs: Troweled finish

.2 Exterior slabs: broom finish

.3 Walls (typical): fill all defects larger than 25mm (1") diameter and grind ridges flush with surrounding surfaces

.7 All concrete curing shall be in accordance with CAN/CSA A23.1-09. Special precautions shall be taken per CSA A23.1 for placing and curing concrete at or above 27°C and at or below 5°C.

.8 Unless noted otherwise, or required for fire resistance rating, all reinforcing steel shall have the following clear cover distances:

.1 Cast against and permanently exposed to earth: 75 mm (3")

.2 Exterior members: 40 mm (1.5”)

.3 Interior beams, girders, columns, and piles: 30 mm (1.25”)

.4 Interior slabs, walls, joists, shells and folded plates: 20 mm (0.75”)

.5 In addition, cover must be at least 1.0x the bar diameter for interior exposure, and 1.5x the bar diameter for exterior exposure

.9 Water stops shall be installed where indicated in accordance with the manufacturer's written instructions. The stops shall be rigidly tied in place. Do not distort or puncture water stop. Do not displace reinforcing bar during placement.

.10 Joint filler shall be installed in all expansion and construction joints.

.11 Embedded plates and anchor bolts for structural steel shall be securely tied or fastened in place prior to pouring concrete. All anchor bolts shall be laid out using a template. "wet doweling" of anchor bolts and embedded plates is not permitted.

PART 8 STRUCTURAL STEEL

.1 All steel work shall be in accordance with csa-s16-09 and the reviewed shop drawings.

.2 The steel fabricator shall submit shop drawings as specified under 'submittals' to the project engineer for review prior to fabrication. Shop drawings shall indicate all details, fasteners, material specifications, finishes and design loads.

.3 A copy of the fabricator's Canadian welding bureau certificates shall be included with the shop drawing submission.

.4 All welding shall be in accordance with CSA W59-03 (R2008) and shall be performed by fabricators "fully approved" by the Canadian welding bureau under CSA W55.3-08. Fabricating shop to have a minimum division 2.1 certification by the Canadian welding bureau to the requirements of CSA W47.1-09 and CSA W55.3-08 for resistance welding of structural components. The fabricator shall submit proof of certification prior to start of work.

.5 All welding electrodes shall conform to CSA W48-06 (R2011).

.6 Connections not detailed on the structural drawings shall be designed for the loads indicated on the drawings. Unless noted otherwise on the structural drawings connection details are schematic only and final connection configuration is the responsibility of the fabricator. Use a minimum of 2-M20 (3/4") a325 bolts per connection. Connections designed by the contractor shall be sealed by a professional engineer registered in the province of British Columbia. Connections shall be designed to CSA-S16-09 to resist forces, moments and shears indicated on the plans. In instances of non-compliance the fabricator shall be responsible for additional costs associated with achieving compliance with the standard.

.7 Connections detailed on these structural drawings shall be fabricated and erected as shown. Alternatives may be considered at the sole discretion of the structural engineer of record but must be pre-approved by same. Where an alternative is approved it shall be at no additional cost to the owner and shall not negatively impact the construction schedule.

.8 Fabricator shall increase weld sizes to accommodate slot widths so that leg size as specified is fully on steel connection element. Final weld size to be shown on the shop drawings.

.9 Bolts and anchor rods shall be long enough that the end of the bolt or rod is outside the face of the nut.

.10 All bolts with oversized bolt holes shall be slip critical.

.11 Secondary structural elements are to be detailed such that they do not impose direct load transfer to the SFRS (Seismic Force Resisting System) without the approval of the engineer of record.

.12 All welded, headed studs, and welded deformed bar anchors shall be installed as per the manufacturer's specifications and recommendations in accordance with CSA W55.3-08.

.13 Do not field burn base plate holes or connection bolt holes unless approved in writing by the engineer. No field cutting or alteration of structural members is to occur without the prior written approval of the engineer

.14 If anchor bolts are misplaced or bolt holes misaligned, inform the engineer.

.15 Except parts of members to be embedded in concrete or galvanized or unless noted otherwise on the drawings, all steel work shall be shop primed. Priming shall be in accordance with CISC/CPMA-1-73a "quick drying primer" when no top coat is required and in accordance with CISC/CPMA-2-75 when a top coat is specified. If a top coat is specified the primer shall be selected ensuring compatibility with the specified system. Items specified to be galvanized shall be hot dipped galvanized to ASTM A123/A123M, minimum zinc coating of 600g/sq.m. Field touch-up all abrasions, scratches, welds or bolts with galvacon or equivalent.

.16 All exterior steel work and steel protruding through the building envelope shall be hot dip galvanized.

.17 Grout under base plates to be non-shrink 48 MPa (7000 psi) at 28 days.

.18 Provide structural steel to CSA G40.20-04/G40.21-04 (R2009) or ASTM A992 with the following grades:

.1	Pipe railings	240W (35W) to ASTM A53
.2	Wide flange beams and columns	350W (50W) or ASTM A992/A992M-11
.3	Channels and angles	300W (44W)
.4	HSS sections	350W (50W) class 'C'
.5	Miscellaneous steel plates	300W (44W)

.19 Bolt sizing shall be as noted on drawings and details. Provide bolts to CSA G40.21-04 (R2009) with the following grades:

.1 Erection bolts to ASTM A325-10

.2 Final bolted connections; ASTM A325 unless noted otherwise

.3 Anchor bolts shall meet the requirements of ASTM F1554, grade 36 (36ksi yield strength)

.20 Threaded rod shall be to ASTM F1554 grade 36 (36ksi yield strength)

.21 The contractor shall provide temporary bracing during construction. The bracing shall be designed, installed and maintained by the contractor. The bracing shall be removed only after permanent roof and floor diaphragms, shear walls and bracing are complete.

.22 The contractor shall provide seal welded closure plates at all open ends of exterior HSS columns. Plate thickness shall be a minimum of 6 mm (1/4") unless noted otherwise.

.23 The architect is responsible for ensuring adequate fire protection for all structural steel in accordance with CAN/ULC-S101.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.2 Underwriter's Laboratories of Canada (ULC)

.1 ULC-S115 (latest edition) Fire Tests of Fire stop Systems.

1.3 DEFINITIONS

.1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.

.2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.

.3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.

.4 Tightly Fitted; (ref: BCBC Part 3.1.9.1.1 and 9.10.9.6.1): penetrating items that are cast in place in buildings of noncombustible construction or have "0" annular space in buildings of combustible construction.

.1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

1.4 SUBMITTALS

.1 Provide submittals in accordance with 26 05 00 Common Work Results – Electrical.

.2 Shop Drawings:

.1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.

.1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

.3 Closeout Submittals:

.1 Contractor shall provide certificate of completion for firestopping that all firestopping has been installed in accordance with manufacturer's written instructions. Incorporate into Operations and Maintenance Manual.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: person specializing in fire stopping installations approved by manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results – Electrical.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.

.1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended.

.2 Fire stop system rating: to match existing.

.2 Service penetration assemblies: systems tested to CAN-ULC-S115.

.3 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.

.4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.

.5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.

.6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.

.7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

.8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.10 Sealants for vertical joints: non-sagging.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.

.1 Ensure that substrates and surfaces are clean, dry and frost free.

.2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.3 INSTALLATION

.1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.

.2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

.3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.4 Tool or trowel exposed surfaces to neat finish.

.5 Remove excess compound promptly as work progresses and upon completion.

.6 Fire stop and smoke seal at:

.1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.

.2 Edge of floor slabs at curtain wall and precast concrete panels.

.3 Top of fire-resistance rated masonry and gypsum board partitions.

.4 Intersection of fire-resistance rated masonry and gypsum board partitions.

.5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.

.6 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.

.7 Openings and sleeves installed for future use through fire separations.

.8 Around mechanical and electrical assemblies penetrating fire separations.

.9 Rigid ducts: greater than 129 cm^2: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

3.4 SEQUENCES OF OPERATION

.1 Proceed with installation only when submittals have been reviewed by Departmental Representative.

.2 Install floor fire stopping before interior partition erections.

.3 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.

.4 Mechanical pipe insulation: not required.

3.5 FIELD QUALITY CONTROL

.1 Departmental Representative's Review: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.

.1 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 SUMMARY OF WORK

.1 The scope of work for this project includes but is not limited to:

- .1 Provision of wired exterior lighting for Depot area
  - .1 Replace existing luminaries and poles with new
  - .2 Provide new luminaires, poles, and bases
  - .3 Provide new luminaires mounted to building exterior
- .2 Provision of lighting controls for new lighting
- .3 Provision of self-contained solar lighting

1.3 CODES AND REFERENCES

.1 Definitions:

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

.2 Any reference to Codes, Standards, and Regulations contained within the Contract Documents shall be taken as the latest or most current in effect at time of Tender.

.3 In no instance shall the standards established by the Contract Documents be reduced by any referenced Code or Regulation.

.4 Reference Standards:

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

1.4 DEFINITIONS

.1 The word ‘Provide’ means the supply, delivery, and installation of device or equipment referenced to the level required to be complete and operational.

.2 The word ‘Supply’ means to obtain and deliver to the project site, ready for unpacking, assembly, and installation.

.3 The word ‘Install’ means the unloading, unpacking, assembling, erecting, applying, finishing, protecting, cleaning and similar operations at the project site to complete items of work supplied by others.

.4 AHJ: Authority Having Jurisdiction

1.1 RESPONSIBILITY AND COORDINATION

.1 Provide all labour, materials, equipment, tools, and incidentals necessary to provide a complete electrical installation as indicated on the Drawings and as set out in these Specifications.

.2 Without relieving the Contractor of his responsibilities, the Specifications have been divided into approximate trade sections for convenience. These Sections do not, however, limit the responsibility of any subcontractor or supplier. The Departmental Representative will not arbitrate on any dispute between the subcontractors' responsibilities. The onus of defining the extent of the subcontractors' work remains with the Contractor, who, when awarding subcontracts, will ensure that the area of responsibility of any particular subcontractor is set out in full detail.

.3 The Contractor shall advise the Departmental Representative during the tender period of any specified material or equipment which is either no longer available from manufacturers or whose delivery is likely to exceed the requirements of the anticipated Construction Schedule. Failure of the Contractor to perform the above shall cause the Contractor to supply, at his own expense, alternate material or equipment as selected by the Departmental Representative at a later date. Alternatively, the Contractor shall procure the specified material or equipment at his own additional expense by means of air freight or other special means of transportation.

.4 The Drawings and Specifications complement each other and what is called for by one is binding as if called for by both. If there is any doubt as to the meaning or true intent due to a discrepancy between the Drawings and Specifications, obtain a ruling from the Departmental Representative prior to tender closing. Failing this, the most expensive alternative is to be allowed for.

.5 Advise the Departmental Representative of any specified equipment, material, or installation of same which appears inadequate or unsuitable or which is in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction. Provide all labour and materials which are obviously necessary or reasonably implied to be necessary to complete the work as if the work was shown on the Drawings and/or described in the Specifications.

.6 Check Drawings of all trades and coordinate the installation of all material and equipment to ensure adequate space and free access and to maintain headroom limitations for all proposed and indicated future work. Work out jointly, with all Subcontractors on the site, solutions to interference problems. Coordinate all work before fabricating or installing any material or equipment. It is incumbent on all Subcontractors on the site to ensure that all materials and equipment fit into the allocated spaces and that all equipment can be properly inspected, serviced, and replaced if and when required. Advise the Departmental Representative of space problems before fabricating or installing any material or equipment. Demonstrate to the Departmental Representative on completion of his work that all equipment and material installed by him can be properly and safely serviced and replaced. Make no deviations from the intent of the design, or any involving additional cost, without the Departmental Representative's written direction.

.7 Where electrical work and materials are noted as being provided by the Departmental Representative or under other Divisions of these Specifications, the responsibility for

integrating, to the extent required, such work and materials into the complete installation, shall remain within Division 26.

.8 Ensure that any building structure loaded during the installation is adequate to carry such load.

.9 Testing in accordance with Section 26 05 10 Testing and Commissioning.

.10 A contractor is entitled to engage in the regulated work for which the contractor is licensed.

.1 A licensed contractor must not:

.1 Manage or do regulated work that is:

.1 Outside the scope of the license,

.2 Contrary to any term or condition of the license, or

.3 Contrary to any term or condition imposed by the regulations on the use of the license, or

.2 Permit regulated work to be undertaken by persons under the control of the licensed contractor if they are not authorized.

.2 A licensed contractor must:

.1 Maintain current knowledge of the Acts, relevant regulations, relevant directives, relevant safety orders and any other relevant material that the minister makes publicly available, and

.2 Ensure that individuals who do regulated work for the licensed contractor maintain similar current knowledge.

1.5 PERMITS, FEES, AND INSPECTIONS

.1 Before commencing work obtain and pay for all necessary approvals and permits. The Departmental Representative shall provide printed drawings required by the AHJ to obtain such permits.

.2 Arrange for inspection of the work at rough-in completion, prior to Substantial Completion, and as otherwise required by all applicable Authorities Having Jurisdiction.

.1 Notify Departmental Representative of any changes required by the Authorities Having Jurisdiction prior to proceeding with changes.

.3 Provide Departmental Representative with a certificate of unconditional approval for all electrical work from the appropriate Authorities Having Jurisdiction. Final payment to the Contractor shall not be made prior to submission of the inspection certificate.

1.6 EVALUATION OF CONTRACT CHANGES

.1 Notwithstanding other provisions of the Contract, this Contractor shall supply detailed information for the valuation of all changes to the Contract. Such information shall include, but not necessarily be limited to, the following:

.1 Labour hours per unit of material or equipment to be added, deleted, or altered.

.2 Units of material or equipment to be added or deleted.

.3 Cost to the Contractor per unit of material, equipment and labour broken down by category of labour and type of material or equipment.

.4 Extensions of the above to arrive at total costs.

.5 Other miscellaneous and identifiable charges such as delivery, restocking, overhead, profit, etc.

.6 Include in the valuation of any change to the Contract the cost, if any, of recording such change on the record drawings as previously specified.

1.7 MEASUREMENT AND PAYMENT

.1 Notwithstanding any other provisions of this Contract, supply the following general information and any additional information as may be requested by the Departmental Representative as part of each Monthly Progress Claim.

.1 Indicate the labour cost and the material cost separately for each Item of Work within Divisions 26, 27, and 28.

.2 Progress claims will be certified as per contract requirements.

.3 Format for Monthly Progress Draws shall be approved by the Departmental Representative prior to the first submission.

.4 For each Monthly Progress Draw, each change order shall be listed separately.

.5 Indicate both the Change Order number and title on the progress draw.

1.8 REVIEW OF WORK

.1 The Departmental Representative will make periodic visits to the site during construction to ascertain reasonable conformity to plans and specifications but will not execute quality control. The Contractor shall be responsible for the execution of his work in conformity with the construction documents and with the requirements of the inspection authority.

.1 The Contractor shall notify the Departmental Representative a minimum of 48 hours prior to completion of rough-in to allow review prior to Work being concealed.

1.9 SCHEDULING OF WORK

.1 Work shall be scheduled as required to coordinate with other Divisions and Departmental Representative's work restrictions.

.2 Work Restrictions:

.1 The IOS is a federal facility. Contractor's personnel shall hold reliability clearance or be escorted by IOS staff.

.3 Become familiar with the phasing requirements for the work and comply with these conditions.

.4 No additional monies will be paid for contractor's requirement to comply with work phasing conditions.

1.10 GUARANTEE

.1 Furnish a written guarantee to the Departmental Representative 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 Departmental Representative any defective material or workmanship except where, in the opinion of the Departmental Representative, such defects are due to the misuse or neglect by the Departmental Representative.

.2 This general guarantee shall not act as a waiver of any specified of special equipment guarantees which cover a greater length of time.

1.11 FIRE RATING OF PENETRATIONS

.1 Maintain fire ratings around conduits passing through floors, ceilings and fire rated walls.

.2 Use fire stop products, approved by the Departmental Representative, at each penetration.

.3 Material of the same manufacturer is to be used throughout the entire project as part of a fully rated fire stop system.

.4 Acceptable manufacturers: Hilti, 3M or approved equal.

.5 Refer to Section 07

1.12 ACTION AND INFORMATIONAL SUBMITTALS

.1 All submissions shall be provided in electronic PDF format.

.2 Submit the following documents to the Departmental Representative a maximum of 14 days after Contract award:

.1 Project schedule in Gantt chart format.

.2 Schedule of Values for payment certification.

.3 WCB Letter of Proof of Insurance

.4 Certificate of Insurance for CGL with the Departmental Representative listed as a Certificate Holder.

.3 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.

.4 Certificates:

.1 Submit test results of installed electrical systems and instrumentation.

.2 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.

.5 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.13 SHOP DRAWINGS:

.1 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.

.2 Submissions include:

.1 Where specifically noted in other Sections in Divisions 26, 27, and 28, submit drawings stamped and signed by professional engineer registered or licensed in Province of BC, Canada.

.2 Shop Drawings shall be provided for but not limited to the following systems:

.1 Firestopping systems for all firestopping required to be installed under Divisions 26, 27, and 28.

.2 Distribution equipment including switchgear, switchboards, panelboards, transformers, and motor control centres.

.3 Moulded case breakers whether installed in distribution equipment supplied as part of this project or provided loose.

.4 Lighting.

.5 Lighting controls and motion sensors.

.6 Luminaire Poles & Davit Arms

.7 In-ground junction boxes

.8 Wiring devices including but not limited to receptacles and switches.

.3 Refer to other Sections within Divisions 26, 27, and 28 for detailed shop drawing submission requirements.

.4 Contractor shall review all shop drawings prior to submittal. All shop drawings shall be stamped and signed by both the Electrical Contractor and General Contractor. Unstamped drawings will be returned without comment.

.5 Each shop drawing shall clearly indicate the equipment ID and equipment type (e.g. Luminaire Type ‘A’, Panelboard SD-A) where applicable.

.6 Where manufactures’ brochures that include multiple equipment or device models are submitted, they shall be clearly labelled with the equipment model and options to be supplied. Submit relevant sections of manufacturer’s catalogues only. Submissions of complete catalogues will be rejected.

.7 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure coordinated installation.

.8 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.9 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.10 Submit complete shop drawing packages for each system. Partial submissions will be returned without comment.

.11 Review of shop drawings by the Departmental Representative is for the sole purpose of ascertaining conformance with the general design intent. The review shall not mean approval of the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the contractor of his responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all requirements of the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the work of all sub-trades.

.12 Ensure that copies of all shop drawings are available at the job site.

1.14 CLOSEOUT SUBMITTALS

.1 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.

.2 Operation and Maintenance Manuals:

.1 Refer to Section 26 05 11 Electrical Operations and Maintenance Data.

.2 Provide draft version of Operations and Maintenance Manual to Departmental Representative two weeks prior to Substantial Performance Review.

.3 Submit record drawings including all as-built information and changes on completion of project. Refer to Section 1.1 As-Built Documents and Samples.

.1 Each record drawing as defined above shall bear the Contractor’s identification and signature, the date of record, and the notation: "We hereby certify that these Drawings represent the building as built."

.2 Provide a copy of record drawings to Departmental Representative for review at Substantial Completion.

1.2 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, at site for Project Manager and Departmental Representative one record copy of:

.3 Contract Drawings.

.4 Specifications.

.5 Addenda.

.6 Change Orders and other modifications to Contract.

.7 Reviewed shop drawings, product data, and samples.

.8 Field test records.

.9 Inspection certificates.

.10 Manufacturer's certificates.

.4 Store record documents and samples in field office apart from documents used for construction in secure location.

.5 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.

.6 Maintain record documents in clean, dry and legible condition.

.1 Do not use record documents for construction purposes.

.7 Keep record documents and samples available for inspection by Departmental Representative.

.8 Obtain and pay for three sets of white prints. As the project progresses, mark these prints to accurately indicate installed work. Have the white prints available for inspection at the site at all times and present for scrutiny at each project meeting.

.9 Show on the record drawings the installed inverts of all services entering and leaving the building and the property. Dimension underground services at key points of every run in relation to the structure and building.

.10 Indicate exact location of all services for future work. Show and dimension all work embedded in the structure.

.11 Maintain in the job site office in up-to-date condition, one (1) complete set of whiteprints of each of the Electrical Contract Drawings and one (1) set of Specifications, including Revision Drawings, marked clearly and indelibly in red, indicating as-built conditions where such conditions deviate from the original directions of the Contract Documents, and indicating final installation of feeders and branch circuits.

.12 Record Drawing markings shall include but shall not be limited to the following

.1 All changes in circuiting

.2 Size and routing of all conduits for all branch circuits including power, lighting and systems.

.3 Size and routing of all installed raceways and cables.

.4 Number and size of conductors (#12 AWG and larger) in raceways and cables.

.5 Location of all junction boxes and pull boxes

.6 Location of all access panels

.7 Location of all conduit or duct stubs, installed equipment, devices and fixtures

.8 All changes to electrical installation resulting from Addenda,

.9 Change Orders and Site Instructions

.10 Exact location of all services left for future work

.11 Location by accurate horizontal and vertical dimensions of the routes and terminations of all raceways

.12 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.2 Recording Information on Project Record Documents.

.13 Record information on set of drawings, and in copy of Project Manual, provided by Project Manager.

.14 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.

.15 Record information concurrently with construction progress.

.1 Do not conceal Work until required information is recorded.

.16 Contract Drawings and shop drawings: mark each item to record actual construction, including:

.1 Changes made by change orders.

.2 Details not on original Contract Drawings.

.3 References to related shop drawings and modifications.

.17 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.

.18 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, as required by individual specifications sections.

.19 Provide digital photos, if requested, for site records.

1.15 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.1 Except for equipment intended for installation outdoors, store equipment indoors in dry location.

.2 Store and protect equipment and materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.3 Packaging Waste Management: remove and dispose of all packaging waste materials.

.1 Where possible, return packaging materials to supplier for re-use.

.2 Divert all recyclable materials from landfill.

PART 2 PRODUCTS

2.1 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates and labels in English.

2.2 MATERIALS AND EQUIPMENT

.1 Equipment and material shall be new and certified by a certification body accredited by the Standards Council of Canada (SCC). Where there is no alternative to supplying equipment which is not certified, obtain special approval and pay all associated fees. Notify Departmental Representative prior to supplying material that is not SCC approved.

.2 Factory assemble control panels and component assemblies.

.3 Substitution of Products After Contract Award

.1 After acceptance of the list of products, no substitution of any item will be permitted unless the approved item cannot be delivered in time to comply with the work schedule.

.2 To receive acceptance, proposed substitutes must equal or exceed the quality, finish and performance of those specified and/or shown, and must not exceed the space requirements allotted on the drawings.

.3 Provide to the Departmental Representative documentary proof of equality, difference in price (if any) and delivery dates, in the form of certified quotations from suppliers of both specified items and proposed substitutions.

.4 Include costs for any required revisions to other structures and products to accommodate such substitutions.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

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

2.4 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of the authority having jurisdiction, code requirements, and as specifically noted in the Contract Documents.

.2 Engraved signs using rigid phenolic engraving material, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

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

2.6 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.1 Nameplates: rigid phenolic engraving material 3 mm, lettering accurately aligned and engraved into core, mechanically attached with self tapping screws.

.2 Nameplate colours as follows:

.1 Normal Power Systems: black face, white core

.2 Emergency/Standby Power Systems: red face, white core

.3 Life Safety Systems: red face, white core

.4 Colours for other equipment as specified by the Departmental Representative.

.3 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

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

.3 Wording on nameplates to be approved by Departmental Representative prior to manufacture.

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

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

.8 Transformers: indicate capacity, primary and secondary voltages.

2.7 WIRING IDENTIFICATION

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

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

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

2.8 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Prime	Auxiliary	
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

2.9 FINISHES

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

.1 Paint outdoor electrical equipment "equipment green".

.2 Paint indoor switchgear and distribution enclosures light gray.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Pre-Bid Examination

.1 Examine the site of work and become familiar with all features and characteristics affecting this work before submitting bid.

.2 No additional compensation will be given for extra work due to existing conditions which such examination should have disclosed.

.3 Report to Departmental Representative any unsatisfactory conditions which may adversely affect the proper completion of this work.

.2 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for 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 In accordance with CSA C22.1 except where specified otherwise.

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

3.3 NAMEPLATES AND LABELS

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

3.4 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 LOCATION OF OUTLETS

.1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate light switches on latch side of doors.

.1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.6 MOUNTING HEIGHTS

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

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

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

.1 Local switches: 1400 mm.

.2 Wall receptacles:

.1 General: 300 mm.

.2 Above top of continuous baseboard heater: 200 mm.

.3 Above top of counters or counter splash backs: 175 mm.

.4 In mechanical rooms: 1400 mm.

.3 Panelboards: as required by Code or as indicated.

.4 Telephone and interphone outlets: 300 mm.

.5 Wall mounted telephone and interphone outlets: 1500 mm.

.6 Television outlets: 300 mm.

.7 Wall mounted speakers: 2100 mm.

.8 Clocks: 2100 mm.

.9 Doorbell pushbuttons: 1500 mm.

3.7 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.8 FIELD QUALITY CONTROL

.1 Refer to Section 26 05 10 Testing & Commissioning

3.9 SUBSTANTIAL PERFORMANCE REVIEW

.1 Prior to requesting the Departmental Representative complete a Substantial Performance review, the Contractor shall submit written confirmation that:

.1 All wiring devices, coverplates, motor controls, light fixtures and other equipment are operational, plumb, clean, and correctly labelled.

.2 All electrical equipment has been cleaned and vacuumed

.3 All Test Reports have been submitted including but not limited to data test reports and fire alarm verification reports with no exceptions noted.

.4 Factory finished equipment has been cleaned, touched up, or refinished as necessary to present a new appearance.

.5 All firestopping/smoke sealing of conduits, cables, cable trays, wireways, etc. at all wall and floor penetrations has been completed.

.6 All light fixtures, fixture lenses, and reflectors have been cleaned.

.7 All loose equipment including spare parts have been turned over to the Departmental Representative.

.8 Verification letter from the Seismic Consultant.

.9 Draft copy of the Maintenance Manual.

3.10 SYSTEM STARTUP

.1 Arrange and pay for services of manufacturer's factory service Departmental Representative to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

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

3.11 CLEANING

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Where work is performed in a phased manner, or Departmental Representative will take partial occupancy of the area of Work, perform final cleaning at the end of each Phase or prior to Departmental Representative taking occupancy of each area.

.4 Waste Management: separate waste materials for reuse and recycling.

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

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 RELATED SECTIONS

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

1.3 REGULATORY REQUIREMENTS

.1 Restraints shall meet the requirements of the latest edition of the British Columbia Building Code and amendments.

.2 The Seismic Consulting Engineer should be able to provide a proof of professional insurance and the related practice credentials if requested by the Departmental Representative. The Seismic Consulting Engineer should be familiar with SMACNA, ECABC & NFPA guidelines as well as BCBC requirements.

.3 The Contractor's Seismic Consultant shall submit original signed BC Building Code Letters of Assurance Schedules S-B and S-C to the Departmental Representative.

.4 Importance Factor: 1.5.

.5 Use the Electrical Contractors Association of BC details in the absence of any local requirements.

.6 The above requirements shall not restrict or supplant the requirements of any local bylaws, codes, or other certified agencies which may have jurisdiction over all or part of the installation.

1.4 SCOPE

.1 It is the responsibility of equipment manufacturers to design their equipment so that the strength and anchorage of internal components of the equipment exceeds the force level used to restrain and anchor the unit itself to the supporting structure.

.2 Manufacturer's shop drawings to be submitted with seismic information on equipment structure, bracing and internal components and as required by Division 01 and other Division 26 specification sections.

.3 Provide restraint on all equipment and machinery, which is part of the building electrical services and systems, to prevent injury or hazard to persons and equipment in and around the structure. Restrain all such equipment in its normal position in the event of an earthquake.

.4 The total electrical seismic restraint design and field review and inspection will be by a B.C. registered professional structural engineer who specializes in the restraint of building elements. Contractor to allow for coordination, provision of seismic restraints, as well as all costs for the services of the Seismic Restraint Engineer. This Engineer, herein

referred to as the Seismic Consultant, will provide normal engineering functions as they pertain to seismic restraint of electrical installations.

.5 The Contractor shall be aware of, and comply with, all current seismic restraining requirements and make provision for those that may come into effect during construction of the project. Make proper allowance for such conditions in the tender. The contractor shall include for all costs related to seismic restraint.

.6 The Seismic Consultant shall provide detailed seismic restraint installation shop drawings to the Contractor. Copies of the shop drawings to be included in the final project manual.

.7 Provide seismic restraints on all equipment, and/or installations or assemblies, which are suspended, pendant, shelf mounted, freestanding and/or bolted to the building structure or support slabs.

.8 The Seismic Consultant shall provide inspections during and after installation. The Contractor shall correct any deficiencies noted without additional cost to the contract.

.9 Include all costs associated with the Seismic installation and certification in the base tender.

1.5 SHOP DRAWINGS & SUBMITTALS

.1 Submit shop drawings of all seismic restraint systems including details of attachment to the structure, either tested in an independent testing laboratory or approved by the seismic consultant.

.2 Submit all the proposed types and locations of inserts or connection points to the building structure or support slabs. Follow the directions and recommendations of the Seismic Consultant.

PART 2 PRODUCTS

2.1 SLACK CABLE SYSTEMS

.1 Slack cable restraint systems shall be as designed and supplied by Vibra-Sonic Control or equal.

.2 Slack cable systems to allow normal maintenance of equipment and shall not create additional hazard by their location or configurations. Contractor shall rectify any such installations at no additional cost, all to the satisfaction of the engineer and inspection authority having jurisdiction.

.3 Coordinate requirements of slack cables with suppliers prior to installation.

PART 3 EXECUTION

3.1 GENERAL

.1 All seismic restraints systems shall conform to local authority having jurisdiction and all applicable code requirements.

3.2 CONDUITS

.1 Provide restraint installation information and details on conduit and equipment as indicated below:

.2 Vertical Conduit:

.1 Attachment - Secure vertical conduit at sufficiently close intervals to keep the conduit in alignment and carry the weight of the conduits and wiring. Stacks shall be supported at their bases and, if over 2 stories in height, at each floor by approved metal floor clamps.

.2 At vertical conduit risers, wherever possible, support the weight of the riser, at a point or points above the center of gravity of the riser. Provide lateral guides at the top and bottom of the riser, and at intermediate points not to exceed 9.2 m o.c.

.3 Riser joints shall be braced or stabilized between floors.

.3 Horizontal Conduits:

.1 Supports - Horizontal conduit shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging.

.2 EMT tubing - tubing shall be supported at approximately 1.2 m intervals for tubing.

.4 Provide transverse bracing at 12.2 m o.c. maximum unless otherwise noted. Provide bracing at all 90° bend assemblies, and pull box locations.

.5 Provide longitudinal bracing at 24.4 m o.c. maximum unless otherwise noted.

.6 Do not brace conduit runs against each other. Use separate support and restraint system.

.7 Support all conduits in accordance with the capability of the pipe to resist seismic load requirements indicated.

.8 Trapeze hangers may be used. Provide flexible conduit connections where conduits pass through building seismic or expansion joints, or where rigidly supported conduits connect to equipment with vibration or seismic isolators.

.9 A conduit system shall not be braced to dissimilar parts of a building or two dissimilar building systems that may respond in a different mode during an earthquake. Examples: wall and a roof; solid concrete wall and a metal deck with lightweight concrete fill.

.10 Provide large enough conduit sleeves through walls or floors to allow for anticipated differential movements with firestopping where required.

.11 It is the responsibility of the contractor to ascertain that an appropriate size restraint device be selected for each individual piece of equipment. Submit details on shop drawings. Review with seismic consultant and submit shop drawings to Departmental Representatives for their reference.

3.3 FLOOR MOUNTED EQUIPMENT

.1 Bolt all equipment, e.g. transformers, switchgear, generators, motor control centres, free standing panelboards, control panels, capacitor banks, etc. to the structure. Seismic Engineer shall design anchors and bolts.

3.4 LIGHT FIXTURES

.1 Luminaires installed in suspended ceilings shall be hung independently of the ceiling system. Fixtures shall be secured to concrete or structural deck above by at least two tight cables which are connected to the fixture at diagonal points.

.2 Surface and recessed style fixtures shall be hung independently of the ceiling system. Fixtures shall be secured to concrete or structural deck above by taught cables.

.3 Fixtures which are hung independently of ceiling systems shall have minimum of two seismic cable in addition to the chain or cable used to support the fixture. Seismic restraint cables shall be secured into the concrete or structural deck above.

.4 Cables shall be corrosion resistant and approved for the application.

.5 Fixtures which are rod hung shall have seismic ball alignment fittings at the ceiling and fixture.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This section of the specification forms a part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 EXISTING CONDITIONS

.1 Examine site prior to submitting Tender and be responsible for ascertaining all conditions which will affect this trade whether shown on the drawings or not and to take all the necessary measurements.

.2 Investigate and confirm the locations, the method of connections and routes of existing and new electrical facilities. Report at once any discrepancy between drawings, specifications and existing conditions.

.3 Absorb any costs incurred by failure to carry out this investigation and examination.

1.3 GENERAL REQUIREMENTS

.1 Provide and be responsible for the removal, relocation, reconnection, etc., of electrical devices, equipment, material, etc., as indicated on the drawings and/or as required by renovations to existing building and the installation of new facilities.

.2 All electrical devices and equipment which are disconnected, removed from service, etc., and which are not reused on the job and not required are to be offered to Departmental Representative. If refused, remove from site.

.3 Continuity of power and communication shall be maintained or restored promptly where services to other portions of a site are affected by renovation or demolition that is outlined on architectural, structural, mechanical or electrical plans or specifications.

1.4 SHUTDOWNS AND TRAFFIC INTERRUPTIONS

.1 Outage plan to be provided by the contractor to the Departmental Representative and Consultant team for review and approval prior to interruption of any existing services. An pre-outage meeting with the Departmental Representative and Consultant is required to review the proposed plan. Meeting shall be held a minimum of 1 week ahead of proposed outage. The general outline of the plan to be submitted as follows:

- .1 Electrical Power Pre-Change Over Meeting.
  - .1 Meeting time.
  - .2 Personnel required, including specialty personnel (e.g.: utility, mechanical contractor, etc.).
- .2 List all loads to be shut down.
  - .1 Distribution.
  - .2 Sub-distribution.
  - .3 Panels.

.4 Circuits.

.3 Schedule.
- .1 Date and time of each activity.
- .2 Length of each activity.

.4 Back out plan.

.5 Monitoring plan.

.6 List of personnel to be on site.
- .1 Electrical contractor foreman and required personnel.
- .2 Departmental Representative representatives and maintenance personnel

PART 2 PRODUCTS

.1 Manufacturers of existing devices and equipment where known are indicated on the drawings or in the specifications.

.2 Material and equipment added shall match existing wherever possible unless otherwise noted.

PART 3 EXECUTION

3.1 GENERAL

.1 Visit site prior to submitting Tender and make survey of renovation areas. Check out locations and operation of all systems and be aware of all requirements involved in changes and modifications to systems. Consult maintenance staff for any information regarding type and operation of systems. Take into account and allow for all work required to existing facilities to meet requirements as indicated on the drawings and in the specifications.

.2 Provide all labour and equipment required to remove existing electrical facilities in the area to be renovated as noted.

.3 Provide all labour and materials required to revise existing electrical facilities as indicated on the drawings and/or as required by building renovations and for installation of new facilities.

.4 Existing facilities shall remain operational during construction period. When renovations are complete, all facilities shall be checked and tested and shall be left in a proper working order and to the satisfaction of Departmental Representative.

.5 Where walls, ceilings, floors, etc., containing electrical devices, material and equipment, etc., are removed and the deletion of outlets in said areas disrupt service to adjacent devices and equipment, then conduit and wiring shall be provided to pick up adjacent devices and equipment to maintain continuity of service.

3.2 DISPOSAL OF HAZARDOUS MATERIAL

.1 Dispose of PCB Ballasts, radioactive material in smoke detectors, PCB capacitors, and PCB transformers in accordance with:

.1 Canadian Environmental Protection Act (Canada)

.2 Canadian Environmental Protection Act - Chlorobiphenyls Regulations (Canada)

.3 Provincial Environmental Protection Act

.4 Transportation of Dangerous Goods Act, (Canada)

.5 Dangerous Goods Transportation and Handling Act

.6 Other legislation and regulations which apply to the performance of the work of this section.

.2 Perform work in accordance with the recommendations in the following Environment Canada publications:

.1 Handbook on PCBs in Electrical Equipment by Environment Canada.

.2 Identification of Fluorescent Lamp Ballasts Containing PCBs, EPS 2/CG/2, April 1986, by Environment Canada.

.3 Persons employed for the removal of capacitors and other energized electrical equipment shall be qualified electricians.

.4 Where contact with liquid PCB is possible, personnel shall be instructed in handling procedures, safety precautions, use of safety equipment and applicable Provincial and Federal legislation and regulation.

.5 Handling and transportation of hazardous wastes shall be performed by a company registered as a carrier with the Provincial Environment department.

.6 Submit proof that all persons involved in handling, packing, loading, transportation, unloading, unpacking and disposal of PCB waste are trained in accordance with the Dangerous Goods Transportation and Handling Act.

.7 Dispose of all radioactive smoke detector components as radioactive waste when, smoke detectors:

.1 contain 5 microcuries (185 kilobecquerels) or more of Americium-241 or any amount of Radium.

.2 containing less than 5 microcuries (185 kilobecquerels) of Americium-241 are disposed of in quantities of ten or more.

.8 Dispose of radioactive smoke detector components by making disposal arrangement with one of the following radioactive waste disposal facilities:

.1 Original equipment manufacturer.

.2 Waste Operations Branch
Atomic Energy of Canada Ltd.
Chalk River, Ontario K0J 1J0

.3 Atomic Energy of Canada licensed waste disposal facility.

.9 Contact selected radioactive waste disposal facility to obtain their instructions for packaging, labeling and shipping of radioactive smoke detector components.

.10 Package, label and ship radioactive smoke detector components in accordance with waste disposal facility's instructions and in accordance with Provincial and Federal

legislation and regulations governing the handling, transportation and disposal of radioactive materials.

3.3 LAMP DISPOSAL

.1 Contractor to recycle lamps (glass, phosphor, and metal). Provide receipt in maintenance manual for lamp recycling.

3.4 EXISTING SYSTEM SHUTDOWNS

.1 Where the work of the Contract required shutdown or will otherwise affect and existing electrical system, Contractor must provide a minimum of two weeks' notice to Departmental Representative.

.2 Shutdowns for tie into existing systems may be required after normal working hour to maintain facility operation.

.3 All costs related to non-coordinated nuisance alarms or the fire alarm system caused by this contractor will be borne by this contractor (i.e. false charges by Fire Department).

3.5 EXCAVATION

.1 Contractor shall perform GPR underground utilities locate scans of all areas to be excavated prior to commencing excavation.

.2 Existing utilities identified during the GPR scan shall be exposed by hand digging or hydrovac.

.3 Prior to commencing excavation, a site meeting is required with the contractor and Departmental Representative.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

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

1.3 SCOPE

.1 The Electrical Division to take note that the demolition and renovation will be done in an occupied building that is normally occupied during the day and during the evenings, seven days a week, year round. Maintain electrical and communication systems as required to minimize services disruption.

.2 The work of this contract shall be done in a phased manner to allow operations in the renovated area to continue. Coordinate work with Departmental Representative and Tenants to minimize disruption to building operations.

.3 The Electrical Division to also take note of the dust containment requirements as outlined in the architectural and front end specification.

.4 Electrical tender documents do not show all wiring devices, conduit, boxes or wire. Conduit routing and wire grouping is not known. During demolition, the Electrical trade(s) are to deactivate all existing electrical and communication systems affected in such a manner that complete systems are not deactivated and system circuits affected in party wall partitions to be reactivated immediately on a temporary or permanent basis as site conditions dictate.

.5 Any discrepancies appearing on the drawings or in this specification are to be brought to the attention of the Departmental Representative who will provide instruction.

1.4 EXAMINATION

.1 Refer to Division 1.

1.5 PROTECTION

.1 Refer to Division 1.

PART 2 PRODUCTS

2.1 STANDARDS

.1 Refer to applicable material standards in other specification sections and/or as detailed on drawings.

PART 3 EXECUTION

3.1 DEMOLITION

.1 Demolition to be carried out in strict conformance to provincial, local and municipal authorities and Part 8 of the B.C. Building Code current edition.

.2 All redundant electrical components in the areas of demolition excluding those specifically identified, shall become the property of the Electrical Division and shall be removed from site.

3.2 DISRUPTION TO OPERATIONS

.1 Contractor to issue a scheduled shutdown time and coordinate installation of the new equipment as appropriate. All equipment installed and modified requires testing before startup.

.2 Contractor to provide temporary connections to all required equipment for temporary power during the installation of any new equipment.

3.3 REUSE OF EXISTING COMPONENTS

.1 Existing components may be reused only where so specifically indicated on the drawings or in the specifications, however in all cases all wiring shall be new and no splicing shall be permitted at any location. All lighting switches and all receptacles shall be new.

3.4 DISRUPTION OF CIRCUITS

.1 Circuit: power, voice/data, fire alarm, control etc. which are disrupted during demolition and are essential, to be made good immediately. The Electrical Trade(s) to identify these circuits to the Departmental Representative. Specific tasks involving the demolition of essential circuits will require that the contractor obtain permission from the Departmental Representative before proceeding.

3.5 ABANDONED CONDUIT, WIRE AND EXISTING CIRCUITS

.1 Except as specifically noted, all abandoned conduit and wire to be removed and disposed of by the Electrical Divisions.

.2 Remove all accessible (eg. Surface) wiring and cables back to source.

.3 Remove abandoned outlets and raceway, even if in or behind drywall, where they are located behind millwork or in locations unsuitable for reuse i.e. not at standard heights for switches or outlets.

.4 All remaining circuits to be rerouted as required and suitably secured to the building structure to CEC Standards.

.5 Any cabling, including voice/data wiring, presently resting on any suspended ceiling system to be removed as part of the renovation process and shall be neatly bundled, protected and permanently secured to building structure. No cabling is permitted to rest on the ceiling system.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This section of the specification forms a part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 SUMMARY

.1 Test and check all portions of the electrical systems for satisfactory operation. All tests shall be tabulated, signed and incorporated into the Operating and Maintenance Manuals. All testing and commissioning to be carried out under this contract. Procedures and tests outlined below are electrical tests required in addition to normal visual and mechanical inspections which must be carried out prior to placing equipment in service.

.2 Prior to field testing, obtain applicable copies of factory tests for comparative results.

.3 Additional testing requirements may be outlined in specific Sections in Division 26, 27, and 28.

PART 2 PRODUCTS

.1 Not used.

PART 3 EXECUTION

.1 General

- .1 Contractor shall coordinate and pay for all testing required by the Contract Documents including any additional testing required by the Authority Having Jurisdiction.
- .2 All deficient equipment/devices shall be replaced and retested.
- .3 Testing for each System shall be performed after the System installation is complete and prior to the system being put into continuous operation.
- .4 Advise the Consultant a minimum of three (3) working days in advance of each test and carry out tests in the presence of the Consultant.
- .5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .6 Submit detailed typewritten test reports to the Consultant within five (5) working days after the completion of each test. Include all test reports in the Maintenance Manuals.
  - .1 Test reports shall clearly indicate each component that has been individually tested, test results, and whether the results are within acceptable limits.
  - .2 Each test report shall be accompanied by a cover sheet outlining the test and summarizing any items that have failed the tests.
    - .1 Cover sheet shall include names, signatures, and contact information of the individuals who conducted the tests.
- .7 Protective Device Setting and Testing

.1 All work shall conform to NETA standards.

.2 Ensure circuit protective devices including but not limited to overcurrent trips, relays, and fuses are installed to required values per protection and coordination study.

.2 Contractor Testing:

.1 Load Balance:

.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Provide upon completion of work, load balance report, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Systems: Lighting Controls.

.3 Insulation resistance testing:

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Check resistance to ground before energizing.

.4 Breakers and Load Break Switches

.1 clean and lubricate;

.2 visual inspection;

.3 manual function test;

.4 torque test;

.5 contact resistant test (100 amp resistance tester);

.6 electrical function test;

.7 function trip test of all protective relay device.

.5 Fused or Unfused Disconnect Switches:

.1 Visually inspect and clean.

.2 Ductor test across switch blade contact surfaces.

.3 Megger test.

.4 Mechanical function test.

.6 Transformers

.1 Visual inspection of enclosure and all accessories.

.2 Torque test all bus connections and cable terminations and seal with red lacquer.

.3 Megger test.

.4 Dielectric power factor test.

.5 Core ground test.

.6 Ratio test in all tap positions.

.7 Test operation of temperature and operation of all associated alarm contacts.

.8 Test and calibrate ground fault relays and function test to trip associated breakers.

.9 Make voltage and power factor checks throughout building. If directed by the Departmental Representative, adjust transformer tap settings. Readings taken at this time to be logged, tabulated and any adjustments made to be suitably logged and incorporated in the Operating and Maintenance Manuals.

.7 Microprocessor Type Relays:

.1 Mechanical Inspection:

.1 Remove cover from relay case carefully. Trip circuit is live circuit and on some relays it is possible to cause an instantaneous trip while removing relay cover. Inspect cover gasket. Check glass for tightness and cracks.

.2 Eliminate unwanted tripping, short-circuit current transformer secondary by careful removal of relay test plug or operation of appropriate current blocks.

.3 Check connections, circuit boards and modules for tightness.

.4 Check output relay coils for signs of overheating and brittle insulation.

.2 Cleaning:

.1 Clean glass inside and out.

.2 Clean relay compartment as required. Clean relay plug in contacts if applicable, using proper tools.

.3 Remove dust and foreign materials from interior of relay using small brush or low pressure 3.2 kg blower of nitrogen.

.4 Inspect for any signs of moisture and corrosion.

.5 Clean relay output contacts with burnishing tool or non-residue contact cleaner.

.3 Electrical Testing: Function Tests for typical overcurrent relays include:

.1 Energize relay from an appropriate DC power source and check "ON" indication.

.2 Time-current function test and trip flag operation.

.3 Instantaneous pickup functional trip and flag operation.

.4 Use tests listed above for most microprocessor overcurrent type relays.

.5 Check C/T and P/T ratios and compare to coordination data.

.8 Solid State Relays:

.1 Inspect and test in accordance with manufacturer's most recent installation and maintenance brochure.

.2 Perform tests using manufacturer's relay test unit as applicable, with corresponding test instructions.

.3 If manufacturer's tester is not available, use an approved relay tester unit with proper test data and test accessories.

.4 Proof test each relay in its control circuit by simulated trip tests to ensure total and proper operation of breaker and relay trip circuit by injection of relay circuit to test the trip operation.

.5 Check C/T and P/T ratios and compare to coordination data.

.9 Devices

.1 Test all receptacles for proper polarity, circuitry and grounding.

.3 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports to Consultant for review. Include field reports in Operations and Maintenance Manuals.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Obtain manufacturer's field services for commissioning of equipment as required in other Sections of Division 26, 27, and 28 specifications.

.4 Conduct additional testing as required in other Sections in Division 26, 27, and 28.

3.2 STANDARDS

.1 The following tests shall be conducted in accordance with latest CSA, ASTM, IEEE and IPCEA standards, recommendations for power cable and equipment testing and authority waving jurisdiction. Notwithstanding, the test levels listed in these standards, in no case shall the maximum DC test level exceed manufacturer's factory test AC level for that equipment.

.2 Equipment shall be tested to a maximum level determined by formula ET Max. = (2EN x 1.6 x 0.75) or maximum test voltage level agreeable to equipment manufacturer - whichever is highest. (Where ET = withstand test voltage' EN = nameplate voltage rating' 1.6 = AC to DC volts conversion factor' 0.75 field test factor).

.3 Where production tests are required by EEMAC or CSA for manufactured equipment, provide records of these tests.

.4 All tests shall be completed in accordance with manufacturer's published instructions. If these instructions do not conform to the test requirements as specified herein inform the Departmental Representative prior to proceeding with the test.

3.3 TEST APPARATUS AND INSPECTION REPORT

.1 The testing company to be responsible for furnishing all apparatus and labour required for the test operations.

.2 Inspection and test results to be recorded on a suitable form which shall be furnished by the testing company. The inspection and report forms shall be submitted to the Departmental Representative. Each form to be signed by the test technician. Space to be provided for noting approved items and their disposition.

.3 Testing company to submit full commissioning reports and information for as-built drawings and acceptance documents signed by test technician.

.4 Upon completion of the project, the testing company to assemble complete sets of inspection/test results/reports to be placed in the operating and maintenance manuals.

3.4 SYSTEM ACCEPTANCES

.1 Prior to requesting inspection, submit, for review by the Departmental Representative letters from the Manufacturers of equipment and systems indicating the their Technical Service Representative have inspected and tested the equipment and systems and are satisfied with the methods of installation, connections and operation.

.2 Acceptance letters shall be submitted for the following:

.1 Low Voltage Lighting Controls

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This section of the specification forms a part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 RELATED REQUIREMENTS

.1 Electrical Systems Testing and Commissioning Section 26 05 10.

1.3 WORK INCLUDED

.1 Provide operation and maintenance data as specified herein for incorporation in operation and maintenance manuals. Before requesting final certificates, submit copies of the operation/maintenance manuals.

1.4 MANUALS

.1 Submit three (3) hard copy bound sets and one (1) digital set of the operations and mantinance manual on CD or USB memory stick.

.1 Submit one draft soft copy to the Departmental Representative for review at Substantial Completion prior to final issue.

.2 O&M Manual Format

.1 Organize data as instructional manual.

.2 Binders: vinyl, 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.

.1 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, 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.

.1 Bind in with text; fold larger drawings to size of text pages.

.9 Provide to scale CAD files in dwg format on CD.

.3 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.4 Contents:

.1 Table of Contents for Each Volume: 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.

.1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

.6 Training: refer to Section 26 05 12 Electrical Equipment and Systems Demonstration and Training.

.5 The divider tabs shall be laminated Mylar plastic and coloured according to Section . Plastic tabs with typewritten card insertions will not be accepted. Index manuals as follows:

.1 Tab 1.0 Division 26, 27, and 28 System complete with title page.

.2 Tab 1.1 List of Division 26, 27, and 28 Drawings

.3 Tab 1.2 Description of Systems

.4 Tab 1.3 Equipment Suppliers and Parts

.5 Tab 2.0 (.1, .2, etc.) Shop Drawings.

.6 Divider tabs shall be mylar plastic and colour coded.

.6 Each manual shall contain:

.1 Table of contents. Arrange contents sequentially by systems under section numbers. Label tabs of dividers between each to match section numbers in table of contents.

.2 Name and contact information of all project Contractors including all Electrical subcontractors.

.3 Copies of all contractor and subcontractor statements of warranty.

.4 Name and contact information of all Electrical equipment suppliers.

.5 Systems Descriptions. A brief synopsis of each system typed and inserted at the beginning of each section. Include sketches and diagrams where appropriate.

.6 Descriptive and technical data.

.7 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 Departmental Representative in the proper operation and maintenance of this installation.)

.8 Lubricating and servicing intervals recommended.

.9 A copy of all wiring diagrams complete with wire coding.

.10 List of spare parts of all electrical equipment complete with names and addresses of sales, service representatives and suppliers.

.11 Copy of test data.

.12 A motor list showing each motor number, name, horsepower, nameplate, current rating, heater size and type, and current being drawn.

.13 Include type and accuracy of instruments used.

.14 Set of final reviewed Shop Drawings.

.15 Provide manufacturer's installation instructions for all systems and components.

.16 provide manufacturer's operation instructions for all systems and components

.17 Provide manufacturer's maintenance instructions for all systems and components. Include the following:

- .1 Complete parts list for all serviceable components, including description and catalogue number.
- .2 List of spare parts supplied under the Contract and list of other spare parts recommended by manufacturers.

.18 Provide copies of all inspection certification reports from authorities having jurisdiction.

.19 Provide copies of reports documenting the results of all tests, including factory tests, required by the Contract Documents to be performed.

.20 Provide copies of all manufacturer's warranties.

.21 Record Drawings.

.22 Operating instructions to include following:

- .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
- .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
- .3 Safety precautions.
- .4 Procedures to be followed in event of equipment failure.
- .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .6 Recommended spare parts

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This section of the specification forms a part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 INTENT

.1 Provide demonstration and instruction sessions to familiarize Departmental Representative and Tenants' operation and maintenance personnel with electrical systems and their operation and maintenance.

1.3 MANUFACTURER'S SITE SERVICES

.1 Arrange and pay for appropriately qualified manufacturer's representatives to provide or assist in providing electrical equipment and systems demonstration and instruction seminars for systems specified in this Section.

1.4 DEMONSTRATION AND INSTRUCTION SEMINARS

.1 Present Operator Training Seminar.

PART 2 PRODUCTS

.1 Not used.

PART 3 EXECUTION

3.1 SYSTEMS AND EQUIPMENT DEMONSTRATIONS 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 Low Voltage Lighting Controls.

END OF SECTION

PART 1 CONCRETE WORK

.1 All concrete required for and/or installed under Division 26 shall be as specified in other Divisions. Unless otherwise noted, it shall have a specified strength of 20,000 kPa(3000 psi) at 28 days and an entrained air content of 6% ±1%.

.2 Use proper placement techniques to remove entrained air. Do not place thereon or attach thereto any materials or equipment prior to a minimum curing period of seven (7) days.

.3 Vibrators shall be utilized for the placement of all concrete.

PART 2 HOUSEKEEPING PADS

.1 Not Required.

PART 3 OPENINGS

3.1 OPENINGS AND SLOTS

.1 Provide all openings as necessary and as specified elsewhere to permit the installation of all conduits and cables and recessed equipment and devices.

.2 Grind and file smooth the interiors and edges of all sleeves and slots prior to pulling any cables.

PART 4 WALL, CEILING, AND FLOOR PENETRATIONS

.1 Any and all penetrations through walls, ceilings and floors (fire, smoke, sound as well as all other penetrations) must be sealed after the installation of all conduits, cables, bus ducts, cable trays, wireways, etc., to maintain the integrity of the separations in a manner approved by the Departmental Representative and the authorities having jurisdiction. Use sealing materials as specified herein and shown on the drawings.

.2 Rated sealing systems for penetrations of Fire Rated walls, ceilings and floors: Hilti, or approved equal, refer to the drawings. Contractors are to submit ULC, cUL, WHI, or equivalent certified Design or System Data Sheets to demonstrate compliance of a particular Floor or Wall Assembly, Through Penetrant, and Sealant with requirements and for what period of time.

.3 Provide bus ducts, cable trays, wireways, etc., with fire barriers at each floor and at each fire separation and smoke separation, and further seal against the migration of smoke.

.4 Seal all slots, core holes, etc., not being used.

.5 Provide fire-rated gypsum board of required thickness around all surfaces of recessed panelboards and cabinets within rated separations so as to maintain the separation rating as approved by the authorities having jurisdiction.

.6 Provide fire-rated gypsum board enclosures for lighting fixtures recessed in fire rated ceiling assemblies, all as required by the authorities having jurisdiction.

PART 5 WATERPROOFING/VAPOUR BARRIERS

.1 Generally penetrations through waterproofing members and vapour barriers will not be permitted. However, where any work must pierce vapour barriers and waterproofing membranes including waterproofed concrete, the method of installation, colour of caulking material and location of penetration shall be as approved by the Departmental Representative prior to proceeding with the work. Supply and install all necessary sleeves, caulking and flashing and make the penetrations watertight. For penetrations of vapour barrier, maintain integrity of the system. Restore penetrations through existing surfaces to match the surroundings.

.2 Provide specified caulking around all exterior recessed lighting fixtures in concrete steps, walls, etc.

.3 Provide clear silicon bead on top and down both sides of all exterior wall mounted devices (e.g. light fixtures and gongs) where devices are exposed to the weather.

PART 6 EQUIPMENT FINISHES

.1 Thoroughly degrease all metalwork and apply one overall coat of zinc chromate primer to all electrical equipment enclosures, supports, switchgear cubicles, bus ducts, gutters, panelboards, low tension and other cabinets. Unless otherwise directed, apply one overall coat of grey enamel and a second coat of gloss enamel. Paint all exposed surfaces.

.2 Grey ASA #61 unless matching existing equipment in which case colour shall match existing.

.3 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint. Ensure that equipment finishes are not defaced during installation. Scratched or otherwise marred surfaces shall be refinished before the job will be accepted. Other surfaces shall be completely repaired to match original paint. Patching of damaged area will not be accepted.

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

.5 Generally, equipment finishes shall be as outlined under applicable sections of the specifications.

PART 7 VIBRATION AND NOISE CONTROL

.1 Not Required.

PART 8 **ACOUSTICAL SPECIFICATIONS FOR TRANSFORMER**

.1 Not Required.

PART 9 **PRODUCTS**

.1 Mason Z-1011 seismic restraints.

.2 Mason SLFH open spring isolators.

.3 Mason Super W pad isolator, 50 durometer.

.4 Mason HD hangers.

PART 10

.1 Locate all mechanical equipment, electrical conduit, and lighting at least 300 mm (12”) below the ceiling slab, including wall-mounted equipment. Do not locate mechanical ducts over transformer cabinets.

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 CSA International

.1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings.

.2 CAN/CSA-C22.2 No.65, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

.1 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

1.3 SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results-Electrical.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with 26 05 00 Common Work Results - Electrical.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to NEMA to consist of:

.1 Connector body and stud clamp for copper conductors.

.2 Clamp for copper conductors.

.3 Stud clamp bolts.

.4 Bolts for copper conductors.

.5 Bolts for aluminum conductors.

.6 Sized for conductorsas indicated.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

- .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
- .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
- .3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.
- .4 Install bushing stud connectors in accordance with NEMA.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results-Electrical.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results - Electrical.

PART 2 PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE, Non Jacketted.

2.2 TECK 90 CABLE

.1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Conductors:

- .1 Grounding conductor: copper.
- .2 Circuit conductors: copper, size as indicated.

.3 Insulation:

- .1 Cross-linked polyethylene XLPE.
- .2 Rating: 600 V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking aluminum.

.6 Overall covering: thermoplastic polyvinyl chloride, [compliant to applicable Building Code classification for this project].

.7 Fastenings:

- .1 One hole stainless steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
- .2 Channel type supports for two or more cables at 1500 mm centers.
- .3 Threaded rods: 6 mm diameter to support suspended channels.

.8 Connectors:

- .1 Watertight, approved for TECK cable.

2.3 CONTROL CABLES

.1 Type: LVT: soft annealed copper conductors, sized as indicated:

.1 Insulation: thermoplastic.

.2 Sheath : thermoplastic jacket,.

.2 Type: low energy 300 V control cable: stranded annealed copper conductors sized as indicated LVT: [2] soft annealed copper conductors, sized as indicated:

.1 Insulation: polyethylene.

.2 Shielding: wire braid over each pair.

.3 Overall covering: PVC jacket.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and Section 26 05 10 – Testing and Commissioning.

3.2 GENERAL CABLE INSTALLATION

.1 Install cable in trenches in accordance with Section 33 71 73.02 - Underground Electrical Service.

.2 Lay cable in cable trays in accordance with Section 26 05 36 - Cable Trays for Electrical Systems.

.3 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).

.4 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.

.5 Conductor length for parallel feeders to be identical.

.6 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.7 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

.8 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.

.9 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 In underground ducts in accordance with Section 33 65 76 Direct Buried Underground Cable Ducts.

3.4 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit.

.2 Ground control cable shield.

3.5 INSTALLATION OF NON-METALLIC SHEATHED CABLE

.1 Install cables.

.2 Install straps and box connectors to cables as required.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE 837, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

.2 CSA International

.1 CSA Z32, Electrical Safety and Essential Electrical Systems in Health Care Facilities.

1.3 SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results – Electrical.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results - Electrical.

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as indicated on Drawings..

.2 Rod electrodes: not required.

.3 Plate electrodes: not required.

.4 Grounding conductors: bare stranded copper, soft annealed, size as indicated on Drawings or per CEC where not indicated on Drawings.

.5 Insulated grounding conductors: green, copper conductors, size [as indicated].

.6 Ground bus: not required.

.7 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

.1 Grounding and bonding bushings.

.2 Protective type clamps.

.3 Bolted type conductor connectors.

.4 Hy-Press type conductor connectors.

.5 Bonding jumpers, straps.

.6 Pressure wire connectors.

PART 3 EXECUTION

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main, electrodes, using permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837 (Burndy Hypress or equal).

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Install bonding wire for flexible conduit, connected at [both] [one] end[s] to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.9 Install separate ground conductor to outdoor lighting standards.

.10 Install grounding resistance bank as indicated.

.11 Ground secondary service pedestals.

3.2 MAINTENANCE HOLES

.1 Install conveniently located grounding stud, electrode, size as indicated stranded copper conductor in each maintenance hole.

.2 Install ground rod in each maintenance hole so that top projects through bottom of maintenance hole. Provide with lug to which grounding connection can be made. Confirm ground resistance meets or exceeds Canadian Electrical Code minimum requirements.

3.3 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting, cable trays.

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and 26 05 10 – Testing and Commissioning

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 Not Required.

1.3 SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results - Electrical

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results - Electrical.

PART 2 PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted.

.2 Cord Grips: Kellems grip Type 073-03 and 073-04 or approved equal.

.3 Wire and cable ties: nylon ‘Ty-rap’ or approved equal for wiring and control cable. Velcro cable wraps for data cables.

.4 Threaded hanger rods: galvanized steel, minimum 6mm diameter; larger sizes as shown on drawings or as required.

.5 Conduit and cable clamps for individual or pair runs:

.1 One-hole steel or galvanized malleable iron for sizes 53mm and smaller.

.2 Two-hole steel for sizes larger than 53mm.

.6 Fixture suspension chain: #3 Tenso chain.

.7 Backboards: New 21mm (3/4”) G1S paint grade fir plywood.

.8 Conductor supports for vertical runs: O-Z Electrical Mfg. Co. Type ‘S’ or ‘R’ as required or equal, for not more than 5 wires or cables each not greater than 250 kCMIL. Kellems grip Type 022-11 or approved equal for all manufacturer-approved combinations of wires and/or cables.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Secure equipment to masonry, tile and plaster surfaces with nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.

- .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
- .2 Two-hole steel straps for conduits and cables larger than 50 mm.
- .3 Beam clamps to secure conduit to exposed steel work.
- .4 Stainless steel straps where installed outside.

.7 Suspended support systems.

- .1 Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.
- .2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.

.9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Consultant.

.13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1, Canadian Electrical Code, Part 1, Current Edition.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 26 05 00 Common Work Results – Electrical.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results – Electrical.

PART 2 PRODUCTS

2.1 SPLITTERS

.1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Terminations: main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

2.2 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure.

.2 Covers Flush Mounted: 25 mm minimum extension all around.

.3 Covers Surface Mounted: screw-on turned edge covers.

PART 3 EXECUTION

3.1 SPLITTER INSTALLATION

.1 Mount plumb, true and square to building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.3 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.

.2 Identification Labels: size 2 indicating system name, voltage and phase or as indicated on Drawings.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1, Canadian Electrical Code, Part 1, Current Edition.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 26 05 00 Common Work Results – Electrical.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results – Electrical.

PART 2 PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 347 V outlet boxes for 347 V switching devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

.1 One-piece electro-galvanized construction.

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

.3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

.4 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.5 Extension and plaster rings for flush mounting devices in finished plaster or tile walls.

2.3 MASONRY BOXES

.1 Not Required.

2.4 CONCRETE BOXES

.1 Not Required.

2.5 FLOOR BOXES

.1 Not required.

2.6 CONDUIT BOXES

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

2.7 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

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

2.8 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.

.5 Vacuum clean interior of outlet boxes before installation of wiring devices.

.6 Identify systems for outlet boxes as required.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

- .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
- .2 CSA C22.2 No. 45, Rigid Metal Conduit.
- .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83, Electrical Metallic Tubing.
- .5 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit.
- .6 CAN/CSA C22.2 No. 227.3, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (Current Edition).

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 26 05 00 Common Work Results – Electrical.

.2 Quality assurance submittals:

- .1 Test reports: submit certified test reports.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Instructions: submit manufacturer's installation instructions.

PART 2 PRODUCTS

2.1 CABLES AND REELS

.1 Provide cables on reels or coils.

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

.2 Each coil or reel of cable to contain only one continuous cable without splices.

.3 Identify cables for exclusively dc applications.

.4 Reel and mark shielded cables rated 2,001 volts and above.

2.2 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, aluminum threaded.

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

.3 Rigid pvc conduit: to CSA C22.2 No. 211.2.

.4 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.

2.3 CONDUIT FASTENINGS

.1 One hole malleable iron or galvanized steel straps to secure surface conduits 50 mm and smaller.

.1 Two hole steel straps for conduits larger than 50 mm.

.2 Stainless steel straps for outdoor installations.

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

.3 Channel type supports for two or more conduits at 1.5 m on centre.

.4 Threaded rods, 6 mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS

.1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.

.2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT.

.1 Set-screws are not acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 FISH CORD

.1 Polypropylene.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

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

.2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

.3 Use rigid aluminum threaded conduit except where specified otherwise.

.4 Use electrical metallic tubing (EMT) in building interiors, above 2.4 m not subject to mechanical injury.

.5 Use rigid pvc conduit underground.

.6 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.7 Minimum conduit size for lighting and power circuits: 21 mm.

.8 Bend conduit cold:

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

.9 Mechanically bend steel conduit over 19 mm diameter.

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

.11 Install fish cord in empty conduits.

.12 Remove and replace blocked conduit sections.

.1 Do not use liquids to clean out conduits.

.13 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on surface channels. Do not pass conduits through structural members except as indicated.

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

.6 Pain conduits to match building finish.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

.4 Do not affix conduits to accessible ceiling structure.

3.5 CONDUITS IN CAST-IN-PLACE CONCRETE

.1 Not Required.

3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

.1 Not Required.

3.7 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 CSA International

.1 CAN/CSA-Z809, Sustainable Forest Management.

.2 Forest Stewardship Council (FSC)

.1 FSC-STD-01-001, FSC Principle and Criteria for Forest Stewardship.

.3 Insulated Cable Engineers Association, Inc. (ICEA)

.4 Sustainable Forestry Initiative (SFI)

.1 SFI Standard.

1.3 SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results – Electrical.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results – Electrical.

PART 2 PRODUCTS

2.1 CABLE PROTECTION

.1 Not Required.

2.2 MARKERS

.1 Not Required.

PART 3 EXECUTION

3.1 DIRECT BURIAL OF CABLES

.1 Not Required.

3.2 CABLE INSTALLATION IN DUCTS

.1 Install cables as indicated in ducts.

.2 Do not pull spliced cables inside ducts.

.3 Install multiple cables in duct simultaneously.

.4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.

.6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

.7 After installation of cables, seal duct ends with duct sealing compound.

3.3 MARKERS

.1 Not Required.

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and 26 05 10 Testing and Commissioning.

.2 Perform tests using qualified personnel.

.1 Include necessary instruments and equipment.

.3 Check phase rotation and identify each phase conductor of each feeder.

.4 Check each feeder for continuity, short circuits and grounds.

.1 Ensure resistance to ground of circuits is not less than 50 megohms.

.5 Pre-acceptance tests:

.1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.

.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.6 Acceptance Tests:

.1 Ensure that terminations and accessory equipment are disconnected.

.2 Ground shields, ground wires, metallic armour and conductors not under test.

.3 High Potential (Hipot) Testing.

.1 Conduct hipot testing in accordance with manufacturer's recommendations.

.4 Leakage Current Testing:

.1 Raise voltage in steps from zero to maximum values as specified by manufacturer for type of cable being tested.

.2 Hold maximum voltage for specified time period by manufacturer.

.3 Record leakage current at each step.

.7 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.

.8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.184.1, Solid-State Dimming Controls (Bi-national standard with UL 1472 updates).

1.3 SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results – Electrical.

.2 Shop Drawings:

.1 Indicate on drawings:

.2 Complete assembly.

.3 Contact surfaces.

.4 Construction features.

.5 Wiring diagrams.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results - Electrical.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Control system: by one manufacturer and assembled from compatible components.

2.2 LOW VOLTAGE RELAYS

.1 Not Required.

2.3 CONTROL TRANSFORMER

.1 Low voltage power Class 2, input 347 V, AC, 60 Hz, output 24 VAC. Capacity as required by lighting control system manufacturer.

2.4 ENCLOSURES

.1 Lighting Control System enclosures shall be supplied as part of a complete lighting control assembly by the manufacturer.

2.5 MOTION SENSORS

.1 Provide motion sensors on all exterior luminaire poles.

.1 Provide one sensor per single davit pole.

.2 Provide two sensors on multi-davit poles.

.2 Motion sensors shall dim luminaires to 50% levels, and increase lighting level to 100% when motion is detected.

.3 Include integrated photocell where indicated on luminaire schedule.

2.6 INTEGRATED LIGHTING CONTROL SYSTEM:

.1 Provide Douglas Dialog Lighting Controller's to match facility's existing lighting control system.

.2 Lighting control system shall including the following:

.1 Programmable Lighting controller with BACnet over Ethernet or BACnet IP capability for integration into the facility's existing building control system.

.1 Controller shall be programmed to turn all luminaires on at dusk and off at dawn.

.2 Hand-Off-Auto control:

.1 Auto – automatic operation based on lighting controller schedule and photocell.

.2 Off – all luminaires off

.3 Hand – all luminaires on.

.1 Motion detectors are wired directly to each luminaire. Dimming for motion sensor will not be overridden by hand switch.

.3 20A relays

.1 Refer to Drawings for Relay Schedules.

.4 Integrated or external astronomical timer

.5 Lighting control system shall be shipped pre-installed in NEMA1 Enclosure. All internal control wiring shall be completed and tested by manufacturer prior to shipping.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Locate and install equipment in accordance with manufacturer's recommendations and as indicated.

3.3 FIELD QUALITY CONTROL

.1 Site Tests:

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and 26 05 10 Testing and Commissioning.

.2 Actuate control units in presence of Departmental Representative to demonstrate lighting circuits are controlled as designated.

.3 Demonstrate dimming systems operate as intended.

.4 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 CSA International

.1 CSA C22.2 No. 5, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

.2 CAN/CSA C22.2 No.144, Ground Fault Circuit Interrupters.

1.3 SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results – Electrical.

.2 Certificates:

.1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit PDF copy of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.

.1 Production certificate of origin must be submitted to Consultant for approval.

.2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.

.3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Consultant. Unless complying with this requirement, Consultant reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.

.4 Production certificate of origin must contain:

.1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.

.2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.

.3 Contractor's name and address and person responsible for project.

.4 Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.

.5 Name and address of building where circuit breakers will be installed:

.1 Project title: [_____].

.2 End user's reference number: [_____].

.3 List of circuit breakers: [_____].

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results – Electrical.

PART 2 PRODUCTS

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers, ground-fault circuit-interrupters,: to CSA C22.2 No. 5

.2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation.

.3 Plug-in moulded case circuit breakers: not accepted.

.4 Common-trip breakers: with single handle for multi-pole applications.

.5 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings on breakers with adjustable trips to range from [3-8] times current rating.

.6 Circuit breakers to have minimum symmetrical rms interrupting capacity rating as indicated on Drawings.

2.2 BREAKER TYPE GROUND FAULT INTERRUPTER

.1 Not Required.

2.3 THERMAL MAGNETIC BREAKERS

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

2.4 MAGNETIC BREAKERS

.1 Not Required.

2.5 CURRENT LIMITING AND SERIES RATED THERMAL MAGNETIC BREAKERS

.1 Not Required.

2.6 SOLID STATE TRIP BREAKERS

.1 Not Required.

2.7 OPTIONAL FEATURES

2.8 ENCLOSURE

.1 Not Required.

PART 3 EXECUTION

3.1 EXAMINATION

.1 No used.

3.2 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI C82.1, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.

.2 ANSI C82.4, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.

.2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

.3 ASTM International Inc.

.1 ASTM F1137, Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.4 Canadian Standards Association (CSA International)

.5 ICES-005-, Radio Frequency Lighting Devices.

.6 Underwriters' Laboratories of Canada (ULC)

.7 Illuminating Engineering Society of North America (IESNA)

.1 LM-79 Electrical and Photometric Measurements of Solid-State Lighting Products

.2 LM-80 Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 26 05 00 Common Work Results – Electrical.

.2 Shop Drawings:

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide complete photometric data prepared by independent testing laboratory for luminaires.

.3 Samples:

.1 Provide samples as indicated.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results - Electrical.

PART 2 PRODUCTS

2.1 LAMPS

.1 Not Required.

2.2 BALLASTS

.1 Not Required.

2.3 FINISHES

.1 Light fixture finish and construction to meet ULC listing and CSA certification related to intended installation.

2.4 OPTICAL CONTROL DEVICES

.1 As indicated in luminaire schedule and in Section 26 09 23 Lighting Control Devices and Systems.

2.5 LUMINAIRES

.1 Luminaires shall be LED, tested to LM-79 and LM-80 standards.

.2 As indicated in luminaire schedule.

.3 Colour Temperature: 3000k.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

3.2 WIRING

.1 Connect luminaires to lighting circuits:

.1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE ALIGNMENT

.1 Align luminaires as indicated on drawings.

3.4 TESTING AND ACCEPTANCE

.1 Test installed lighting systems in accordance with Section 26 05 00 Common Work Results Electrical and Section 26 05 10 Testing and Commissioning.

.2 Luminaire Replacement: Replace any failed luminaires prior to Substantial Completion.

3.5 CLEANING

.1 Clean lighting control elements, lamps fixture interiors and exposed exterior surfaces prior to Substantial completion.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

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

.2 Section 33 65 75 Direct Buried Underground Cable Ducts.

1.3 MEASUREMENT PROCEDURES

.1 Excavated materials will be measured in cubic metres in their original location.

.1 Common excavation quantities measured will be actual volume removed within following limits:

.1 Width for trench excavation as indicated.

.2 Width for excavation for structures as indicated.

.3 Depth from ground elevation immediately prior to excavation, to final depth of trench.

.2 Rock quantities measured will be actual volume removed within following limits:

.1 Width for trench excavation as indicated.

.2 Width for excavation for structures to be bounded by vertical planes up to 500 mm outside of and parallel to neat lines of footings as indicated.

.3 Depth from rock surface elevations immediately prior to excavation, to elevation as indicated.

.4 Where design elevation is less than 300 mm below original rock surface, depth will be considered to be 300 mm below original rock surface.

.5 Volume of individual boulders and rock fragments will be determined by measuring three maximum mutually perpendicular dimensions.

.2 Shoring, bracing, cofferdams, underpinning and de-watering of excavation will not be measured separately for payment.

.3 Backfilling to authorized excavation limits will be measured in cubic metres compacted in place for each type of material specified.

.4 Placing and spreading of topsoil will be measured for payment in cubic metres calculated from cross sections taken in area of excavation from original location.

.1 If double handling of topsoil is directed by Departmental Representative (stockpiling and later placing), then quantities will be measured twice; on excavation from original location and on excavation from stockpile.

1.4 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C117 (Current Edition), Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136 (Current Edition), Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D422-63(Current Edition), Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D698 (Current Edition), 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 (Current Edition), 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 (Current Edition), Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1 (Current Edition), Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2 (Current Edition), Sieves, Testing, Woven Wire, Metric.

.3 Canadian Standards Association (CSA International)

.1 CAN/CSA-A3000 (Current Edition), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.1 CSA-A3001 (Current Edition), Cementitious Materials for Use in Concrete.

.2 CSA-A23.1/A23.2 (Current Edition), Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

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

.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.5 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

.1 Rock : solid material in excess of 1.00 m ^{3} and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m^3 bucket. 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 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.

1.6 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 EXISTING CONDITIONS article of this Section.

.2 Submit for review by Departmental Representative proposed dewatering methods as described in PART 3 of this Section.

.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 report 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.

1.7 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 Province of BC, Canada.

.5 Keep design and supporting data on site.

.6 Engage services of qualified professional Engineer who is registered or licensed in Province of BC, 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.

1.8 WASTE MANAGEMENT AND DISPOSAL

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

.2 Divert excess materials from landfill to local facility for reuse as directed by Departmental Representative.

1.9 EXISTING CONDITIONS

.1 Examine soil report included in Contract Documents

.2 Buried services:

.1 Before commencing work establish location of all buried services on and adjacent to site.

.1 Perform ground penetrating radar (GPR) Scan of all areas to be excavated.

.2 Provide Departmental Representative with results of Scan including location of all underground services in CAD drawing format.

.3 Review results of GPR Scan with Departmental Representative prior to commencing excavation work.

.4 Establish location and state of use of buried utilities and structures.

.5 Mark locations of all buried utilities and structures with survey marking paint.

.6 Where crossing of buried services and structures identified by GPR scan is required, confirm locations of buried utilities by careful test excavations prior to commencing excavation Work.

.2 Remove obsolete buried services within 2 m of foundations: cap cut-offs.

.3 Size, depth and location of existing buried utilities and structures are not known. Buried services in areas of excavation may include but are not limited to: water lines, sewer lines, communications lines, low voltage (600 and 208V) power, high voltage distribution.

.4 Prior to beginning excavation Work, notify Departmental Representative.

.5 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.

.6 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before proceeding with Work.

.7 Record location of maintained, re-routed and abandoned underground lines.

.8 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.

.4 Restore existing surface features to original condition after completion of excavation Work.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Type 1 and Type 2 fill: properties to and the following requirements:

.1 Crushed, pit run or screened stone, gravel or sand free from clay lumps, cementation, and organic material.

.2 Gradations to be within limits specified when tested to ASTM C136 or ASTM C117 as applicable. Sieve sizes to CAN/CGSB-8.2.

.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 Sand: clean, washed, coarse sand free from clay, shale, and organic matter.

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 requirements of authorities having jurisdiction.

.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.

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 STRIPPING OF TOPSOIL

.1 Begin topsoil stripping of areas after area has been cleared of brush or grasses and removed from site.

.2 Strip topsoil to as required.

.1 Do not mix topsoil with subsoil.

.3 Stockpile in locations as indicated as directed by Departmental Representative.

.1 Stockpile height not to exceed 2 m and should be protected from erosion.

3.5 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.

3.6 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

.1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Health and Safety Act for the Province of BC.

.2 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.

.3 When sheeting is required to remain in place, cut off tops at elevations as indicated.

.4 Upon completion of substructure construction:

.1 Remove cofferdams, shoring and bracing.

.2 Remove excess materials from site.

3.7 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress.

.2 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.

.3 Protect open excavations against flooding and damage due to surface run-off.

.4 Dispose of water in as directed by Departmental Representative and in manner not detrimental to public and private property, or portion of Work completed or under construction.

3.8 EXCAVATION

.1 Advise Departmental Representative at least 5 days in advance of excavation operations.

.2 Excavation must not interfere with bearing capacity of adjacent foundations.

.3 Do not disturb soil within branch spread of trees or shrubs that are to remain.

.1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.4 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.

.5 Restrict vehicle operations directly adjacent to open trenches.

.6 Dispose of surplus and unsuitable excavated material off site.

.7 Do not obstruct flow of surface drainage or natural watercourses.

.8 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.9 Notify Departmental Representative when bottom of excavation is reached.

.10 Obtain Departmental Representative approval of completed excavation.

.11 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.

.12 Correct unauthorized over-excavation as follows:

.1 Fill under other areas with Type 2 fill compacted to not less than 95 % of corrected Standard Proctor maximum dry density.

3.9 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Place and compact granular material for bedding and surround of underground services as indicated on Drawings.

.2 Place bedding and surround material in unfrozen condition.

3.10 BACKFILLING

.1 Vibratory compaction equipment.

.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 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 Consolidate and level unshrinkable fill with internal vibrators.

3.11 RESTORATION

.1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 21 - Construction/Demolition Waste Management and Disposal, trim slopes, and correct defects as directed by Departmental Representative.

.2 Reinstate lawns to elevation which existed before excavation.

.3 Reinstate gravel roadways disturbed by excavation to thickness, structure and elevation which existed before excavation.

.4 Clean and reinstate areas affected by Work as directed by Departmental Representative.

.5 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.

.6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

1.0 ELECTRICAL FORMS

1.1 EF 100 Check List – Submissions to Consultant

ITEM	CHECKED BY	DATE
5 WORKING DAYS BEFORE CLOSE OF SUBTRADE TENDER – Request for addition of acceptable manufacturers		
10 DAYS AFTER AWARD OF THE CONTRACT – List of equipment suppliers and subtrades (EF 110) – Detailed price breakdown (EF 112)		
A.S.A.P. – Shop drawings and Product Samples (EF 111)		
WITH EACH APPLICATION FOR PROGRESS PAYMENT – Price breakdown (EF 112)		
PRIOR TO DEMONSTRATION OF SYSTEMS – Demonstration agenda		
DEMONSTRATION OF SYSTEMS – Checklists for sign off of Demonstrations (EF 141)		
10 DAYS PRIOR TO SUBSTANTIAL PERFORMANCE – Submission of items listed on Form EF-142		
WHEN REQUESTING REVIEW OF OUTSTANDING WORK – Checklist of work remaining (EF 144) – Certificate of total completion (EF 145)		

1.2 EF 110 Equipment/Sub-Trade List

ITEM	COMPANY/SUPPLIER
Civil Services	
Seismic/Structural Engineer	

1.3 EF 111 Check List –Shop drawings and Product and Samples

		REVIEW	
ITEM	**DATE SUBMITTED**	**ACTION**	**DATE**
Luminaires			
Solar Luminaires			
Seismic Engineer			
In-Ground Junction Boxes			
Luminaire Poles & Arms			

1.4 EF 112 Progress Claim Summary – Division

PROJECT: **CLAIM NO:** _____

FOR MONTH OF:

ITEM		**PRICE**	**WORK TO DATE**		**PREVIOUS WORK**		**THIS MONTH**	
		$	**%**	**$**	**%**	**$**	**%**	**$**
Base Contract:								
General Conditions								
Mobilization (not to exceed 2%)								
Demolition								
Conduit, Boxes & Wire	Matl. Lab.							
Luminaires & Poles	Matl. Lab.							
Lighting Controls	Matl. Lab.							
Civil Services	Matl. Lab.							
O & M Manuals/Record Dwgs								
Testing & Commissioning								
Other								
Total Base Contract								
Change Order Summary								
Total Change Orders								
Total Contract:								
Amount due less holdback								

Submit this form as called for on EF 100 for tender price breakdown and for each progress claim

1.5 EF 130 Certificate of Penetrations Through Separations

Project Identification: _____

I hereby declare that I _____

am an employee/a principal of _____

have personally witnessed that all electrical service penetrations through fire separations (rated & non-rated) and sound separations in the following areas have been properly sealed in accordance with the specified requirements.

SIGNED _____ DATE _____

AREA	SIGNED	DATE
Level:		
Level:		
Level:		
Level:		
Level:		
Level:		
Level:		
Level:		
Level:		

NOTES:

.1 This certificate shall be submitted to the Consultant prior to Substantial Performance.

1.6 EF 131 Certificate of Seismic Restraint Installation

Project Identification: _____

I hereby declare that I _____

am an employee/a principal of _____

Certify that the seismic restraint of all electrical equipment and wiring system installation meets the requirements of the B.C. Building Code as it relates to seismic restraint and the Supplemental Schedules S-B and S-C have been submitted and signed and to the Consultant.

SIGNED _____ DATE _____

NOTES:

.1 This certificate shall be submitted to the Consultant prior to Substantial Performance

1.7 EF 141 Check List – Owners Demonstration

	CONTRACTOR		OWNER	
SYSTEM / ITEM	**SIGNED**	**DATE**	**SIGNED**	**DATE**
Lighting Controls				
Review of Maintenance Manual				
Points of required Maintenance				

NOTES:

.1 Contractor shall submit copies of this form with each appropriate item signed and dated by the person having overall charge of commissioning prior to substantial performance. (See EF 143).

.2 Owner's representative shall sign off each item during or after the demonstration.

.3 Contractor to strike out items where they do not apply to the systems being demonstrated.

.4 Interlocks and controls to be demonstrated by following the descriptions and diagrams in the contract documents and proving that all controls function as required.

.5 Where multiple identical controls are installed the Owners representative may elect to only witness sample items, but the person having charge of commissioning is expected to have checked them all.

1.8 EF 142 Check List – Substantial Performance Submissions – Electrical

ITEM	DATE	STATUS
Electrical Certificate of Inspection and Safe to Occupy Declaration		
Fire Stop Penetration Certificate. (EF-130)		
Identification		
Record Drawings		
Operating & Maintenance Manuals		
Seismic Engineer Report and Schedules (EF131)		
Contractor's Letter of Guarantee and Warranty		
Demonstration to Operating Staff agenda		
Demonstrations Checklists (EF 141)		
Substantial Performance Certificate (EF143)		
Checklist of work remaining after Substantial (EF 144).		

NOTES:

.1 This list is provided as a checklist and may not include all Substantial Performance requirements.

1.9 EF 143 Certificate of Substantial Performance - Electrical

I hereby certify that I _____
am an employee / a principal /an agent

of _____

and have personally witnessed the following with regard to the electrical systems work specified for the above project and that to the best of my knowledge except as noted on EF 144 (attached);

- The installation is complete and as specified.
- The systems have been commissioned and operate satisfactorily.
- Every control sequence and every control performs as specified.
- The systems are clean.
- All of the required submissions have been made to the consultant.

SIGNED _____ DATE _____

NOTES:

.1 This certificate must be completed and submitted to the consultant prior to substantial performance.

.2 If it is apparent that the systems or their operation are seriously deficient then all reasonable costs and consultant time charges relating to any subsequent site reviews shall be deducted from the contract sum.

1.10 EF 144 Check List – Work Remaining After Substantial Performance

		COMPLETION		
ITEM NO.	**DESCRIPTION**	**CLAIMED BY**	**DATE**	**VERIFIED DATE**

NOTES:

.1 This form must be filled in and submitted to the Consultant prior to substantial performance.

.2 Any discovered outstanding items will be added to the list by the Consultant. Copies of the complete list will be circulated to the Owner, the Architect and the Contractor.

.3 The Contractor may include estimated values against the outstanding work but determination of the actual amounts to be held will be made by the Consultant.

.4 The Contractor shall sign off each item as it is completed and submit the list monthly to the Consultant. When all items are signed off the completed list shall be submitted with the certificate of total performance **EF 145**.

1.11 EF 145 Certificate of Total Performance – Electrical

I hereby certify that I _____
am an employee / a principal / an agent

of _____

and have personally witnessed that each item of outstanding work on the checklist and record of work remaining after substantial completion EF 144 (attached) has been satisfactorily completed and I hereby certify that the Electrical systems work specified on the above project is complete.

SIGNED _____ DATE _____

NOTES:

.1 This certificate must be completed and submitted to the Consultant when requesting total performance.

.2 If it is apparent during the final review that the systems or their operation are seriously deficient then all reasonable costs and consultant time charges relating to any subsequent site reviews shall be deducted from the contract sum.

END OF SECTION